

Final Program

Thirty-Fifth Annual Meeting

International Neuropsychological Society

February 7-10, 2007
Portland, Oregon, USA

WEDNESDAY, FEBRUARY 7, 2007

4:15–5:45 PM

Poster Session 1: Assessment/Aging/HIV

Aging

1. BANGEN, KJ Complex Activities of Daily Living and Cognition in Mild Cognitive Impairment.
2. BOORSTEIN, HC Predicting Relative Impairment from the Wechsler Test of Adult Reading (WTAR) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in a Sample of Normal Elderly Volunteers.
3. CERNIN, PA Cognitive Functioning Tasks as Related to Self-Rated and Objectively Measured Successful Aging in a Sample of Urban, African American Older Adults.
4. CHANG, Y Age Difference in Memory for Relational Associations.
5. DOODY, A The Baycrest Attention Test and Normal Aging.
6. DUX, M A Longitudinal Analysis of Negative Affect as a Moderator between Objective Cognitive Functioning and Subjective Memory Complaints in Older Adults.
7. ELDERKIN-THOMPSON, V Relationship Between Executive Performance and Prefrontal Volumes among Healthy and Depressed Elderly.
8. GLEASON, CE Orientation, but not Recall Performance, Predicts Falls in Elderly Community-Dwelling Subjects: The Kenosha County Falls Prevention Research Study.
9. HILBORN, J Intraindividual Variability Across Cognitive Domains: Investigation of Dispersion Levels and Performance Profiles in Older Adults.
10. HISCOCK, M The True Effect of Aging on Verbal and Nonverbal Abilities: An Examination of Wechsler Subtest Norms after Adjustment for the Flynn Effect.
11. HOLTZER, R The Cognitive Determinants of Gait in Aging.
12. HOLTZER, R Comparison of Robust Versus Conventional Norms of Neuropsychological Tests in Aging.
13. JAK, AJ Diagnostic Characterization of MCI Subtypes in a Naturalistic Sample.
14. JEFFERSON, AL Activities of daily living in individuals with mild cognitive impairment.
15. KIM, E Effects of Visual vs. Auditory Presentation on Memory Span Tasks in Young and Older Adults.
16. LEE, S Physiological stress response is associated with increased regional glucose metabolism in anterior cingulate cortex and poor episodic memory in normal elderly adults.
17. LEE, J Psychosocial Stress Induced Cortisol Response, Basal Cortisol Level, and Cognitive Functions in Healthy Elderly Adults.
18. MCGILLIVRAY, S Cognitive Performance in Long-Term Abstinent Elderly Alcoholics.
19. MIKOS, AE Aging, Emotional Memory, and the Hippocampus.
20. MILLER, KJ Verbal Memory Declines with Age and Alzheimer's Disease Risk Factors.
21. MILLER, KJ Semantic Fluency as a Screening Tool.
22. MILLER, LS Preliminary Results from the FRILL-2 Study: Caregiver cognitive performance and quality of elder care.
23. NICOSIA, JD Verbatim and Paraphrase Recall: Older Adults' Performance on a Story Memory Task.
24. PELOQUIN, AA RBANS Normative Samples: A Comparative Examination of the use of the RBANS Norms versus the OKLA-HOMA Norms with High-Risk Older Adults.
25. POTTER, CG Occupational Complexity, Intelligence, and Education as Predictors of Cognitive Status in Late Life.
26. RECKNOR, EC Decision-Making Deficits are Related to Heightened Reward Responsiveness in Older Adults.
27. ROGERS, SA Differences in Stroop Performance Between Normal and MCI Patients.
28. ROGERS, SA Cognitive Functioning in Older Adults: Looking Closer at the Role of Hormones.
29. ROGERS, SA Normative Data on the Stroop Measures for Older Adults.
30. SCHNEIDER, B Executive Functioning as Related to Disability and Physical Function in Urban African American Elders.
31. SPINA, L Education Corrections for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Are They Necessary?
32. SPINA, L The Stability of the Mini Mental Status Exam (MMSE) in Cognitively Intact Elderly.
33. SUHR, J Relation of Executive Dysfunction to Memory Performance in an Assisted Living Population.
34. TAN, J Cognitive Functioning and Independent Behaviors in Older Adults.

35. UTTL, B Factors Influencing Size of Age-Related Declines in Prospective Memory.
 36. ZINN, S Relationship Between Executive Functioning and Balance and Mobility in Cerebrovascular Disease.
 37. ZOLLER, Y The effects of education on different types of verbal fluency tasks among Hispanic elders.

Agnosia/Disordered Representations

38. DEMERTZIS, KH Neuropsychological and Neuroanatomical Correlates of Topographical Disorientation Following Right PCA Infarct.
 39. WIEGAND, MA Prosopagnosia Reflects a Lack of Caricature: The Differential Effects of Training on Object Recognition.
 40. WISNOWSKI, JL What is the Relation between the Extent of Damage within Temporal-occipital Cortex and the Severity of Visual Recognition Impairments?

Apraxia/Motor Sequencing

41. HANNA-PLADDY, B Three Dimensional Kinematics of Tool Action: Comparison of Pantomime and Manipulation.
 42. RAYMER, AM Gesture Recognition and Production in Patients with Left Hemisphere Stroke.
 43. ROY, EA Tool and Action Recognition and Gesture Production in Left Hemisphere Stroke.
 44. STAMENOVA, V Tactile and Visual cues facilitate performance of transitive gestures in patients with Corticobasal Degeneration.

Behavioral Neurology

45. DRAGO, V Spatial-Attention and Emotional Evocation: Line Bisection's Performance and Visual Art's Emotional Evocation.
 46. DRAGO, V Pseudoneglect in Parkinson's Disease.
 47. KLUGER, B Dysfunctional Generation and Interpretation of Emotional Faces in a Patient with Corticobasal Degeneration.
 48. WILDE, MC Inter-hemispheric Differences in Motor Impersistence Performance in Acute Stroke.

Cognitive Neuroscience

49. BECERRIL, KE Cortical Reorganization of Language Areas in Patients with Brain Tumors: fMRI and Neuropsychological Evidence.
 50. BERGERON, J The Influence of Cerebrovascular Risk Factors on Non-motor Procedural Learning in Parkinson's Disease Patients.
 51. BOWLER, RM Memory Enhancement Rehabilitative Training of Manganese Exposed Welders: Pre- and Post-Test Results*.
 52. BROWNDYKE, JN Functional Neuroanatomical Correlates of Subsequent Memory for Object Concept and Response Certainty in the Elderly.
 53. CHAMBERS, CA Cognitive and Affective Outcomes in Patients with Intentional and Accidental Acute Carbon Monoxide Poisoning.
 54. GOODALL, K Asymmetry in Spatial Judgments: Bins vs Spatial Frequency in a Double Double Dissociation.
 55. LALCHANDANI, RM "Subtyping" Schizophrenia by Higher-Order Cognitive Functions.
 56. RIES, M Functions of the Posterior Cingulate Cortex: Interaction of Memory Retrieval and Self-Appraisal.
 57. SUBRAMANIAM, K Mood Effects on Insight Problem Solving.
 58. TAYLOR-COOKE, PA Repetitive Transcranial Magnetic Stimulation Alters Higher Cortical Visual Processing.
 59. TLUSTOS, S Neural Correlates of Comprehension of Distorted Speech.

HIV/AIDS

60. BOGDANOVA, Y Relation of Alexithymia to Cognition in Asymptomatic Individuals with HIV.
 61. FAMA, R Attentional and Memory Deficits in HIV Infection Comorbid with Alcoholism.
 62. FULLER, S Sleep Disturbances, Fatigue, and Cognition in Children with Perinatal HIV Infection.
 63. GOULD, F Procedural Memory Function in HIV + Women.
 64. HALL, MJ The effect of anxiety and depression on neuropsychological performance for those with HIV/AIDS.
 65. HARRIS, L Attentional Problems in Young Children with Vertically-Acquired HIV-Infection.
 66. IUDICELLO, J Both semantic memory and executive functions predict action (verb) fluency in HIV infection.
 67. LOVEJOY, T Neuropsychological Functioning and Risk Behavior in Persons 50-Plus Years of Age Living with HIV/AIDS.
 68. MONZONES, J Neuropsychological and Sociocultural Determinants of Activities of Daily Living Among Ethnic Minority HIV+ Adults.
 69. MUÑOZ-MORENO, J Benefits of a Cognitive Rehabilitation Program on Neurocognitive Impairment in HIV-Infected Patients. Preliminary Findings.
 70. PALTIN, I Predictive Utility of Neuropsychological Functioning and Depression on Activities of Daily Living in HIV+ Adults.

Normal Aging

71. BEDICS, J Normative Data Stratified by Age for Measures of Semantic Fluency: Animals and Fruits/Vegetables.
 72. BELFOR, N Reliability, cross validation and age norms of a modified Token Test for use with the elderly (ages 60+).
 73. BENAVIDES, BM Congruency Effects in Normal Aging.
 74. CHAN, RC Multitasking performances in healthy older Chinese adults.
 75. ERCOLI, LM Memory Enhancement Training Effects in Healthy Older Adults Compared to Health Education and Wait List Conditions.

- 76. HUBY, N Impact of Early Mild Cognitive Change on Activities of Daily Living in Healthy Older Adults: Markers for Decline.
- 77. KANG, C Superior Intellectual Functioning and Cognitive Decline in Normal Aging.
- 78. LALOGGIA, AL Working Memory Contributes to Iowa Gambling Task Performance in Older Adults.
- 79. LANTING, SC Sex and Age Differences in Performance and Strategy Use During Speeded Verbal Fluency Tasks.
- 80. MACKAY, A Instructional set changes semantic clustering but does not improve memory in healthy older adults.
- 81. MARSHALL, RS A Pilot Study on the Effect of Unilateral Nostril Breathing on Mood, Verbal and Spatial Abilities.
- 82. SPRINGATE, B Semantic Clustering on a Verbal Memory Task in Healthy Elderly.
- 83. TENG, S Temporal Order Memory in Normal Elderly Individuals.
- 84. VAN DER HULST, E Trait Openness Correlates More Highly with Crystallized Intelligence than with Executive Functioning.
- 85. ZEC, RF Comparison of Cross-Sectional and Longitudinal Data on the Boston Naming Test.

Executive Abilities/Frontal System

- 86. CRUZ, N The Link Between Executive Functioning and Academic Performance Ratings Among Clinically-Referred Children.

4:45–6:15 PM

**Paper Session 1
Cross Cultural Issues
Room:Grand Ballroom I**

- 1. WOLFE, N Comparison of Semantic Fluency Performance of Healthy Elderly in Japan and the United States.
- 2. CHEY, J Illiteracy is a Risk for Dementia: A Seven-Year Follow-Up Study of Community Residing Elderly Koreans.
- 3. HUMPHREY, L Rey Osterreith Performance in a Population Sample of Finnish Adolescents With and Without Attention Deficit Hyperactivity Disorder.
- 4. GONZALEZ, F Development and Rationale for Hg Testing Protocol.

4:45–6:15 PM

**Paper Session 2
Chronic Illness
Room:Grand Ballroom II**

- 1. PRAKASH, RS Altered Patterns of Cerebral Activation During Response Inhibition in Multiple Sclerosis: An fMRI Investigation.
- 2. BUSCH, RM The Relationship Between ApoE ε4 and Memory Performance in Patients with Medically Intractable Temporal Lobe Epilepsy.
- 3. SCHOENBERG, MR Neuropsychological outcome of a Prospective Clinical Trial of Thalamic Deep Brain Stimulation for Tourette Syndrome: 3-month post-op data.
- 4. BACK-MADRUGA, C Cognitive Reserve as a Risk Factor for Neuropsychological Impairment in Patients with Chronic Hepatitis C.

6:15–7:45 PM

**INS Welcome Reception
Room:Pavilion**

THURSDAY, FEBRUARY 8, 2007

9:00–10:30 AM

**Paper Session 3
Pediatric Oncology
Room:Pavilion**

- 1. CONKLIN, HM Academic Achievement after Treatment with Conformal Radiation Therapy for Localized Ependymoma in Childhood.
- 2. KRULL, KR Folate Pathway Polymorphisms are Related to AD/HD in Childhood Acute Lymphoblastic Leukemia Survivors.
- 3. MORRIS, RC Exploration of Social Rule Violation in Patient with Focal Prefrontal Neurosurgical Lesions.
- 4. PAPAZOGLU, A Behavior Problems as Predictors of Later Adaptive Functioning in Children with Brain Tumors.

9:00–10:30 AM

**Invited Symposium
The Cognitive Neuroscience and Neuropsychology of Normal Aging and Alzheimer's Disease
Chair: Betty Glisky, Discussant: Eric Reiman
Room:Grand Ballroom I**

- 1. GLISKY, E The Cognitive Neuroscience and Neuropsychology of Normal Aging and Alzheimer's Disease.
- 2. BARNES, CA Cognitive Changes in Normal Aging: What Does the Hippocampus Contribute?
- 3. GLISKY, EL Neuropsychological Changes with Age: What is Normal?
- 4. RYAN, L Assessing risk for Alzheimer's disease using diffusion-weighted MRI.

5. KASZNAK, AW Connecting Cognitive Neuroscience and Neuropsychological Assessment in Alzheimer's Disease.

9:00–10:30 AM**Symposium 1****Functional Neuroimaging and Sport-Related Concussion: A 5-Year Study****Chair: Jamie Pardini, Discussant: Jeff Barth****Room:Grand Ballroom II**

1. PARDINI, J Functional Neuroimaging and Sport-Related Concussion: A 5-Year Study.
2. LOVELL, M Functional Neuroimaging and Sport-Related Concussion: An Overview.
3. PARDINI, J Neuropsychological and Neurobehavioral Sequelae of Concussion.
4. BECKER, JT MRI Correlates of Sports-Related Concussion.
5. PARDINI, D Examining Heterogeneity in Concussed Athletes Using Functional Neuroimaging.
6. EDDY, B Magnetoencephalography: Exploring the Electrophysiological Consequences of Concussion.

9:00–10:30 AM**Poster Session 2: Imaging/Assessment****Assessment/Psychometrics**

1. AHMED, FS Assessment of Theory of Mind: Variance among Measures.
2. ANDERSON, EJ Use of Standard Neuropsychological Measures as Indicators of Insufficient Effort.
3. ASHENDORF, L Older Adult Normative Data for Trail Making Test Errors.
4. ATCHISON, T Factor Analysis of the Ward 7 Subtest Short Form of the WAIS-III.
5. ATKINSON, TM Age Differences in the Switching Component of Phonemic Fluency in the Written Version of COWA.
6. ATKINSON, TM The Use of Alternate Forms of the Trail Making Test to Facilitate Serial Neuropsychological Assessment.
7. BAERWALD, JP Reported Depressive Symptomatology and Verbal-Performance Differences.
8. BOWDEN, S Interpreting clinical dissociations: Why does test theory matter?
9. BYLSMA, FW Cuing Effects on Boston Naming Test (BNT) Performance.
10. CAROTHERS, T Ecological Validity of Neuropsychological Tests for Predicting Navigational Ability After Unilateral Brain Damage.
11. CARROLL, RT The Relationship Between MMPI-2 Depression Scores and Cognitive Functioning in a Heterogeneous Neuropsychiatric Sample.
12. COBIA, D Investigating the Extended Complex Figure Test and Motor Independent Version in Individuals with Traumatic Brain Injury.
13. CROMER, JR Internet-Based Games as Measures of Cognition: An Untapped Resource.
14. DEVINE, S The Framingham Heart Study Clock Scoring Protocol: An Introduction.
15. EL-MESSIDI, L Assessment of Memory and Executive Function Awareness in Older Individuals.
16. FLETCHER-JANZEN, E The Influence of Socioeconomic Status on the Measurement of Cognitive Abilities: A Lurian Context.
17. HARVEY, DJ Relationship of Demographic Variables to Derived Trail Making Test Indices Among Normal Older Adults.
18. HUGHITT, V Time Estimation Predicts Performance on Neuropsychological Tests: Preliminary Findings.
19. JENKINS, RA Anatomy of the Token Test: Which Items Best Predict Language and Executive Function Abilities?
20. KANE, AE Evaluation of the 7 Minute Screen in Elderly Primary Care Patients with Memory Complaints.
21. KATZENSTEIN, J Validity of Parent Report in Assessing Language Among Internationally Adopted Children.
22. MARTIELLI, TM Boston Naming Test Norms for 15 through 18 year old Adolescents.
23. POLANCE, C Depression, Anxiety, and Validity of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) in Adult Attention-Deficit/Hyperactivity Disorder (ADHD).
24. RANE, S Development of a Non-Manual Trail Making Test: Convergent and Discriminant Validity.
25. RAU, H Emotional Processing Deficits May Predict Poor Reading Comprehension in Male Sex Offenders.
26. RICE, S A Comparison of Four Clock-Drawing Scoring Systems: Preliminary Results.
27. RIZZO, T A Preliminary Study of the Incremental Validity of Quantified Process-Related Features from the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to Diagnostic Classification of Cognitive Disorder in a Geriatric Sample.
28. RYAN, GP Verbal-Performance Discrepancy and Social Introversion: A Pilot Study Comparing College Students Performance on the WAIS-III and MMPI-2.
29. SESTITO, N WAIS-III Matrix Reasoning and WCST: The Same Cognitive Domain?
30. UNVERZAGT, FW The Indiana University Telephone-Based Assessment of Neuropsychological Status (IU-TBANS): A new method for large scale neuropsychological assessment.

Electrophysiology/EEG/ERP

31. BAKER, TE Which way do I go? Neural activation in response to feedback processing and decision making in a virtual T-Maze.
32. CANNON, R Loreta Neurofeedback: A Cortical – Subcortical Comparison.
33. CATO JACKSON, MA Electroclinical Features, Neuroimaging, and Neuropsychological Findings in Childhood Atypical Absence Epilepsy.
34. HIGGINS-STRICKLAND, K Early Orthographic Specific Visual ERPs During Word Recognition in Developmental Dyslexia.
35. MENNEMEIER, MS The P50 ERP is Sensitive to Arousal States in Both Neglect and Normal Subjects.

36. MOLLET, GA Hostility and Pain: Increased Cerebral Activation to Cold Pressor Pain in Heightened Hostility.
 37. MOLNAR, AE Alphabetic Letter-Knowledge and Speech Sound Discrimination: A Preliminary Study using Electrophysiology in a Preschool Sample.
 38. PRATT, NL Frontal Negativity Assesses Feedback in Associative Learning.
 39. PRICE, J Hemispheric and Sex Differences in Speech Perception in 4-year olds.
 40. STEFANATOS, G Mapping Neural Responses to Rapid Frequency Modulations (FM) in Sound.
 41. STIGGE-KAUFMAN, DA Cognitive Modulation of Event-Related Potentials to Emotional Faces.

Executive Abilities/Frontal System

42. MCLAUGHLIN, NC Working Memory and the Prefrontal Cortex: A Structural Analysis.

Imaging: Functional

43. BRINKMAN, M Using fMRI to Distinguish Complex Visual Processing from Emotion Processing.
 44. CARR, L The Neural Correlates of Gender and Number Agreement in Spanish.
 45. CHEN, S Reproducibility of Activations for Two Standardized Chinese Language Tasks for Use in a Clinical fMRI Battery.
 46. CHIOU, K An fMRI Investigation of Visual Working Memory Following Moderate and Severe TBI.
 47. CLERKIN, SM Simultaneous Measurement of Brain Activation Associated with Emotional Processing and Response Inhibition.
 48. FARACO, CC Searching for Endophenotypic Markers of Schizophrenia: An FMRI Study Using the Stroop Task.
 49. GREEN, E Measure of Appetite Associated With Differences in Cortical Activation From Hungry to Satiated States.
 50. KENNEPOHL, S Correlating fMRI activation in the medial temporal lobe with memory performance: discrimination or response bias?
 51. KESSEL, Y Practice- and Fatigue-Related Changes in Neural Activity in an FMRI Scanning of a Spatial Working Memory Task.
 52. KOVEN, NS Neural Correlates of Reaction Time Variability during Working Memory Performance in Schizophrenia.
 53. KRIVITZKY, L Initial Development of a Pediatric Working Memory and Inhibitory Control Task for fMRI.
 54. LENGENFELDER, J A Functional Near Infrared Spectroscopy Study of Verbal Fluency.
 55. MADORE, MR Activation Patterns for Healthy Individuals for Emotional and Neutral Pictures.
 56. MANI, T Application of FMRI to Evaluate Changes in Functional Activation among a Moderate to Severe TBI Group.
 57. MANI, T Changes in Brain Functioning over Time among a Small TBI Group Performing a Stroop Task.
 58. MCLAUGHLIN, NC Diffusion Tensor Imaging of the Corpus Callosum: A Cross-Sectional Study Across the Lifespan.
 59. MUNRO, CA Sex Difference in the Relation between Striatal Dopamine Release and Testosterone.
 60. PADULA, CB Spatial Working Memory Performance and fMRI Activation Interactions in Abstinent Adolescent Marijuana Users.
 61. PENDERGRASS, J Neural Correlates of Response Inhibition and Reaction Time Variability in Bipolar Disorder.
 62. RAMATI, A Working Memory and Implicit Learning in Electrically Injured Patients: A Functional Neuroimaging Study.
 63. REY, CJ Language Networks in Children with Intractable Epilepsy Due to Malformations of Cortical Development and Hippocampal Sclerosis.
 64. ROSEMAN, EC FMRI: Redefining the Rest State.
 65. TAKAHASHI, T Differential Patterns of Near Infrared Spectroscopy (NIRS) Response in Alzheimer's Disease and Late-Life Depression.
 66. VOELBEL, G Pattern of Activation within the Frontal Lobe during Auditory Working Memory: A functional Near Infrared Spectroscopy Study.
 67. WOOLSTON, DJ fMRI Investigation of an Experimental Executive Function Measure: The Texas Card Sorting Test.

Imaging: Structural

68. BRICKMAN, AM Multivariate defined age-associated atrophy is associated with cognitive functioning.
 69. BUCKMAN, JF Volumetric Differences of the Thalamus Associated with Childhood Psychopathology and Family History of Alcoholism.
 70. ELDERKIN-THOMPSON, V Cognitive Function and Prefrontal Volumes of Adults with Type 2 Diabetes and Major Depression.
 71. HORNE, NR Diffusion Tensor Imaging in Alzheimer's Disease: A Meta-Analysis.
 72. JOSEPH, DA DTI Morphological Dilation Techniques and Relationships to Cognitive Functioning.
 73. KLAGES, JD Regional Hippocampal Atrophy in Persons with Mild Alzheimer's Disease and Vascular Cognitive Impairment.
 74. LOCKHART, PJ Volumetric Analyses of the Corpus Callosum and Cerebellar Vermis of Children with Prenatal Alcohol Exposure without Fetal Alcohol Syndrome.
 75. ROSENBLUM, MJ Frontal White Matter Fiber Bundle Integrity Predicts Digit Symbol Test Performance in Alcoholics: A Diffusion Tensor Imaging Study.
 76. SEMRUD-CLIKEMAN, M Frontal Lobe Volumes in Children with ADHD.
 77. WILDE, E The Relation Between Diffusion Tensor Imaging in the Frontal Lobes and Executive Functioning in Pediatric Traumatic Brain Injury.
 78. WILLIAMSON, JB Relationships between Whole Brain and Regional Apparent White Matter Integrity and Neuropsychological Markers in Post-ischemic Stroke Patients.
 79. WOOD, M Volumetric Measurement of the Entorhinal Cortex: A Reliability and Validity Analysis.
 80. YALLAMPALLI, R The Relation Between Diffusion Tensor Imaging in the Cingulate and WCST Performance in Bipolar Disorder.

10:30–10:50 AM**Coffee Break
Room: Plaza and Ballroom Foyers, Exhibit Hall****10:45 AM–12:15 PM****Poster Session 3: Adult Acquired CNS Injury****Hemispheric Asymmetry/Laterality/Callosal Studies**

1. DELEON, RC Why Do Certain Right-Handers Fail to Exhibit a Right-Ear Advantage? An Electrophysiological Study.
2. HIATT, K Behavioral Assessment of Interhemispheric Communication Among Psychopathic Offenders.
3. HOLLAND, AK Differences in Cerebral Lateralization of Phoneme Detection as a Function of Hostility and Stress.
4. HOLLAND, AK Lateralized Differences in Systolic Blood Pressure Regulation as a Function of Hostility Level.
5. LEE, J An Investigation of Sex Differences in Hemispheric Asymmetry using Auditory and Tactile Recognition Memory Tasks.
6. LEGARDY, SN Deficits in Interpreting Inference and Irony Individuals with Agenesis of the Corpus Callosum.
7. MANO, QR cAsE MiXiNg Reverses the Asymmetry of Orthographic Neighborhood Effects: A Lateralized Lexical Decision Experiment.
8. MOES, P Interhemispheric Interaction of Emotional Processing in Relation to Social and Emotional Behavior.
9. PARLOW, SE Identifying Ambiguous Hand Preference in Autistic Children.
10. PULSIPHER, D Line Bisection is Not a Measure of Gross Callosal Maturation in Healthy Children.
11. SCHULTE, T Stroop-Cue Match Performance In Alcohol Abuse, Hiv, And Combined Disorder: A Diffusion Tensor Imaging Study.
12. SITZER, TE A Comparison of Hippocampal Asymmetry in Alzheimer Disease and Hippocampal Sclerosis.
13. SKIDMORE, FM Lateralization Effects of Conceptual Hypometria on Perception of Relatively Far Peripersonal Space in Idiopathic Parkinson's Disease.
14. WHITMAN, RD A Reciprocal, Dynamic, Hemispheric Model of Creativity.
15. WHITMAN, RD Lateralized Serial Semantic Priming.

Neglect

16. ANTONIELLO, D Task Specific Altitudinal Neglect.
17. BUTLER, B The Effect of Left Limb Movements on the Orienting of Attention after Right Hemisphere Stroke.
18. LEE, BH Mini-Mental State Examination in Right Hemisphere stroke with or without hemispatial neglect.
19. MURRAY, E "Getting the Picture" of Spatial Neglect.

Stroke

20. HASHIMOTO, Y Reversal Learning with Different Type of Stimuli in Patients with Unilateral Hemisphere Damage.
21. HERNÁNDEZ, TD Effects of Jin Shin on Motor Function Following Stroke.
22. LEE, SB Rehabilitative Couple Therapy Approach for the Stroke Patients and Caregivers.
23. NAKHUTINA, L The Effect of Educational Attainment on Cognitive Performance and Recovery in Patients with Subarachnoid Hemorrhage (SAH).
24. ONO, M Cognitive Decline among Patients with Coronary Artery Disease.
25. PARSONS, TD Virtual Reality Upper Extremity Motor Training for Post-Stroke Rehabilitation.
26. RUSH, BK Persistent Cognitive and Functional Effects of First-Ever Ischemic Stroke.
27. SCOTT, CA Self-Assessment of Driving Ability and the Decision to Resume Driving Following Stroke.
28. WILDE, MC Correlates of Motor Impersistence in Acute Stroke.
29. ZINN, S Factor Analysis of Executive Functioning in Cerebrovascular Disease.

Traumatic Brain Injury

30. ABLITZ, BW Neurorehabilitation Associated Gains Following Long Standing Traumatic Brain Injury.
31. ANDERSON, J Memory predictions for episodic memory tasks in early recovery following severe traumatic brain injury.
32. ARENTH, PM An fMRI Study of Episodic Memory Following Traumatic Brain Injury.
33. BAILEY, CM Baseline MTBI Estimation in Collegiate Sports: Traditional vs. Newly Constructed Methods.
34. BERCAW, EL Effects of Overall Injury Severity on ANAM Performance in Mild Traumatic Brain Injury.
35. BOOTH, JE N-back task and working memory in severe traumatic brain injury.
36. BORNHOFEN, C Treating Emotion Perception Deficits in Traumatic Brain Injury.
37. BORNHOFEN, C Comparing Strategies for Treating Emotion Perception Deficits in Traumatic Brain Injury.
38. CARONE, DA Most Patients with Postconcussional Syndrome in a Clinical (Versus Forensic) Setting Exert Optimal Effort.
39. CARONE, DA Use of the Beck Depression Inventory - Fast Screen in Postconcussional Syndrome and the Moderating Influence of Effort.
40. CARTER, S The Relationship Between Cognitive Functioning and Sleepiness in Moderate to Severe Traumatic Brain Injury.
41. CLARK, AN Community Participation and Life Satisfaction One-Year Following Traumatic Brain Injury.
42. DAVIS, LC Medical and Psychosocial Predictors of Caregiver Functioning After Traumatic Brain Injury.
43. DIKMEN, S Magnesium Sulfate for Neuroprotection after Traumatic Brain Injury: A Randomized Trial.
44. DIVER, T Discordance of Symptom Report Across Clinical and Control Groups with Respect to Parent and Child.

45. EDWARDS-STEWART, A Impact of Litigation Status on Cognitive and Pain Subjective Complaints and Depression in Symptomatic Mild Traumatic Brain Injury.
46. ETTENHOFER, ML The Impact of Mild TBI on Cognitive Functioning and Post-Concussive Symptoms in the Post-Acute Phase of Injury: No Effects Relative to Injury Controls.
47. FESTA, JR Sedative Challenge Reveals Effects of Head Trauma.
48. GARMOE, W The Functional Self-Assessment Scale (FSAS) in Measurement of Self-Awareness Early Following Severe Traumatic Brain Injury.
49. GREMLEY, SM Self-Awareness and Memory Deficits in Sub-Acute Traumatic Brain Injury.
50. HEITZMAN, T Residual Effects of Head Injury: A Comparison of Self-Reports, Attention and Executive Functioning in Young Adults with and without a Reported History of Head Injury.
51. IVERSON, GL Effort testing and self-reported problems in patients with a post-concussion syndrome.
52. IVERSON, GL Predicting Recovery Time from Concussion in High School Football Players.
53. KIMBERG, C Development of a Measure of Functional Cognition for Adult TBI.
54. LARSON, MJ Contingency Sensitivity and Reward Prediction Following Severe TBI: An ERP Investigation.
55. LARSON, MJ Awareness of Deficit, Performance-Monitoring, and Evaluative Control Following Severe TBI.
56. LOEHER, KE Impulsivity and Traumatic Brain Injury: The Relationship Between Performance Measures, Rating Scales, and Behavioral Observation.
57. MARQUEZ DE LA PLATA Ethnic Differences in Rehabilitation Placement and Outcome after TBI.
58. NAIDOO, R Predictors of Independent Living After Traumatic Brain Injury.
59. NAKASE-RICHARDSON, R Predictive Utility of Acute Confusion Severity at One-Month Post Traumatic Brain Injury upon Late Employment Outcome: Prospective Comparison with Duration of Posttraumatic Amnesia.
60. NEAL, TJ Predicting neurological impairment with cognitive ability.
61. NOVACK, T Validity of the Memory/Attention Scale of the Neurobehavioral Functioning Inventory: Patient vs. Caregiver.
62. PAGULAYAN, KF Depression and Self-Reported Limitations After Traumatic Brain Injury: Direction of Causality.
63. PAGULAYAN, KF Magnitude and Characteristics of Impaired Self-Awareness Among Consecutively Hospitalized Individuals with Traumatic Brain Injury.
64. PAVAWALLA, SP Monitoring Behavior on a Time-Based Prospective Memory Task Following Traumatic Brain Injury.
65. PENNA, S Factors Associated with Life Satisfaction Following TBI at 3 and 6 Months Post-Injury.
66. PENNA, S Relation of the Neurobehavioral Functioning Inventory to Other Self-Report Measures of Depression.
67. PHATAK, VS Patient Perception of Disability and Post-Injury Depression in Traumatic Brain Injury (TBI).
68. PICA, AA The Relationship between Concussion Grading Scales and Clinical Outcome following Sports Related Concussion.
69. PONSFORD, J Cognitive Functioning and Outcome Ten Years Following Traumatic Brain Injury.
70. ROSKOS, T Factors affecting functional outcome following inpatient rehabilitation of TBI patients.
71. SANDER, AM Expectancies for Performance in Persons With Mild Traumatic Brain Injury.
72. SCHOENBERG, MR Comparing Functional Outcomes of a Computer-Based Cognitive Rehabilitation Teletherapy Program to Face-to-Face Rehabilitation Treatment: Cost equivalency.
73. SCHWARZ, L Mental Flexibility in Patients with Traumatic Brain Injury: An Examination of Contemporary Measures of Verbal Fluency and Set-Switching.
74. SHERER, M Comparison of Indices of Traumatic Brain Injury Severity.
75. SILVERBERG, ND Validity of the Cognitive Estimation Paradigm in Traumatic Brain Injury.
76. SIM, A Adolescent Athletes Demonstrate Prolonged Recovery of Memory Functioning Following mTBI.
77. STRUCHEN, MA Reliability and Discriminant Validity of the Script Analysis Measure for Persons with Traumatic Brain Injury.
78. STRUCHEN, MA Concurrent Validity of the Script Analysis Measure as a Test of Executive Functioning for Persons with Traumatic Brain Injury.
79. SUFFIELD, B Does Conventional Wisdom Explain the Miserable Minority? Risk Factors and Outcome from MTBI in a Compensation System.
80. TATE, RL Predicting the End of Post-traumatic Amnesia at the Beginning of Rehabilitation Admission.
81. THORNTON, AE Chronic Post-Concussion Symptoms are Differentially Associated with Concussion Exposure in Active versus Retired Athletes.
82. TSAOUSIDES, T Using the URICA to assess rehabilitation readiness for individuals with Traumatic Brain Injury.
83. VANVOORST, W Self-Awareness, Injury Severity, History of Substance Use, and Family Functioning Following Traumatic Brain Injury.
84. WHITNEY, KA Symptom Validity Testing Among Operation Iraqi Freedom (OIF) Polytrauma Military Patients.
85. WILDE, E Diffusion Tensor Imaging of the Cingulate and Relation to Reaction Time in Pediatric Traumatic Brain Injury.

11:00 AM–12:30 PM**Symposium 2****The Relationship Between Depression and Cognition in Different Neurological Patient Populations****Chair: Robyn Busch, Discussant: Meryl Butters****Room:Pavilion**

1. BUSCH, RM The Relationship Between Depression and Cognition in Different Neurological Patient Populations.
2. HAUT, JS Depression and Memory Before and After Temporal Lobectomy in Children with Epilepsy.
3. DULAY, MF Depression and Cognitive Test Performance 3 Months After Mild TBI.
4. BUSCH, RM Depression and Memory Before and After Temporal Lobectomy in Adults with Epilepsy.
5. SMERZ, JM Depression and Cognition Before and After VP Shunt Placement in Patients with Normal Pressure Hydrocephalus.
6. KUBU, CS Depression and Memory Before and After Deep Brain Stimulation in the Subthalamic Nucleus in Patients with Parkinson Disease.

11:00 AM–12:30 PM**Paper Session 4****Adult and Child CNS Injury Impact****Room:Grand Ballroom I**

1. GANESALINGAM, K Family Functioning Following Mild Closed-Head Injuries in Children and its Association with Post-Concussive Symptoms.
2. GOVEROVER, Y Treatment to Improve Self-Awareness and Functional Independence for Persons with TBI: A Pilot Randomized Trial.
3. HUESTIS, SE Associations of Neuropsychological and Behavioral Outcomes in Late Adolescent Survivors of Very Low Birth Weight.
4. ESPY, KA Prenatal Tobacco Exposure and Neonatal Attention and State Regulation: Role of Genetics?

11:00 AM–12:30 PM**Symposium 3****Neurocognitive Impairment Following Chemotherapy: Finding “Chemobrain”****Chair: Bart Brigidi****Room:Grand Ballroom II**

1. BRIGIDI, BD Neurocognitive Impairment Following Chemotherapy and Therapeutic Radiation.
2. WEFEL, JS Cognitive Sequelae Of Chemotherapy.
3. BRIGIDI, BD Assessment of Neurocognitive Impairment and Quality of Life in High Grade Glioma Patients Treated With Iodine-131-Labeled Anti-Tenascin Monoclonal Antibody (81C6) Radioimmunotherapy Administered into the Resection Cavity.
4. JACKSON, EF Evaluation of Functional Magnetic Resonance Imaging, Relative Cerebral Blood Volume, and Neuropsychological Testing in Patients With 1-3 Brain Metastases Treated With Stereotactic Radiosurgery +/- Whole Brain Radiation.
5. MEYERS, CA Neurocognitive Impairment in Hematologic Malignancies.

12:30–2:00 PM**Poster Session 4: Aging/Dementia****Dementia Alzheimer’s Disease**

1. ALLY, B Memorial Response Bias in Patients with Alzheimer’s Disease.
2. ASHENDORF, L Test-Retest Consistency of the WRAT-3 Reading Subtest Among Older Adults.
3. ASHENDORF, L Utility of Trail Making Test Errors in MCI and AD.
4. BEDICS, J Verbal Fluency among Individuals at Familial and Genetic Risk for Alzheimer’s Disease.
5. BLEASE, SJ Relating Clock Drawing Performance and Alzheimer’s Disease Pathology in the Framingham Heart Study.
6. COSENTINO, SA Metamemory Profiles offer Insight into Disordered Awareness for Memory Loss in Alzheimer’s Disease.
7. DAVIS, J Longitudinal Analysis of Neuropsychological Functioning and On-road Performance in Drivers with Mild Dementia.
8. DELANO-WOOD, L Posterior White Matter Changes in MCI: Associations With Cognition and Stroke Risk.
9. DISIMONE, AM Aricept (Donepezil) Reduces Everyday Action Errors in Alzheimer’s Disease.
10. FEARING, MA Autopsy-Confirmed Alzheimer’s Disease versus Clinically-Diagnosed Alzheimer’s Disease in the Cache County Study on Memory Health and Aging: A Comparison of Quantitative MRI and Neuropsychological Findings.
11. FEARING, MA Neuroimaging Correlates of the IQCODE in Autopsy-Confirmed Alzheimer’s Disease versus Clinically-Diagnosed Alzheimer’s Disease: The Cache County Study on Memory Health and Aging.
12. FERNÁNDEZ GUINEA, S Set shifting and control cognition in early stages of Alzheimer’s disease: task switching paradigm.
13. FITZGERALD, ME Decreased Medial Parietal fMRI Activity in Healthy Middle-Aged Adults with a Parental History of Alzheimer’s Disease.
14. GIBSON-BEVERLY, C Examining the Impact of Severity on HRB and WRAT-Reading Subtest Performance in Alzheimer’s Dementia Patients.

15. GIOVANNETTI, T Omissions and Commissions: Dissociable Deficits in Everyday Action Performance in Alzheimer's Disease.
16. GIOVANNETTI, T The Nature of Everyday Action Impairment in Parkinson's Dementia.
17. GOLDSTEIN, FC Vascular Comorbidities and Cognitive Functioning in Patients with Mild-Moderate Alzheimer's Disease.
18. GOLDSTEIN, FC Vascular Comorbidities and Neuropsychiatric Symptoms in Patients with Mild-Moderate Alzheimer's Disease.
19. GRIFFITH, R Impaired Financial Abilities Predict Dementia in Patients with Amnesic Mild Cognitive Impairment.
20. HAYDEN, KM Screening for Prodromal Dementia in the Community: The Cache County Memory Study.
21. HESTER, AL Neuropsychological Performance in Tangle Predominant Senile Dementia and Alzheimer's Disease.
22. HUA, M Gist Memory in Patients with Mild Alzheimer's Disease.
23. JEON, H Auditory and Visual Naming in Early Dementia.
24. JONES, JE Do Serial Position Profiles Have Promise as a Cognitive Marker of Pre-Clinical Alzheimer's Disease?
25. KAYNE-LANGILL, MA Task Switching Ability for Older Adults with Very Mild Dementia.
26. LEE, E Cognitive Profiles in Persons at Risk for Alzheimer's Disease.
27. MANNING, K Impairment in Semantic Fluency is Not a Marker of Preclinical Alzheimer's Disease.
28. MARQUINE, MJ Self-Knowledge and Self-Referential Processing in Alzheimer's Disease and Mild Cognitive Impairment.
29. MICKES, L Progressive Impairment on Neuropsychological Tasks in a Longitudinal Study of Preclinical Alzheimer's Disease.
30. MITCHELL, JC Using the Dementia Severity Rating Scale to Identify Groups of Normal, MCI, and AD Community-Dwelling Older Adults.
31. NELSON, LD Detecting Dementia in Down Syndrome: A Paradigm for Alzheimer's Disease.
32. OGROCKI, PK The Exploration of Behavioral Symptoms in Subtypes of Mild Cognitive Impairment.
33. PASTOREK, NJ Differential Neuropsychological Profiles in Normal Older Adults and Patients with Depression, Mild Cognitive Impairment, and Alzheimer's Disease.
34. POOCK, JL The Effects of "Talking While Walking" in Early Stage Alzheimer Disease and Normal Aging.
35. REED, B A Multi-site Study of Determinants of Capacity to Consent for Research.
36. RUEDA, A Time Estimation in Healthy Older Adults and Very Mild Dementia.
37. SCHMITTER-EDGEcombe, M Very Mild Dementia and Feeling-of-knowing in Episodic Memory.
38. SEELYE, AM Face Recognition Memory in Mild Cognitive Impairment and Alzheimer's Disease.
39. SHIN, K Neuropsychological predictors of dementia : A 7-year follow-up study on elderly population with wide range of education.
40. STEPANIUK, JA Neuropsychiatric Impairments as Risk Factors for Mild Cognitive Impairment and Dementia.
41. SUHR, J The Relationship of Verbal and Semantic Fluency to Cognitive Performance in Older Adults.
42. SUHR, J Education Moderates the Relation of Cognitive Activity to Performance on Neuropsychological Tests.
43. TENG, E Sensitivity and Stability of Specific Memory Tests in Amnesic Mild Cognitive Impairment.
44. TENG, E Sensitivity and Stability of Neuropsychological Tests for the Diagnosis of Non-Amnesic Mild Cognitive Impairment.
45. TOMASZEWSKI FARIAS, S Demographic, Neuropsychological and Functional Predictors of Rate of Decline in a Community-based Sample of Spanish and English-Speaking Older Adults.
46. TREMONT, G Relationship Between Living Situation and Awareness of Deficit in Dementia.
47. TSCHANZ, J Rate of Cognitive and Functional Decline in Alzheimer's Disease in the Cache County Population.
48. VANVOORST, W Risk for Progression from Mild Cognitive Impairment to Alzheimers Disease Depends on How Mild Cognitive Impairment is Operationalized.
49. WIERENGA, C Functional Connectivity of Learning Differs by APOE Genotype in Nondemented Older Adults.
50. WILSON, JS Potential Blood Biomarkers for Alzheimer's Disease: Anti-A β and Anti-RAGE Immunoglobulins and Cognitive Functioning.
- Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)**
51. AMICK, M Driving Safety in Parkinson's Disease.
52. CIMINO, C Rate of Agreement in Ratings of Apathy between PD Patients and their Caregivers.
53. FOSTER, PS Executive functioning in Parkinson's disease: The effects of asymmetrical symptom presentation and anxiety.
54. FOSTER, PS Asymmetrical Parkinson's and dopaminergic enhancement.
55. GLISKY, M The Relation Between Perceived Quality of Life, Cognition and Emotion in Parkinson's Disease.
56. JEDRZKIEWICZ, M Neurobehavioral Outcome Following Subthalamic Deep Brain Stimulation in Parkinson's Disease: A Waitlist Control Study.
57. JEWELL, G Behavioral & Affective Changes following Bilateral DBS of the Subthalamic Nucleus in Parkinson's disease.
58. KIRSCH-DARROW, L Parkinson's Disease: Relationship Between Apathy and Dopaminergic Medications.
59. LEAHY, B Cognitive Functions and Quality of Life in Individuals with Movement Disorders.
60. OGDEN, JA Does Dopamine Improve Visuospatial Ability in Parkinson's Disease?
61. PATEL, K Cognitive Impairment, Hippocampal Volume, and White Matter Integrity in CADASIL.
62. POSSIN, KL Spatial and Object Working Memory Deficits in Parkinson's Disease are Due to Impairment in Different Underlying Processes.
63. POSSIN, KL Spatial-Based but not Object-Based Components of Inhibition of Return are Impaired in Parkinson's Disease.
64. RASCOVSKY, K Cognitive and Behavioral Features of Early Progressive Supranuclear Palsy (PSP) and Frontotemporal Dementia (FTD).
65. SCANLON, BK Neuropsychological Predictors of All-Cause Mortality in Parkinson's Disease.
66. SCHIEHSER, DM Retrieval Deficits in Patients with Parkinson's disease or Huntington's disease.
67. SEICHEPINE, DR Clock Drawing Test as a Measure of Visuospatial Impairment in Parkinson's Disease.
68. SKOBLAR, BM Neuropsychological Prediction of Memory Function in Parkinson's Disease.

69. STERN, S Automated Neuropsychological Assessment Metrics (ANAM) Motor Tasks Demonstrate Group Differences in Parkinson's Disease.
70. WELDON, K Comparison of Neuropsychological Profiles of Patients with Normal Pressure Hydrocephalus and Parkinson's Disease with Dementia.
71. WULFF, LL Validation of the Automated Neuropsychological Assessment Metrics (ANAM) for Parkinson's Disease (PD).
72. WYLIE, SA Flanker Effects in Parkinson's disease.

Dementia: Other (e.g., Semantic Dementia, FTD, VaD)

73. BANKS, S Insight in Behavioral Variant Frontotemporal Dementia, and Primary Progressive Aphasia.
74. BETTCHER, BM Error Detection and Correction Patterns in Dementia.
75. BRAATEN, AJ Cognitive Screening in Assisted Living.
76. BRENNAN, L The Impact of Goal Cues on Everyday Action Performance in Dementia.
77. LAMARRE, AK Cognitive and Personality Profiles of Individuals At-Risk for Frontotemporal Lobar Dementia with Tau-Negative, Ubiquitin-Immunoreactive Inclusions (FTLD-U).
78. LEVY, J Pattern of Impaired Word Generation Differs in Frontotemporal Dementia and Alzheimer's Disease.
79. MILLER, BI SSRIs and Cognitive Performance in Patients with Dementia.
80. MORGAN, E Perceptual Errors on the Boston Naming Test in Dementia with Lewy Bodies.
81. NEWMAN, A The Role of Neuropsychology in the Diagnosis of Depression vs. Dementia: Three Variations on a Theme.
82. ORIETA-BARBALACE, C Neuropsychological and Functional Impairment Measures as Correlates of Caregiver's Burden.
83. OSHER, J Tracking Disease Progression in Behavioral Variant Frontotemporal Dementia and Primary Progressive Aphasia.
84. QUITANIA, L Frontal Lobe Correlates of Functional Decline in AD and FTLT.
85. RACINE, CA Neuropsychological Profiles of Patients with Clinical Diagnoses of Frontotemporal Lobar Degeneration and Positive Findings on Amyloid PET Imaging with Pittsburgh Compound-B.
86. RAUDABAUGH, BJ Self-Concept and Insight in FTLT, AD, CBD and PSP.
87. WILLIAMS, V Intact Odor Identification in a Patient with Creutzfeldt- Jakob Disease.
88. WILLIAMS, VC Error Type on the Boston Naming Test Distinguishes Between Dementia with Lewy Bodies and Alzheimer's Disease.

Genetic Disorders

89. CARLOZZI, N Assessment of Intellectual Functioning in Pre-diagnostic Huntington's Disease.
90. QUELLER, S Detecting Cognitive Changes in Pre-Diagnosis HD in the Predict-HD Study.
91. TOMUSK, AB Sensitivity of the UHDRS Cognitive Tests in Pre-Diagnosis and Early Huntington's Disease (HD).

1:30–3:00 PM

Symposium 4 Neuropsychological Research in Late Life Mental Disorders: Innovative Directions and Opportunities Chair: Jovier Evans Room:Pavilion

1. EVANS, JD Neuropsychological Research in Late Life Mental Disorders: Innovative Directions and Opportunities.
2. SAVLA, GN Stability of Neurocognitive Deficits in Middle-Aged and Older Adults with Bipolar Disorder.
3. BHALLA, RK Prevalence and Classification of Cognitive Outcomes Following Remission of Depression in the Elderly.
4. SITZER, DI Can Old Dogs Learn New Tricks? Neuropsychological Status and Cognitive Training Outcomes in Psychosis.
5. MAST, BT Vascular Risk, Executive Dysfunction and Geriatric Depression: A Review.

1:30–2:30 PM

Invited Plenary Best Practice When Training Individuals with Severe Memory Impairments Speaker: McKay Sohlberg Room:Grand Ballroom

2:15–3:45 PM

Poster Session 5: Intervention and Assessment

Assessment/Psychometrics

1. ANDERSON, AM Selection of Normative Reference Data Influences Clinical Considerations.
2. ASHENDORF, L Grooved Pegboard Test Performance Among Cognitively Normal Elders and Individuals with MCI.
3. BROOKS, BL Low Neuropsychological Test Scores are Common in Healthy Older Adults.
4. BROOKS, BL Reliable Change Scores for Older Adults' Performances on the Neuropsychological Assessment Battery (NAB).
5. BURROWS, CL Predicting Individual Differences in Performance on the Iowa Gambling Task.
6. CAROTHERS, T Executive Functions in Adolescent Arsonists.
7. CHELUNE, GJ How Reliable Are Reliable Change Methods Across Multiple Time Points.
8. CHONG, J Cross-Validation in a Non-Litigating Clinical Population of Mittenberg's WAIS-III Regression Formula for Identifying Malingering.

9. CONNOR, BB Standardization of the Rivermead Behavioural Memory Test II-Story Immediate and Delayed (RBMT-II-Story) for Serial Administrations.
10. DUX, M The Factor Structure of Post Concussive Symptom Ratings in Male and Female High School Athletes.
11. HOLDNACK, J A New Method for Comparing Performance on Two Cognitive Variables: WMS-III General Memory Performance Controlling for WAIS-III General Ability Index.
12. HOLDNACK, J Development of Education Adjusted Norms for D-KEFS Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests.
13. HOLDNACK, J Development of IQ Adjusted Norms for D-KEFS Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests.
14. HUMPHREYS, J Evaluation of the Mini-Mental State Examination Adjusted Score.
15. LARRABEE, CJ Sensitivity to Brain Dysfunction of the Halstead Reitan vs. an Ability-Focused Neuropsychological Battery.
16. LUTON, LM Theoretical and Utility-Based Development of a Short Form of the WISC-IV.
17. MEYER, SM Preliminary Results of Measures Designed to Increase the Accuracy and Range of Premorbid IQ Estimates.
18. MILLIS, SR Rasch Analysis of the PCSQ: Measuring the Core Construct of Head Injury Symptomatology.
19. SCHAFFER, A Validity Of A Direct Assessment Of Financial Skill In Older Adults.
20. SHANDERA, AL Clinician's Confidence in Measures of Effort.
21. SPENCER, RJ Timed Alphabet-Writing as Measures of Complex Attention: Preliminary Findings.
22. TRAN, H Sensitivity and Specificity of Different Neuropsychological Methods of Malingering in Neurotoxicant Exposed workers.
23. TRASK, CL The Clinical Utility of the Cancellation Subtest of the WISC-IV.
24. UTTL, B Measurement IS the Foundation of Science and Clinical Practice.
25. VAN DER HULST, EJ Development and Psychometric Properties of Two Equivalent Short Forms of the Beery VMI.
26. WADE, T Novel Threshold-Based Assessments of Speed of Processing and Memory in the Elderly: Validation and Norms.
27. WINICKI, JM Psychometric Properties and Initial Validation of the Mental Status Exam-Telephone Version (MSE-TV).

Child - Assessment

28. BLOSS, CS Neuropsychological Assessment and Developmental Comorbidities: A Case Study.
29. BUJOREANU, I Developmental and Neuropsychological Perspectives on the Wisconsin Card Sorting Test in Normal Children.
30. CAMPBELL, MC Clock Drawing and Telling Time in Clinical and Non-clinical Children: A Multifactorial Measure.
31. CHAPIESKI, L Development of Child and Parent Report Measures of Subjective Memory.
32. CHASE, D The Underlying Structures of the Stanford-Binet Intelligence Scales - Fifth Edition.
33. CHRISTOPHER, G Using Screening Interviews to Predict Scores on a Social Perception Task.
34. CIRINO, P Predictors of Math in Spina Bifida Myelomeningocele.
35. DAVIS, AS Descriptive Discriminant Analysis of Basic Auditory and Visual Acuity and Subcortical Motor Processes between Individuals with ADHD and TBI.
36. DAVIS, AS Can Agraphesthesia and Astereognosis Predict Academic Deficits in Children with ADHD?
37. DAVIS, AS Evaluating the Presence of Agraphesthesia and Astereognosis in Children with ADHD.
38. DAVIS, AN Is There a Relationship Between Self-Esteem and Executive Functioning?
39. DAVIS, A Evaluation of Social Deficits in Nonverbal Learning Disability in Comparison to Attention Deficit Hyperactivity Disorder.
40. DAVIS, A Evaluation of Executive Functioning Across Parent Report and Test Performance in Attention Deficit Hyperactivity Disorder and Nonverbal Learning Disability.
41. DORFLINGER, J Neuropsychological Profiles of Children with Bipolar Disorder versus Subtypes of ADHD.
42. FRIEND, J Use of Cognitive Assessment to Differentially Diagnose Between Bipolar and ADHD in Pediatric Populations.
43. GOMES, H The Impact of Expressive Formulation Skills on Vocabulary Definitions in Children.
44. HEFFELFINGER, A Attention and Executive Impairment in Early Neurological Injury.
45. HEFFELFINGER, A Delayed Alternation: Clinical Application in 2-5 Year Olds.
46. HUGHES, S Predictors of Stability and Decline in Bayley Scores Through the "Terrible Twos".
47. MICHEL, J Differentiating ADHD and FASD: the Children's Learning Questionnaire.
48. PHILLIPS, K Clinical Utility of the NEPSY Visual Attention Supplemental Indices.
49. SEMRUD-CLIKEMAN, M Stimulant Medication and Neuropsychological Functioning in ADHD.
50. SHEPARD, K The Relationship Between Processing Speed and Attention Symptoms.
51. SHERESHEVSKY, G Standardization and Validation of a New Non-Verbal General Cognitive Ability Test for Children in Russia.
52. VON THOMSEN, CS (Un)Reliable Change of the CPT-II in Healthy Children.
53. VONTHOMSEN, C Reliable Change Indices in Pediatric Serial Assessment: Three Different Scenarios Involving Typically Developing Children.

Cognitive Intervention/Rehabilitation

54. BELFOR, N A Novel Brain Plasticity Based Training Program Improves Learning and Working Memory on modified Token Test in healthy elderly.
55. BRIGIDI, BD Assessing Adult CNS Tumor Patients' Intentions to Complete Daily Neuropsychological Rehabilitation Using the Theory of Planned Behavior.
56. BRIGIDI, BD Testing a New Component for Neuropsychological Rehabilitation: A Feasibility Study of Acceptance-Based Cognitive Training.
57. DAWSON, D Naturalistic Rehabilitation for Executive Dysfunction.
58. FELVER-GANT, JC Working Memory in Obstructive Sleep Apnea: Construct Validity and Treatment Effects.

59. FRANCHOW, EI Brain Injury and Return to Work: Subjective Ratings of Memory Predict Outcome Failures.
 60. FREELAND, JC Computer-Aided Errorless Learning Paradigm to Improve Face-Name Recall Memory in Patients with Acquired Brain Injury.
 61. FREILICH, B Number Needed To Treat: Efficacy of NEAR Cognitive Remediation.
 62. FULTON, JB Executive Function Enhancement in Children and Adolescents with Severe and Persistent Mental Illness (SPMI): A Small Sample Study.
 63. HEUGTEN, CV Generalisation of Strategy Training Effects in Stroke Patients with Apraxia: there is no place like home?
 64. JASPER, BW Acute Neurocognitive Response to Methylphenidate Among Childhood Cancer Survivors: A Randomized, Double-Blind, Cross-Over Trial.
 65. LITKE, DR An Errorless Learning Approach In A Cognitive Remediation Group Treatment: A Case Study.
 66. MOES, P The Effect of Training with the Makoto Apparatus on Neurocognitive Performance.
 67. NIKI, C Relearning Kanji Words by Short Presentation in a Patient with Left Temporal Lobe.
 68. PEERY, S Rehabilitation of Alexia without Agraphia in an Amnesic Man: A Case Study.
 69. RASQUIN, S Cognitive Behavioural Intervention for Depression after Stroke: Effects and Feasibility in a Series of Single Cases.
 70. RASQUIN, S Effectiveness of Neuropsychological Rehabilitation in Patients with Acquired Brain Injury.
 71. ROHLING, ML Meta-Analytic Review of Evidence Based Cognitive Rehabilitation.
 72. SITZER, DI The Relationship Between Changes in Neuropsychological and Functional Abilities Among Schizophrenia Outpatients.
 73. WINKENS, I Reliability and Validity of Two New Instruments for Measuring the Consequences of Slowness of Information Processing in the Daily Lives of Stroke Patients.

3:00–3:20 PM**Coffee Break****Room: Plaza and Ballroom Foyers, Exhibit Hall****3:15–4:15 PM****Invited Plenary****Neurosteroids as Protective Factors in TBI: From Laboratory Bench to the Bedside****Speaker: Donald Stein****Room: Grand Ballroom****4:30–5:30 PM****Birch Lecture****Developmental Amnesia****Speaker: Faraneh Vargha-Khadem****Room: Grand Ballroom****FRIDAY, FEBRUARY 9, 2007****9:00–10:30 AM****Paper Session 5****Pediatric Assessment/Treatment****Room: Pavilion**

1. DONDERS, J Correct Recall versus Intrusive Errors on the CVLT-II after Traumatic Brain Injury.
 2. SESMA, HW Executive Functioning in the First Year Following Pediatric Traumatic Brain Injury.
 3. FASTENAU, PS A 3-Year Prospective Study of Neuropsychological Changes in Children Following the First Recognized Seizure: Relationship to Neurological and Psychosocial Variables.
 4. HALE, J Executive Impairment Determines ADHD Response to Methylphenidate Treatment.

9:00–10:30 AM**Symposium 5****Methods of Inference and New Developments in the Practice of Clinical Neuropsychology****Chair: David Schretlen, Discussant: Jason Brandt****Room: Grand Ballroom I**

1. SCHRETLEN, DJ Methods of Inference and New Developments in the Practice of Clinical Neuropsychology.
 2. SCHRETLEN, DJ The Logic and Method of Inference in Clinical Neuropsychology.
 3. SHEAR, PK Quantitative Examination of Process-Based Assessment Procedures.
 4. TESTA, S Regression-Based Norms: Historical Development and Current Applications.

9:00–10:30 AM**Symposium 6****Interventions to Maintain Independence in MCI/Early Dementia****Chair: Glenn Smith, Discussant: Deborah Attix****Room: Grand Ballroom II**

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| 1. SMITH, GE | Interventions to Maintain Independence in MCI/Early dementia. |
| 2. GREENAWAY, M | Compensating for Memory Loss in Amnesic Mild Cognitive Impairment. |
| 3. LOEWENSTEIN, D | An Integrated Program of Cognitive and Functional Rehabilitation in Mild Alzheimer's Disease. |
| 4. SMITH, GE | Telehealth Home Monitoring Of Solitary Persons With Mild Dementia. |
| 5. CLARE, L | Awareness and outcome of cognitive rehabilitation in early-stage Alzheimer's disease. |

9:00–10:30 AM**Poster Session 6: Neurocognitive Functions****Attention**

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| 1. BARNES, ME | Rarely Snoring Children Exhibit ERP Differences From Controls. |
| 2. CHAN, RC | The Chinese version of the Test of Everyday Attention for Children: The preliminary norms of healthy Chinese children aged 3 to 8. |
| 3. DRAGO, V | Attentional Grasp in Parkinson's Disease. |
| 4. DUKARM, PD | Trail Making Test Performance for Various Rural Neurological and Psychiatric Groups. |
| 5. DUQUETTE, PJ | Attention Functioning in Pediatric Chronic Kidney Disease. |
| 6. NAIDOO, R | Effects of Disinhibition on the Written Expression and Working Memory of Children With ADHD. |
| 7. NOVAKOVIC-AGOPIAN, T | Visual Attention Test Battery - Normative Data. |
| 8. PANIZZON, MS | Genetic and Environmental Contributions to Attentional Asymmetry in Middle-Age: Findings from the Vietnam Era Twin Study of Aging. |
| 9. PAPAOGLOU, A | Attention Mediates Radiation's Impact on Adaptive Functioning in Children with Brain Tumors. |
| 10. RIDLEY, KP | Comparing Social Perception Abilities in Children with ADHD-Combined and ADHD-Primarily Inattentive. |
| 11. SANCHEZ, C | The Development of Inhibitory Control from Middle Childhood to Young Adulthood. |
| 12. SEMRUD-CLIKEMAN, M | Locus of Control Across ADHD Subtypes. |
| 13. SHIKHMAN, M | Visual and Auditory Interference on Cross-Modal Tasks: Why It is Harder to Concentrate on Conversation While Looking Out the Window Then to Read While Listening to the Radio. |
| 14. ZEITLIN, NN | Intelligence Quotient (IQ) and Executive Function in Children with Attention-Deficit/Hyperactivity Disorder: A Meta-Analysis. |

Language: Aphasia

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| 15. ALTMANN, LJ | Effects of Semantic Training on Lexical Access: A Best Case Scenario. |
| 16. BALDO, J | Neurological and Genetic Factors Affecting Severity of Aphasia Following Stroke. |
| 17. DOMEN, C | Explicit Access to Phonology in Deep Dyslexia: Evidence from a Forced Choice Rhyme Decision Task. |
| 18. EDMONDS, LA | The Effect of Verb Network Strengthening Treatment (VNeST) on Sentence Production in Persons with Aphasia. |
| 19. EDMONDS, LA | The Effect of Verb Network Strengthening Treatment (VNeST) on Connected Speech in Persons with Aphasia. |
| 20. FITZGERALD-DEJEAN, DM | Correlational Examination of Environmental Symbol Processing and Language in Neurologically Damaged Adults. |
| 21. GOLASHESKY, C | Retrospective examination of lay-coached computer training for people with chronic aphasia. |
| 22. HENRY, ML | Intensive Semantic Treatment for Lexical Retrieval in Primary Progressive Aphasia. |
| 23. MAHER, LM | Functional Imaging Before and After Constraint Induced Language Therapy for Aphasia Using Magnetoencephalography. |
| 24. MCHUGH, T | Quality of Life in Aphasia. |
| 25. PATTERSON, J | Cueing Hierarchies in Treatment for Word Retrieval Deficit in Aphasia: A Review of the Evidence. |

Language: Other (e.g., Naming, Fluency, Reading)

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| 26. ANDRESEN, EN | What Aspects of a Word Facilitate Reading? Three Priming Meta-Analyses. |
| 27. BEESON, PM | Toward a Better Understanding of Response to Agraphia Treatment. |
| 28. BEESON, PM | Predicting Reading and Spelling Performance in Acquired Alexia and Agraphia. |
| 29. CARPENTIER, MY | Expressive and Receptive Language Abilities in Children with ADHD: An Overlooked Area of Neuropsychological Deficit. |
| 30. CLEMENTS-STEPHENS, AM | Sentence Comprehension Processing in Adolescents and Young Adults. |
| 31. COLLETTE, MA | Organization and Quality of Children's Written Language and Computers. |
| 32. CROSSLEY, M | Hemispherectomy and Basic Reading Processes. |
| 33. EDWARDS-STEWART, A | Impact of Mood State on Word Valence. |
| 34. HO, C | Neuroanatomical Correlates of Various Reading Dimensions in Adolescents with a Wide Range of Reading Ability. |
| 35. KIM, M | Korean Syntactic Comprehension Test in the Patients with Various Cerebral Ischemic Lesions. |
| 36. MOLNAR, A | ERP And Near-Infrared Procedures In The Same Subjects Indicate Similar Brain Regions Activated. |
| 37. MOORE, EN | Developmental Changes in Morphosyntactic Judgments of Tag Grammaticality. |

38. ORJADA, SA Comprehension of Implicatures Without Context in Individuals With Right Hemisphere Damage: A Preliminary Study.
39. PATRICK, CJ The Influence of Visual Field in the Word Letter Phenomenon (WLP): Does the perceptual advantage for words depend upon bi-hemispheric processing?
40. RAPCSAK, SZ Alexia with Agraphia Following Damage to Left Inferior Temporo-Occipital Cortex.
41. RAPCSAK, SZ Reading and Spelling: Two Sides of the Same Coin?
42. RIMRODT, S Different Skills Contribute to Reading Comprehension Depending on Time-Restriction.
43. RIMRODT, S fMRI of Reading Comprehension in Young Adults With and Without Reading Impairment.
44. SANDOVAL, TC Bilingualism Affects Verbal Fluency: The Dual-Task Analogy.
45. TYNER, CE Homographs: Bringing Norms to Present.

Memory

46. ALLY, B The Effect of Pictures on the Neural Correlates of Recognition Memory.

Miscellaneous

47. (SMITH) PIERSON, SK Etiological Considerations on Cognitive Factors in Preschool-Age Children Diagnosed with Sensorineural Hearing Loss.
48. ALBERTELLA, M Disturbances in Mood Contribute to Discrepancies between Subjective and Objective Measures of Executive Functioning in College Students with "Probable" Attention Deficit Hyperactivity Disorder.
49. BARON, I Neuropsychological Outcome of Extremely Low Birthweight Children Born at 23 To 25 Weeks Gestational Age: Intact Function at Early School Age.
50. BLOSS, CS The APOE-ε4 Genotype and School-Based Group Achievement Test Scores: A Significant Gender by Genotype Interaction in Children.
51. BOWLER, RM Dose-Effect and Covariate Analyses of Education, and Ethnicity on Neuropsychological and Neurological Function in Manganese Exposed Bridge Welders.
52. BRIGIDI, BD Latent Class Analysis of Neurocognitive Impairment and Depression Following Cranial Irradiation and Chemotherapy in Adult Patients with Primary CNS Tumors.
53. BRIGIDI, BD Contributions of Neurocognitive Factors in Predicting the Survival of Adult Patients with High Grade Primary CNS Tumors.
54. BUCKLEY, T Metacognitive Judgments and Change in Cognitive and Functional Abilities in a Population of Elderly Individuals. The Cache County Study.
55. CROCKETT, DJ Relationship of Attention and Free Recall on the Rey Complex Figure Drawing Test.
56. DEAN, A Ethnicity and Performance on the MMPI-2 Fake Bad Scale: A Preliminary Investigation.
57. DUX, M Increased Intraindividual Variability Associated with Decreased Memory Performance in High School Athletes.
58. FUCHS, K Creatine Levels in the Anterior Cingulate Differentiate Amnesic and Nonamnesic MCI.
59. HARDY, SS Arm Flexion, Extension, and Relaxation: How Bodily Feedback Can Impact Cognitive Tuning.
60. HASHIMOTO, Y Feedback effects on time estimation in patients with brain damage.
61. HEATON, SC Confirmatory Factor Analysis of the Test of Everyday Attention for Children (TEA-Ch) in an ADHD Population.
62. HELT, MS When During Childhood Does Contagious Yawning Develop?
63. JACKSON, JC Long-Term Cognitive, Emotional and Functional Outcomes in Trauma ICU Survivors without Intracranial Hemorrhage.
64. KARANTZOULIS, S Prospective Memory Impairment May Be Related to Frontal Lobe Integrity in Amnesic Mild Cognitive Impairment.
65. KAUP, AR Mild Changes in Cognition among Older Adults Following Chemotherapeutic Treatment for Follicular Lymphoma.
66. LERITZ, EC Source Memory and Item Memory in Cerebrovascular and Dementia Risk.
67. PARRISH, J Sex Differences in Affective Priming and Memory for Faces and Semantic Information.
68. POYSKY, J Cognitive and Psychiatric Change Following DBS Surgery for Tourette Syndrome in a 16-year-old Male.
69. RENTERIA, L Neuropsychological Functioning in a Non-litigating Chronic Pain Sample: The Effect of Pain Location, Pain Severity, and Pain Related Life Interference.
70. ROHLING, ML Clinical Neuropsychology Boards: Descriptive Statistics, Comparisons amongst Boards, and Contrasts to Medical Boards.
71. SCHAEFER, LA Rehabilitation of Anosognosia and Anosodiaphoria in a Patient with Right Thalamic CVA.
72. SCHNEIDER, J Emotional Sequelae of Sports-Related Injuries: Concussive and Orthopedic Injuries.
73. SELKE, CJ Development of an Integrative Approach to Psychological Intervention and Neuropsychological Assessment in Deep Brain Stimulation (DBS) for Childhood Dystonia: A Case Study.
74. SMITH, P An Initial Investigation of the Effects of Recent Changes in CPT Codes on Billing and Reimbursement Rates on Outpatient Neuropsychology Practice.
75. SNITZ, BE Proportion of Older Patients Meeting Cognitive Criteria for Mild Cognitive Impairment in a Primary Care Practice Setting.
76. SPADONI, AD Do the Effects of Alcoholism Family History on Adolescent Neuropsychological Function Depend on Maternal Education?
77. SPENCER, K Motor Programming and Working Memory Deficits in Cerebellar Disease.
78. SPITZNAGEL, MB Comparison of Multiple Measures of Awareness in Dementia Patients.
79. SUHR, J The Relation of Substance Use and Abuse to Personality and Executive Dysfunction.

80. TANNER, J Measuring Reliable Change of Neuropsychological Test Scores in Patients with Acute Respiratory Distress Syndrome.
81. VICTOR, TL The False Positive Rate for Common Effort Tests in Individuals Diagnosed with Learning Disabilities.
82. VICTOR, TL Vocabulary minus Digit Span as a Function of Education.
83. ZELLER, MA Different Patterns of Malingering Based on Education.
84. ZELLER, MA APOLIPOPROTEIN E (APOE) GENOTYPE AND NEUROCOGNITIVE FUNCTION IN A SAMPLE OF PATIENTS DIAGNOSED WITH AMNESTIC MILD COGNITIVE IMPAIRMENT.

10:30–10:50 AM**Coffee Break****Room: Plaza and Ballroom Foyers, Exhibit Hall****10:45 AM–12:15 PM****Poster Session 7: Pediatric Acquired and Developmental Disorders****Child - Acquired Disorder: Other**

1. BONGIOLATTI, SR Symptoms of Sleep Disturbance Among Children with Epilepsy: Comparison to a General Pediatric Clinic Sample.
2. CHAN, RC Attributing social meaning to ambiguous visual stimuli and animation in Chinese children with high functioning autism.
3. CLARK, U Impairments on Academic Fluency Measures in Child Survivors of Acute Lymphoblastic Leukemia (ALL) Following Intrathecal Methotrexate CNS Prophylaxis.
4. CONSTANTINOU, M Two Case Studies from Cyprus: Neuropsychological Profile Before and After the Appearance of Fronto-Temporal Epileptic Seizures.
5. DEKEL, N Cognitive Functioning in Pediatric Hematopoietic Stem Cell Transplant Patients.
6. FARACE, E Children With Brain Tumors Have Visual-Spatial and Visual Memory Deficits Which Are Underserved By Most Special Education Programs.
7. JAIN, N Attention and Information Processing in Children Treated with Chemotherapy for Acute Lymphoblastic Leukemia (ALL).
8. KING, T Longitudinal Models of Adaptive Behaviors in Children Treated for Brain Tumors.
9. MILLER, J Taser Tots: Neuropsychological Outcome of an Adolescent Taser Victim.
10. MUMAW, MA Intact Serial Position Effects in Children Treated for Brain Tumors.
11. REY-CASSERLY, C Neuropsychological Outcome After Endoscopic Third Ventriculostomy in Children With Primary Brain Tumors and Aqueductal Stenosis.
12. SCHNOEBELEN, S The Effect of Processing Speed on Proactive Inhibition in the Learning and Memory of Children Treated for Primary Brain Tumor.

Child - Acquired Disorder: TBI

13. AYR, LK Dimensions of Post-Concussive Symptoms 3 Months Post-Injury in Children with Mild Head Injuries.
14. BOEGEHOLD, L The Relationship between Attention and Memory Skills after Pediatric Traumatic Brain Injury.
15. EWING-COBBS, L Naturalistic Action in Young Children with Traumatic Brain Injury.
16. FAY, TB Predicting Longitudinal Patterns of Clinically Significant Deficits in Children with Traumatic Brain Injury.
17. GIOIA, GA Validation of the Acute Concussion Evaluation (ACE) for Identifying Pediatric Mild TBI.
18. KIRKWOOD, MW Identifying Suboptimal Effort in a Pediatric Mild Head Injury Population using Green's Medical Symptom Validity Test.
19. KRIVITZKY, L Recovery from Alexia without Agraphia in an Adolescent with TBI.
20. NAKASE-RICHARDSON, R Symptom Differences Between Confused and Non-Confused Adolescents at One Month Post Traumatic Brain Injury.
21. PRASAD, MR Caregiver and Child Interactions in Infants and Toddlers with Traumatic Brain Injury.
22. RONCADIN, C Stroop Performance After Childhood Closed Head Injury.
23. SHAPIRO, M Recovery Trajectories After Pediatric Mild TBI.
24. SWARTWOUT, M Acute Neuropsychological Outcomes Following Pediatric Traumatic Brain Injury.
25. WADE, S White Matter Damage following Pediatric Brain Injury as Assessed using DTI.
26. WOODROME, SE Coping Strategies as a Predictor of Post-concussive Symptoms in Children with Mild Closed-Head Injury.

Child - Developmental Disorders

27. ARAUJO, G Response Monitoring in Children with Phenylketonuria.
28. BOORSTEIN, HC Regressive Autism: A Distinct Phenotype?
29. BROCKI, KC Performance Monitoring In Children with Behavioral Dysregulation: An Electrophysiological Study.
30. BROCKI, KC Early Concurrent and Longitudinal symptoms of ADHD and ODD: Relations to different types of Inhibitory Control and Working Memory.
31. CARMEAN, V Stress and Anxiety Measures in Children with Autism.
32. CROCKER, NA Comparison of Verbal Learning and Memory in Children with ADHD with or Without Heavy Prenatal Alcohol Exposure.
33. DAVIS, KS Parenting Stress in Families of Children with Genetic Disorders.

34. DELLA ROSA, A Generativity in Autism Spectrum Disorders: The Influence of Task Structure.
35. DZIUK, M Motor Dyspraxia Not Completely Accounted for by Basic Motor Deficits in Children with Autism.
36. FARRAN, LK Screening for Autism Spectrum Disorders: A Collaboration Between Neuropsychologists and Primary Care Providers.
37. GAFFREY, MS Parental Ratings of Executive Behavior in Children with Williams Syndrome: Developmental Stability and Change.
38. GUSTAFSON-DEBASTOS, A The Relationship Between Nucleated Red Blood Cell Counts at Birth and Neuropsychological Outcome in Preterm-Birth Preschoolers.
39. HALL, T The Relationship Among Scores from the GARS, CBCL and the ADOS-G Classifications of Autism, Autism Spectrum, and Non-spectrum.
40. JAMES, S Do Working Memory and Fluid Reasoning Predict the Severity of Asperger Syndrome?
41. JONES, SA Patterns of Performance in Children on the Autism Spectrum.
42. KAYSER, KA Comparing Social Skills and Perceptions of Children with Social Competence Disorders and Attention Deficit-Hyperactivity Disorder.
43. KERNS, KA Impact of Differing Patterns of Prenatal Alcohol Exposure on Working Memory and Inhibition in Children.
44. KOUSHIK, NS Subtypes of Psychopathology in a Clinic-referred Sample of Children with Mental Retardation.
45. LARSON, JC Children with High Functioning Autism Demonstrate Impaired Motor Sequence Learning with Spared Adaptation on Tasks Requiring the Cerebellum.
46. LENTZ, T Attentional Basis of Adaptive Function Deficits in Developmental Coordination Disorder.
47. LI, J Pause Time Variability on Rapid Naming Predicts Reading Fluency and Comprehension in Children Without Word Reading Difficulties.
48. MATUTE, E Memory Skills in Spanish Speaking Children with Dyscalculia.
49. MCGEE, CL Language Performance in Young Children with Heavy Prenatal Alcohol Exposure.
50. MOSTOFSKY, SH Increased Motor Cortex White Matter Volume Predicts Motor Dysfunction in Autism.
51. NEAL, TJ Predicting the cognitive profile of Pervasive Development Disorders and Attention-Deficit Hyperactivity Disorder.
52. OLDS, J Working Memory and Neurocognitive Outcome after Cochlear Implantation.
53. PARKS, L Neural Correlates of Communication and Symptom Severity in Autism: A Voxel-Based Morphometric Analysis.
54. PHILLIPS, KD Performance of Children and Adolescents with Williams syndrome on the Social Responsiveness Scale.
55. PRESTON, AS Attentional Performance in Adolescents with Spina Bifida.
56. RACHES, D Behavioral Implications of Epilepsy in Children with Sturge-Weber Syndrome.
57. SHANAHAN, MA Executive and Motivational Impairments in ADHD: A Double Deficit?
58. SILVERS, J Articulatory Suppression Impairs Tower Performance in Typically Developing Boys but Not in Boys with High-Functioning Autism.
59. SUTERA, S Predictors of Optimal Outcome in Children with an ASD Diagnosis.
60. SZE, L Hyper Intrahemispheric Theta Coherence in Children with Autistic Spectrum Disorder.
61. TARAZI, R Development of Executive Function in Children with Myelomeningocele and Shunted Hydrocephalus Based on Parent Behavior Ratings.
62. VAN ADEL, JM Anticipatory Control During Bimanual Coordination in Children with Down Syndrome.
63. VAURIO, L Can children with FASD be distinguished from children with ADHD using measures of attention?
64. WASSERSTEIN, J Nonverbal Learning Disabilities: A Study of Adult Outcomes.
65. WILSON, LB Screening for Autism Spectrum Disorders in Low- and High-Risk Samples.
66. WINTER, AL Analyzing the Correlation Between Severity of Disorder and Social Perception Abilities in Children with Social Competence Disorders.

Genetic Disorders

67. BUTCHER, BJ Adaptive Behavior of Children with Chromosome 18q Deletion Predicts Parental Stress Levels.
68. ISAAC, L The Relative Contribution of Featural vs. Configural Face Processing Strategies in Williams Syndrome.
69. KELLEY, BJ The Spectrum of Neuropsychological Deficits Associated with Mutations in Progranulin.
70. KEY, AP "Are You Going To Eat This?": ERP Indices of Food Perception In Adults With Prader-Willi Syndrome.
71. KEY, AP Visual Memory and Spatial Processing In Young Adults With Williams Syndrome.
72. LEVINE, TM Reading Disability and Language Differences in Children with Neurofibromatosis Type 1.
73. MARCUS, DJ Everyday Executive Functioning as a Predictor of Behavioral, Emotional, and Adaptive Functioning in Children with Neurofibromatosis Type 1.
74. SHAPIRO, EG A comparison of neuropsychological function in two forms of MPS I.
75. WARD, J Cognitive Differences in Pre-Clinical Gene-Positive Individuals Who Develop Huntington's Disease An Average of Seven Years Following Baseline Evaluation.

Hydrocephalus

76. PYYKKONEN, BA Interaction between intellectual and academic functioning in congenital hydrocephalus.
77. PYYKKONEN, BA Cognitive performance in congenital hydrocephalus.
78. PYYKKONEN, BA Intellectual functioning in children treated for hydrocephalus with nonsiphoning shunts.
79. PYYKKONEN, BA Cognitive outcome as a function of endoscopic third ventriculo-cisternostomy in hydrocephalus.

Learning Disabilities/ADHD

80. ALTMANN, LJ Do the Memory and Vocabulary Deficits in Dyslexia Persist into Adulthood?
81. ANLLO-VENTO, L Neuropsychological Performance of ADHD Adults on the Delis-Kaplan Executive Function System.
82. BRAUN, S Planum Temporale Morphology in Children with Developmental Dyslexia and its Relationship to Phonological Processing.
83. CARR, LA Temporal Acuity and the Effect of Subtype in Adults with ADHD.
84. COLLETTE, MA Organization and Quality of Stories Written by NLD Students as a Function of Response Modality: Keyboarding on the Computer Versus Handwriting.
85. COLLETTE, MA Nonverbal Learning Disordered Students Write Better Stories with computers: relation to frontal versus posterior neuropsychological findings, intelligence and gender.
86. GERRARD-MORRIS, AE Internalized Socioemotional Functioning among Children with Social Competence Disorders, ADHD, and Reading Learning Disability.
87. KRAMER, ME Performance of ADHD Adolescents and Normal Controls on a Parametric Continuous Performance Test (CPT).
88. LESUEUR, L Rehabilitating the classification of learning dysfunction.
89. MATEREK, AD Differences in Language, Fluency, and Executive Function Amongst Children with Word Reading Deficits versus Normal Word Reading/Poor Comprehension.
90. NEMETH, DG Detecting Non-verbal Learning Disorders in Gifted Children.
91. STRASSNER, E The Relation Between Severity of ADHD Symptoms and Empathic Responding while Reading.
92. SUHR, J Self-reported "ADHD" Symptoms in Adults with ADHD, Mild TBI, or Psychological Disorders.
93. WATSON, W Prediction of Performance on "High Stakes" Measures of Reading Comprehension.

11:00 AM–12:30 PM**Symposium 7****Approaches to Defining when Dementia Begins****Chair: Diane Howieson****Room:Pavilion**

1. HOWIESON, DB Approaches to Defining When Dementia Begins.
2. HOFER, SM Identifying Processes of Within-Person Change: Design and Analysis Issues.
3. HOWIESON, DB Defining When Memory Problems Begin in MCI Patients.
4. CARLSON, N Trajectories of Brain Atrophy Associated with Onset of Mild Cognitive Impairment.
5. KAYE, JA Continuous In-home Monitoring of Elders for Mild Cognitive Impairment.

11:00 AM–12:30 PM**Symposium 8****Not All That Matters is Gray: The Importance of White Matter in Neuropsychology****Chair: Adam Brickman, Discussant: Erin Bigler****Room:Grand Ballroom I**

1. BRICKMAN, AM Not all that matters is gray: The importance of white matter in neuropsychology.
2. BRICKMAN, AM Regional white matter changes across the healthy adult lifespan and their neuropsychological consequences.
3. WILDE, EA White Matter Changes in Pediatric Traumatic Brain Injury.
4. TATE, DF Unique visualization and quantification methods for analyzing white matter integrity/connectivity and cognition among HIV infected patients.
5. JEFFERSON, AL Cardiovascular risk factors for white matter disease.
6. BUTTERS, MA White matter hyperintensities, amyloid, and cognition in late-life depression.
7. SULLIVAN, EV DTI studies of white matter microstructural degradation and associated functions in aging, alcoholism, HIV infection and their interaction.

11:00 AM–12:30 PM**Symposium 9****Learning and Memory Function in HIV-1 Disease: Frontostriatal and Medial Temporal Systems****Chair: Eileen Martin****Room:Grand Ballroom II**

1. MARTIN, E Learning and Memory Systems in HIV Disease: Frontostriatal and Medial Temporal Systems.
2. MOORE, DJ Regional Neurodegeneration in Relation to Learning and Memory Difficulties Among HIV-infected Individuals.
3. GONZALEZ, R Nondeclarative Memory among HIV+ and HIV- Individuals with Substance Dependence.
4. MORGAN, E Evidence for Dissociable Item and Source Memory in HIV Infection.
5. MAKI, P Deficits in Verbal Memory and Hippocampal Function in Midlife HIV+ Women.

12:45–1:15 PM**INS Business Meeting
Room:Pavilion****1:15–2:45 PM****Poster Session 8: Psychopathology/ Cross Cultural Issues/ Forensics****Cross-Cultural Issues**

1. ANDERSON, E Demographic Factors Influencing Performance on Neuropsychological Evaluations with Incarcerated Inmates.
2. BENNETT, J First Language Learned Influences Verbal Learning Performance in Older Hispanic Veterans.
3. BURCIAGA, J The Effects of High vs. Low Acculturation on Verbal Memory Tasks.
4. CHERNER, M Equivalency of Spanish Language Versions of the Trail Making Test Part B Including or Excluding “Ch”.
5. ECHEMENDIA, RJ The Use of Reliable Digit Span with Ethnic Minorities.
6. KAZANDJIAN, S Cross-Cultural Differences on Nonverbal Neuropsychological Tests.
7. MONTIEL, T The Literacy and Schooling Influences in Phonological Awareness, Memory and Executive Function Tasks.
8. RENTERIA, L Neuropsychological Assessment with Monolingual Hispanics: Utilizing Normative Data Developed for English Speakers Underestimates Cognitive Abilities.
9. RENTERIA, L The Utility of Relying on Nonverbal Tests in the Evaluation of Monolingual Spanish Speakers.
10. TOURADJI, P Comparison of Reading Level and Race in Predicting Neuropsychological Test Performance among Acute Stroke Rehabilitation Patients.
11. VERNEY, SP Ethnic Experiences Influence Performance on a Brief Cognitive Ability Test.
12. WONG, JT The Effects of Acculturation and its Relationship to Information Processing Tests.

Cross-Cultural Test Development

13. LANTING, SC The Grasshoppers and Geese Test: A Modified Neuropsychological Measure for Assessing Semantic Memory in a Rural and Remote Memory Clinic.

Emotion

14. ALLEN, DN Using the Wechsler Adult Intelligence Scale to Assess Social Cognition.
15. ALLEN, DN Using the Wechsler Intelligence Scales to Assess Social Cognition in Schizophrenia.
16. ASSURAS, S The Impact of Dopaminergic Medication and Emotional Stimuli on Motor Response in Parkinson’s Disease.
17. BARRY, J Age Effects on Memory and Response Time for Emotional Pictures.
18. BARTON, JM Sex Differences in Emotion Perception Utilizing Dynamic Stimuli.
19. BOROD, JC Aspects of Facial Emotion Expression in Parkinson’s Disease (PD) and Healthy Control (HC) Participants: Gender, Valence, and Methodological Innovations.
20. BRIGIDI, BD Neurocognitive Predictors of Depression in Frontal Lobe Tumor Patients.
21. CIMINO, C Facilitory and Inhibitory Effects of Emotion on Memory Following Temporal Lobectomy.
22. CLARK, U Impaired Recognition of Emotional Facial Expressions in Parkinson’s Disease.
23. EVERHART, DE Low Beta (13 to 21 Hz) Sex-Related Differences Observed During Affective Auditory Verbal Learning.
24. EVERHART, DE A Within Subjects Analysis of Menstrual Cycle Phase-Related ERP Differences During the Processing of Emotional Prosodic Stimuli.
25. FINE, JG Static vs. Dynamic Emotion Perception in Children with Social Deficits.
26. SCHAFFER, S Ecological Validity of the Comprehensive Affect Testing System-Abbreviated (CATS-A) in a Clinical Sample.
27. SPRINGER, US The contribution of anterior and posterior regions of the right hemisphere to the recognition of emotions in faces and prosody.
28. SPRINGER, US Investigating facial movement asymmetries in the spontaneous expression of positive and negative emotion.
29. STROESCU, I Cognitive Intelligence, Emotional Intelligence and Personality: An Exploratory Study.

Forensic Neuropsychology

30. BREWER, CC A Comparison of Sensitivity Among Three Symptom Validity Measures: TOMM, CARB & WMT.
31. CLARK, JA Evaluation of Brief Malingering Screening Instruments in a Civil Forensic Sample.
32. D’AMATO, C The Diagnostic Utility of the WMS-III Rarely Missed Index (RMI) in Detecting Response Bias in an Adult Male Incarcerated Setting.
33. DEARTH, C Cross-Validation of Malingering Tests for Use with Adolescents.
34. DENBOER, J Memory for Complex Pictures: Initial Development and Validation of a Digital Test of Memory Malingering.
35. DENBOER, J Preliminary Validation of the Memory for Complex Pictures test in a Mixed Brain-Injured Population.
36. DUNBAR-MAYER, PA An Investigation of the Sensitivity, Specificity, Negative-Predictive and Positive-Predictive Values of the TOMM Trial 1 on Trial 2 and the Retention Trial Performance.
37. GOLDSTEIN, DS Sensitivity and Specificity of the Rey-15, TOMM, VSVT, WMT and CVLT-II FC Among Criminal Defendants.
38. SWOROWSKI, LA Increasing the Positive Predictive Power of the TOMM, VSVT, WMT and CVLT-II FC in Criminal Defendants through the Use of Altered Cutoff Scores.
39. GRAUE, L Detection of Malingered Mental Retardation.
40. GREVE, KW A Comparison of Malingering Indicators Derived from the Original and Second Edition of the California Verbal Learning Test.
41. HANKS, RA Analysis of TOMM scores using the established cut score in a heterogeneous group.

42. HOSKINS, LL Severity of Criminal History and Neuropsychological Status in a Community Corrections Population.
 43. HOSKINS, L Comparison of the Oral and Computerized Versions of the Word Memory Test.
 44. KEISKI, M Sensitivity of Response Bias Indicators on the Personality Assessment Inventory (PAI) to the Feigning of Traumatic Brain Injury (TBI): An Analogue Study.
 45. MILLIS, SR The California Verbal Learning Test-II in the Detection of Incomplete Effort.
 46. MINTZ, S Executive Functioning of Domestic Violence Offenders.
 47. NELSON, NW Identification of Cognitive Effort Using the MMPI-2: An Optimal Classification Tree Analysis.
 48. NEUDECKER, JJ A Novel Malingering Detection Method Involving Multiple Detection Strategies.
 49. ORD, J Prevalence of Malingering in Chronic Pain: A Comparison of Two Diagnostic Systems.
 50. SALDIVAR, A Neuropsychological Testing of a Child and an Adolescent Exposed to Elemental Mercury.
 51. SCHIPPER, L Validation of a Manual Form of the Letter Memory Test.
 52. SCHIPPER, L Comparison of MCMI-III, PAI, and MMPI-2 in Detecting Malingered Traumatic Brain Injury.
 53. SMITH, JA Preliminary Examination of the Extended Complex Figure Test's Utility in the Identification of Suspect Effort.
 54. SOLLMAN, M Detection of Inadequate Effort on Neuropsychological Testing: A Meta-Analytic Update and Extension.
 55. SUHR, J Assessment of Malingering in Adults Presenting for ADHD Evaluation.
 56. TSANADIS, J Head Injury Severity, Litigation Status, and Self-Report of Postconcussive Symptoms.
 57. TSANADIS, J A Negative Impression Management Scale for the Postconcussive Syndrome Questionnaire.
 58. WAGNER, LA Construct Validity of the Expressive Vocabulary Test in a Prison Population.

Psychopathology/Neuropsychiatry/Other

59. BOUDREAU, VG Stability of Cognitive Deficits in First Episode Bipolar Disorder.
 60. CIOVICA, A The MMPI-2 and Neurocognitive Ability: Profile Comparability in Credible Patients vs. Patients Judged to Be Exerting Poor Cognitive Effort.
 61. COTTINGHAM, ME The MMPI-2 Restructured Clinical Scales and Their Correlates Among Various Neuropsychological Domains.
 62. KIXMILLER, JS Long Term Behavioral Management of an Adult with Dandy-Walker Syndrome.
 63. MACKIN, S Incidence and Documentation of Cognitive Impairment in a Community Mental Health Center.
 64. RITTER, LM A case of reduplicative paramnesia following right temporal lobectomy.
 65. SCHMIDT, KS Behavior and Psychological Assessment of Dementia (BPAD): Evidence of Construct and Criterion Validity.

Psychopathology: Anxiety/Stress

66. CARMONA, JE Sympathetic arousal and state anxiety differences in men following vestibular rotary stress.
 67. CARMONA, JE Lateralization of sympathetic arousal to verbal processing in state-anxious men.
 68. CAUDLE, D Cognitive Errors, Symptom Severity, and Response to CBT in Older Adults with Generalized Anxiety Disorder.
 69. FERNÁNDEZ GUINEA, S ALTERATIONS IN VERBAL MEMORY AND ATTENTIONAL DEFICITS IN ANXIETY DISORDERS: POST-TRAUMATIC STRESS DISORDER AND PANIC DISORDER.
 70. PARSONS, TD A Meta-Analysis of Virtual Reality Exposure Therapy.
 71. PARSONS, TD 360-Degree Panoramic Video Virtual Reality System for Affective Arousal.
 72. REA, J Memory, Learning, and Emotional Context: A Study of Children Exposed to Domestic Violence.
 73. ROHLING, ML PTSD and Cognitive Ability in Patients Passing SVTs.
 74. SHUCARD, JL An Electrophysiological and Neuropsychological Study of Attention in PTSD.
 75. SNOW, J Effects of Hydrocortisone on Neurocognitive Performance in PTSD and Healthy Subjects.

Psychopathology: Depression

76. BAYLESS, JD Cognitive performances pre-and post-ECT in psychotic depression: Improvements in RBANS and attention/speed tasks.
 77. DUNKIN, J Relationships Between Neuropsychological Deficits and Social Functioning in Depressed and Nondepressed Postmenopausal Women.
 78. POTTER, GC Neurocognitive Correlates of Medication Noncompliance in Geriatric Depression.
 79. READY, RE Depressive Symptoms and Cognitive Biases in Older and Younger Adults.
 80. WEKKING, EM Prognostic value of mild neuropsychological impairment in high risk euthymic patients with recurrent depression treated with a preventive cognitive-behavioral module.

Psychopathology: Schizophrenia

81. COHEN, H Off-line proceduralization in schizophrenia.
 82. FOLEY, JM Examination of Premorbid Intellectual Estimation in Geriatric Schizophrenia and Frontotemporal Dementia.
 83. FOLEY, JM Nature and Pattern of Memory Decline in Geriatric Schizophrenia versus Frontotemporal Dementia.
 84. GAROLERA, M Executive Impairment and Quality of Life in Schizophrenic Patients.
 85. GAROLERA, M Facial affect recognition deficits and visual attention in schizophrenic patients.
 86. HILL, SK A Comparison of Neuropsychological Dysfunction in Early Psychosis of Schizophrenia, Bipolar Disorder, and Psychotic Depression.
 87. HILL, SK Efficiency of the BACS and CATIE Neuropsychological Batteries in Assessing Cognition and Antipsychotic Treatment Related Change in Cognition during the CAFÉ Clinical Trial.
 88. KEEDY, S Antipsychotic Treatment Effects on the Saccadic Eye Movement System: a Longitudinal fMRI Study in First Episode Schizophrenia.
 89. KESSLER, RK Improving Everyday Action in Chronic Schizophrenia through Strategic Object Placement.

90. KIM, M The relationship between cognitive insight and neuropsychological functions in schizophrenic patients.
 91. LUNDY, S Impaired Memory Function in Schizophrenia and Temporal Lobe Epilepsy.
 92. MATSUI, M Influence of instruction on the Verbal Learning Test in patients with schizophrenia.
 93. THYSEN, J The Relationship Between Performance on the Brief Assessment of Cognition in Schizophrenia (BACS) and Insight into Illness.

1:30–3:00 PM**Symposium 10****Testing Neuropsychological Models across Patient Populations: the Advantages of Examining Measurement Equivalence.****Chair: Stephen Bowden****Room:Pavilion**

1. STEPHEN, B Testing Neuropsychological Models across Patient Populations: the Advantages of Examining Measurement Equivalence.
 2. BOWDEN, S Examining the Equivalence of a Measurement Model of Mood Disorder in Patients with Traumatic Brain Injury Versus Community Reference and other Clinical Groups.
 3. PETRAUSKAS, VM Item Level Analysis of WMS-III Scores in a Heterogeneous Neurosciences Sample.
 4. GREGG, N Divergent Factor Means and Correlations in the Context of Measurement Model Equivalence in College Students with Developmental Disabilities when Compared to the WAIS-III/WMS-III Normative Sample.

1:30–2:30 PM**Invited Plenary****The Luria Legacy for Diagnostic and Rehabilitative Work in Neuropsychology****Speaker: Anne-Lise Christensen****Room:Grand Ballroom****2:45–3:05 PM****Coffee Break****Room:Plaza and Ballroom Foyers, Exhibit Hall****3:00–4:30 PM****Poster Session 9: Medical and Degenerative Disorders****Drug/Toxin-Related Disorders (Incl. Alcoholism)**

1. CERNICH, AN Stability of Neurocognitive Test Performance Over Time in Soldiers Exposed to Depleted Uranium.
 2. CHERRIER, M Characterization of Cognitive and Subjective Side Effects from Immediate Release Oxycodone in Older Adults.
 3. DOTY, RL San Francisco/Oakland Bay Bridge Welder Study: Olfactory Function.
 4. GYSENS, S Factor Loadings of a Neuropsychological Screening Test Battery for the Evaluation of Manganese Exposure.
 5. HANSON, KL Reward-Related Decision-Making Deficits Among MDMA and Other Drug Users.
 6. JACOBUS, J The Interactive Effects of Age and Alcoholism on Brain Response to Spatial Working Memory.
 7. JANULEWICZ, P Qualitative Findings in Complex Figure Drawing In Military Pesticide Applicators from the Gulf War.
 8. MCQUEENY, T Effects of Alcohol and Marijuana Use During Adolescence on Hippocampal Asymmetry and Cognitive Functioning.
 9. MEDINA, KL Neuropsychological Functioning in Adolescent Marijuana Users: Subtle Deficits Detectable After 30 Days of Abstinence.
 10. SCHWEINSBURG, AD An fMRI Study of Residual and Persisting Abnormalities in Adolescent Marijuana Users.
 11. SULLIVAN, K Cognitive Functioning in Gulf War I Veterans Exposed to Pesticides, Pyridostigmine Bromide and Khamisiyah Weapons Depot.
 12. WANKMULLER, MM A Case of Cognitive Dysfunction Associated with Elemental Mercury Ingestion.

Endocrine Disorders/Hormones

13. RUBIN, LH Effects of Ovarian Steroid Hormones on Components of Phonemic Fluency in Premenopausal Women.
 14. WRIGHT, S Cognition Following Successful Surgical Intervention of Cushing's Disease.

Epilepsy

15. BARR, WB Rates of Invalid MMPI-2 Profiles in Patients with Epileptic and Nonepileptic Seizures.
 16. BELL, BD The Tip-of-the-Tongue Phenomenon (TOT) and Famous Person Naming in Temporal Lobe Epilepsy (TLE).
 17. BROWN, F The Role of Anxiety in Memory Performance of Temporal Epilepsy Patients.
 18. BUSCH, RM Utility of Neuropsychological Measures in Predicting Ultimate Side of Surgery in Patients with Medically Intractable Temporal Lobe Epilepsy.
 19. CAHN-WEINER, DA Sensitivity of Process Features of Verbal Memory Performance to Mesial Temporal Sclerosis in Temporal Lobe Epilepsy.
 20. CHEUNG, AM Mechanisms of Action of Antiepileptic Drugs and Fine Motor Dexterity in Generalized and Localization-related/Focal Epilepsies.

21. COADY, E Personality Profiles in a Sample of Patients with Comorbid Diagnosis of Both Epileptic and Psychogenic Nonepileptic Seizures.
22. DAWSON, KA Pre-surgical RAVLT and ROCFT Performance of Selected Right and Left Temporal Lobe Epilepsy Patients.
23. DOW, C Progressive Memory Decline in Temporal Lobe Epilepsy: A Longitudinal Investigation.
24. FOSTER, PS Errors on the Trail Making Test in left and right temporal lobe epilepsy.
25. GEARY, EK Quantitative MRI Volumetrics of the Basal Ganglia and Negative Symptoms in Temporal Lobe Epilepsy.
26. HEINRICHS MATSON, RJ Differential Detection of Non-Epileptic Seizures with the MMPI-2.
27. IAMPIETRO, MC Cross-Validation of a Regression Equation to Predict Side of Surgery in Adult Patients with Medically Intractable Temporal Lobe Epilepsy.
28. KEISKI, M Quantitative MRI Correlates of MMPI Scores in Temporal Lobe Epilepsy (TLE).
29. LEE, E Patterns of Emotional Distress and Negative Symptoms in TLE.
30. LUTON, LM No Laughing Matter: The Neuropsychological Profile of a Child Diagnosed with Hypothalamic Hamartoma and Accompanying Gelastic Seizures.
31. MACIAS, A Neurocognitive Functioning of Women with Psychogenic Non-epileptic Seizures.
32. MCNALLY, KA Discrimination of Frontal versus Temporal Lobe Epilepsy Patients Based on Neuropsychological Assessment and MMPI.
33. MEIDINGER, A An Investigation Of Sleep And Behavior In Children With New Onset Epilepsy.
34. MORTON, JJ Right Hemisphere Structure and Function in Left Temporal Lobe Epilepsy.
35. PULSIPHER, D Subcortical Volumetry and Effect Sizes in Lateralized Temporal Lobe Epilepsy.
36. RAMIREZ, M The Diagnostic Utility of Interictal and Postictal Language Disturbances in Lateralizing Language Dominant Temporal Lobe Epilepsy.
37. SACHS, BC Executive Dysfunction and Depressed Mood in Unilateral Temporal Lobe Epilepsy.
38. SCHAFFER, S Use of the MMPI-2 Restructured Clinical Scales in Patients with Epileptic and Nonepileptic Seizures.
39. SCHOENBERG, MR Pre-surgical Verbal Fluency Performance of selected right and left temporal lobe epilepsy patients.
40. SMERZ, JM ApoE $\epsilon 4$ is Associated with an Increased Incidence of Postictal Confusion in Patients with Medically Intractable Temporal Lobe Epilepsy.
41. STROUP, E "Wrong-Way" Wada is Related to Dominant Hemisphere Epileptogenic Focus in Intractable Temporal Lobe Epilepsy.
42. TESTA, S Hemisphere Specificity of Memory Stimuli During the Wada Procedure.
43. TRANEL, D Why Proper Naming is Sometimes Spared Following Left Anterior Temporal Lobectomy.
44. VAN WINKLE, AN A Comparison of Performances and Outcomes on the California Verbal Learning Test-Children's Version in Children Diagnosed with Epilepsy and Attention Deficit/Hyperactivity Disorder.
45. WINSTANLEY, F Naming Outcome and fMRI Activation Maps in Left and Right Anterior Temporal Lobectomy [ATL] Patients with Bilateral Language Representation on Wada Testing.

HIV/AIDS

46. BECKER, JT Brain Structural Abnormalities in HIV/AIDS Analyzed by the Method of Partial Least Squares.
47. CASTELO, JB Altered Hippocampal-Prefrontal Activation in HIV during Encoding of Novel Face-Name Associations.
48. COLE, M Longitudinal Study of Cognitive Functioning in Long-term Asymptomatic HIV-infected Individuals.
49. CYSIQUE, LA Neurobehavioral Effects of HIV-1 Infection in China versus the US: a pilot study.
50. IUDICELLO, J Differential cognitive mechanisms of time- and event-based prospective memory in HIV infection.
51. NICHOLS, SL Developmental Outcomes of Perinatally-acquired HIV in Late Childhood and Adolescence: Relationship of Cognitive, Academic, and Behavioral Functioning with Disease Severity.
52. ROBBINS, RN Neuropsychological Test Performance, Ethnicity and HAART adherence among HIV+ African Americans.
53. ROBBINS, RN Modeling Verbal List Learning Curves within a Sample of HIV + Adults.
54. SASSOON, SA Long-term Decline in Digit Symbol Performance in Alcoholism and HIV Infection Comorbidity.
55. TATE, DF Alterations in the Diffusion Characteristics of the Midsagittal Corpus Callosum and Cognition Among HIV Infected Patients.
56. WOODS, S HIV-associated Prospective Memory Deficits Predict Antiretroviral Nonadherence.

Medical Disorders

57. ANDREWS, NR Differences in Raw Score Performance Between Hypertensive and Normotensive Community-Dwelling Older Adults on the RBANS.
58. BAUER, L Performance on Cognitive and Symptom Validity Measures in Participants with Fibromyalgia.
59. DAVIS, AS CNS Nocardia: A Neuropsychological Case Study.
60. DEMANUELE, J Quality of Life in Pulmonary Hypertension Patients: A Review of the Literature.
61. DUQUIN, JA The Effect of Smoking on Obstructive Sleep Apnea and Adherence to PAP.
62. EWING, C Associations of Sociodemographics and Blood Glucose Control with Problem Solving in Urban African Americans with Type 2 Diabetes.
63. HALEY, AP Reported Cognitive Dysfunction at Baseline Predicts Global Cognitive Decline at One Year Follow-up in Patients with Cardiovascular Disease.
64. HILSABECK, RC Relationship of Cytokines to Cognitive Functioning in Patients with Chronic Hepatitis C.
65. HOTH, KF C-Reactive Protein Predicts Longitudinal Cognitive Change in Elderly Individuals with Cardiovascular Disease.
66. HUCKANS, M Relationship Between Peripheral Cytokine Levels and Neuropsychological Functioning in Patients with Hepatitis C.

67. JOHNSON, CE Neuropsychological Outcomes of Chemotherapy in Pediatric Acute Lymphoblastic Leukemia: A Meta-analytic Review.
68. KOZORA, E Psychological and Exercise Correlates of Cognitive Improvement in Emphysema Patients following Multidisciplinary Treatment.
69. LAGEMAN, SK Executive Functions in Women With Early-Stage Breast Cancer.
70. LOWE, C Understanding the Efficacy of Treatment on Neurocognitive Performance Among Individuals Classified as Sub-clinical Hypothyroid.
71. LOWE, C Comparing Differences in Neurocognition Among Individuals Classified with Subclinical Hypothyroidism.
72. MOONEY, S Utility Of The Brief Visuospatial Memory Test-Revised Copy Trial And Hopkins Verbal Learning Test In Staging Hepatic Encephalopathy.
73. OKCU, F Neurocognitive Functioning Related to Glutathione S-Transferase Polymorphisms in Childhood Acute Lymphoblastic Leukemia Survivors.
74. PATRY, B Relationship Between Self-Reports of Cognition, Emotion, and Fatigue and Objective Cognitive Change Following Chemotherapy in Breast Cancer Patients.
75. SADEK, JR West Nile Virus Infection Can Produce Mild Chronic Neuropsychological Deficits.
76. VERAMONTI, TL Factor Analysis of the Functional Assessment of Cancer Therapy-Brain module in a Primary Brain Tumor Population at Time of Diagnosis.
77. WEFEL, J Cognitive Outcomes of a Pilot Trial Examining Donepezil for the Treatment of Opioid-induced Sedation in Cancer Patients.
78. WOON, FM Cognitive Outcome Following Carbon Monoxide Poisoning: A Review of the Literature.
79. YAMADA, T Neuropsychological Functioning Predicts Psychosocial Well-Being Among Older Cancer Survivors.

Multiple Sclerosis/ALS/Demyelinating Diseases

80. BARWICK, F Stress, Coping, and Intellectual Decline in MS.
81. BASSO, M Facial Affect Recognition in Multiple Sclerosis.
82. BASSO, M Doing Not Alliterating or Categorizing: Verb/Action Fluency Predicts Functional Impairments in MS Whereas Literal and Semantic Fluencies Do Not.
83. BASSO, M Personality and Dysexecutive Symptoms in Multiple Sclerosis.
84. BASSO, M Neuropsychological Deficits Predict Impaired Functional Outcomes in Multiple Sclerosis.
85. BEENEY, JE Stress and Affective Memory Bias Interact to Predict Depressive Symptoms in Multiple Sclerosis.
86. CHRISTODOULOU, C Affective Symptoms Predict Subsequent Neuropsychological Change in Multiple Sclerosis.
87. JOHNSON, AM The Effects of Chronic Stress on Memory in Patients with Multiple Sclerosis.
88. MARCOTTE, T Driving Performance in Multiple Sclerosis.
89. PARMENTER, BA Sex Differences in Verbal Memory in Multiple Sclerosis.
90. POLEN, DM Learned Helplessness, Coping, and Social Support: Relationship to Depression in MS.
91. ROSENTHAL, S THE RELATIONSHIP BETWEEN OPTIMISM AND NEUROPSYCHOLOGICAL TEST PERFORMANCE IN PATIENTS WITH MULTIPLE SCLEROSIS.
92. RYAN, K Fitness to Drive Among Individuals with Multiple Sclerosis.
93. SESTITO, N Driving After Multiple Sclerosis: Is There Really a Difference?
94. STROBER, LB The role of disease variables, age, and depression proneness in predicting depression in MS patients.
95. TEKOK-KILIC, A Frontal Cortex Atrophy Predicts Defective Learning In Multiple Sclerosis Patients.

3:00–4:00 PM

Invited Plenary
Development of the Brain Network Underlying Self-Regulation
Speaker: Michael Posner
Room:Grand Ballroom

4:30–5:30 PM

Presidential Address
From Muddles to Models: Neuropsychological Rehabilitation from 1979-2007
President: Barbara A. Wilson
Room:Grand Ballroom

5:45–7:15 PM

Reception
Room:Pavilion

SATURDAY, FEBRUARY 10, 2007**9:00–10:30 AM****Paper Session 6
Adult Imaging
Room:Pavilion**

1. MOORE, AB Frontal-Subcortical Circuits in Verbal Working Memory: An fMRI Study.
2. FITZPATRICK, N Longitudinal Examination of Brain Injury Using Diffusion Tensor Imaging.
3. JULIAN, LJ Diffusion Tensor Imaging Correlates of Cognitive Functioning in the Earliest Stages of multiple sclerosis (MS).
4. KLEINHANS, NM Abnormal Amygdala-Fusiform Connectivity in Autism Spectrum Disorders: Relationship to Clinical Severity and Face Memory Performance.

9:00–10:30 AM**Symposium 11
Holistic Milieu-Oriented NeuroRehabilitation: Philosophical, Clinical and
Research Considerations
Chair: Pamela Klonoff
Room:Grand Ballroom I**

1. KLONOFF, PS Holistic Milieu-Oriented Neurorehabilitation: Philosophical, Clinical and Research Considerations.
2. KLONOFF, PS An Overview of Milieu-Oriented Neurorehabilitation at the Center for Transitional NeuroRehabilitation.
3. WATT, L Outcome and Process Variables in Milieu-Oriented Neurorehabilitation at The Center for Transitional NeuroRehabilitation.
4. MYLES, S Changes to Sense-of-Self Post-Brain Injury: Research and Treatment.
5. PEPPING, M Treatment Model Comparisons and Directions for Future Research.

9:00–10:30 AM**Paper Session 7
Adult Language Functions
Room:Grand Ballroom II**

1. MARCOTTE, K Brain Plasticity in Chronic Anomia: Changes in the Neural Network Following Therapy with Semantic Feature Analysis.
2. ARNETT, PA Oralmotor Slowing in Multiple Sclerosis: Relationship to Neuropsychological Tests Requiring an Oral Response.
3. RACINE, CA Longitudinal Change in Cortical Gray Matter and Neuropsychological Profiles in Three Variants of Primary Progressive Aphasia.
4. CAREY, CL The Cognitive Mechanisms and Neuroanatomical Correlates of Verbal Fluency Impairment in Frontotemporal Dementia.

9:30–11:00 AM**Poster Session 10: Neurocognitive Functions/Learning Disabilities****Epidemiology**

1. JEFFERSON, AL Aortic plaque and neuropsychological functioning in the Framingham Heart Study.

Learning Disabilities/ADHD

2. ADAMS, R A Virtual Reality ADD Classroom and Galvanic Skin Response: A Preliminary Investigation of Response in Children with and without Attention Deficit Disorder.
3. ANLLO-VENTO, L A New Continuous Attention Tracking Task for the Comprehensive Assessment of Attention Processes.
4. BRAHMACHARI, R Executive Functioning and IQ among Children with ADHD-PI or Dyslexia.
5. BUBNIK, M Cluster Analysis of Preschoolers using Objective Measures of Inattention, Impulsivity and Activity Level.
6. JOHNSON, AR Relationship of Pars Morphology to Phonological Processing in Children with and without ADHD and Dyslexia.
7. LAMACCHIA, AC Phonological Processing and the Supramarginal Gyrus: a Structural MRI Approach.
8. MANO, QR Structural Equation Modeling of Visuo-perceptual-Orthographic (VPO) Reading Abilities.
9. MCCANN, SJ Does Phonological Intervention Improve Reading Comprehension in Children with Developmental Dyslexia.
10. MESMAN, GR Examining Multiple Theories' Contribution to Orthographic Functioning.
11. PRESTON, AS Comparison of WISC-IV Working Memory and Processing Speed Indices Between Children with ADHD and Clinical Controls.
12. SCHUSTER, JM Students Diagnosed With ADHD Receiving Special Education Services: Predictors of Math Achievement.
13. STUBBS, A Informal Math Skills and Cognitive Correlates in Five-Year-Old Children with Spina Bifida and Typically Developing Controls.
14. WITTENBERG, D Gender Differences in Parieto-Temporal Activation During Phonological Processing in Poor and Normal Readers.
15. WODKA, EL Process Examination of Executive Function in ADHD: Gender and Subtype Effects.

Memory

16. ADAMS, C The Effect of Cognitive Load, Interference Type, and Timing on Working Memory Performance in a Dual-Task Paradigm.
17. CARLOZZI, N Memory Problems in Posttraumatic Stress Disorder: Objective Findings versus Subjective Complaints.
18. CARSWELL, M Paraneoplastic Limbic Encephalitis (PLE): A Case Study of Long-term Cognitive and MRI Findings.
19. CHAN, RC Aging Effect on Prospective Memory in Healthy Elder People: Convergent evidence from experimental and ecological valid tasks.
20. CHAN, RC T102C polymorphism of serotonin-2A receptor gene and working memory dysfunction in Chinese schizophrenic patients.
21. CHANG, Y Verbal Memory Interference in Temporal Lobe Epilepsy: A Temporal Lobe or Frontal Lobe Problem?
22. CHILVERS, R A Dominantly Inherited Lexical Memory Disorder in a Large Family With Four Living Generations.
23. CONTARDO, CP The Memory for Intentions Screening Test: Validity in an HIV+ Sample.
24. CREAN, RD The Effects of Chronic Alcohol Exposure on Spatial Delayed Memory and Brain Functioning in Adolescent Non-human Primates.
25. DAVID, S The Relationship of Memory Controllability Beliefs to Memory Enhancement Training in Healthy Older Adults.
26. DE MARTINO, MF Analysis of Psychophysiological Parameters in Shiftworking Nurses.
27. FIELDS, JA Differences in Recognition Performance on the CVLT and CVLT-II in Alzheimer's vs Parkinson's Subjects.
28. GOODALL, K Happy Faces and Spaceships: Representational Strategy Predicts Poor Recall on the Rey Complex Figure Test.
29. HAN, S Functional Neuroimaging of Age Differences in Face-Name Associative Memory.
30. HARRIS, KM Examination of the Own-Race Bias on the WMS-III Faces Subtests.
31. HOWE, LL More than Meets the Eye: The Medical Symptom Validity Test (MSVT) as a Memory Measure in Impaired Populations.
32. KELLISON, I Mild Cognitive Impairment: Memory, Cortisol and Hippocampal Volumetrics.
33. LUBINSKY, TR Source Memory in Amnesic Mild Cognitive Impairment.
34. MORDECAI, KL Objective Memory Functioning and Subjective Memory Complaints in Healthy and Mood Disordered Elderly: Influence of Negative Affect.
35. MORRONE-STRUPINSKY, J Amygdalar-Hippocampal Activity Generated by Arousing Novel Faces in the Elderly.
36. PARE, N Characterization of Verbal Learning Processes in MCI and AD.
37. RANE, S Verbal and Nonverbal Recognition Tasks Yield Similar Serial Position Curves: More Evidence in Favor of a Unitary Short-Term Memory System.
38. RICH, JB A Comparison of Verbal and Nonverbal Memory Immediately and at 25-minute and 72-hour Delays.
39. RUMBLE, SM Processing Speed and Memory Performance in a Neurological Sample.
40. RYBALSKY, KA The Influence of Flavor Labeling on Memory in Adults and Children.
41. SCHLICHTING, EG N-back Performance and Standardized Measures of Processing Speed, Executive Function, and Working Memory in Mild Cognitive Impairment vs. Normal Controls.
42. SPENCER, RJ Symbol-Digit Modalities Test-Incidental Learning: Preliminary Findings in Older Adults.
43. STEFFEN, E The Role of Awareness in a Delay Eyeblink Discrimination Task.
44. UTTL, B Age Declines on Free Recall are Larger than on Old/New Recognition Memory Tests. True or False?
45. VELIKONJA, D Visual and Verbal Memory Performance in Patients with Acquired Brain Injury (Traumatic Brain Injury and Acute Stroke).
46. WETZEL, ME The Role of Entorhinal Cortex in Memory Consolidation in Mild Cognitive Impairment.
47. WILLIAMS, BR Do Verbal Tasks Really Cause More Retroactive Interference Than Nonverbal Tasks on the CVLT-II?: Results from a College Population.

Psychopharmacology

48. CHRIST, SE Relationship between Blood Phenylalanine Levels and N-back Working Memory Performance in Children with Phenylketonuria.
49. STEH, BD A Modafinil Therapeutic Trial for Adult Brain Tumor Patients: Neurocognitive Outcomes.

Sex Differences/Sex Hormones

50. COX, L The Effects of Ovarian Hormone Suppression on Episodic Memory in Premenopausal Women.
51. LEJBAK, L Sex Differences in Neuropsychological Predictors of Verbal Fluency Output and Strategy.
52. LIOSSI, C Sex specific neuropsychological and affective trajectories after traumatic brain injury.
53. MORDECAI, KL Memory Across the Menstrual Cycle and with Oral Contraceptive Use in Young Women.
54. MORTON, CH Are Male Centenarians Super-Survivors?
55. RUBIN, LH Cognitive Processes Underlying the Sex Difference on the Digit Symbol Test.
56. WOODARD, JL Effects of a Six-Week Trial of Hormone Replacement Therapy on Cerebral Glucose Metabolism, Cognitive Functioning and Mood.
57. WU, J Sex Differences In Attention Across ERP And Near-Infrared Procedures On The Same Participants.

Visuospatial Abilities

58. CHERRY, BJ Normative Data on a Modified Mental Rotation Task in Younger and Older Adults.
59. KHETRAPAL, N Development of Visuo-Spatial Working Memory.
60. MARIANI, M The Effects of Gender and Type of Instruction on Route Performance.
61. MONTIEL, T Visuospatial Processing in Spanish-Speaking Children with Dyscalculia.

62. MULLER-OEHRING, EM Effects of Age and Alcohol on the Relation between Visual Conjunction Search and Regional Corpus Callosum Size.
63. NASS, M Subitization: Insights from Canonical Inspection Time, Semantic and Negative Priming.
64. SENDEN, M Possible Congenital Topographic Heading Disorientation.
65. VAN DER HULST, EJ Cognitive and Neuroanatomic Determinants of Visual-Motor Integration.

10:30–10:50 AM**Coffee Break****Room: Plaza and Ballroom Foyers, Exhibit Hall****11:00 AM–12:30 PM****Paper Session 8****Adult Rehabilitation****Room: Pavilion**

1. BENEDICT, RH Improved Processing Speed in MS Patients Treated with L-Amphetamine.
2. ALTMANN, LJ Change in discourse Quality Following an Attentional Treatment for Anomia.
3. VAN HOUT, M Psychosocial and Cognitive Rehabilitation of Patients with Chronic Toxic Encephalopathy. A Randomized-Controlled Study.
4. KURTZ, M Computer-Assisted Cognitive Remediation in Schizophrenia: What is the Active Ingredient?

11:00 AM–12:30 PM**Paper Session 9****Assessment Issues****Room: Grand Ballroom I**

1. SMITH, GE A plateau in pre-Alzheimer memory decline: Evidence for compensatory mechanisms?
2. LORING, DW Differential Sensitivity of the Rey Auditory Verbal Learning Test and California Verbal Learning Test to Lateralized Temporal Lobe Epilepsy.
3. GREIFFENSTEIN, MF Dimorphism, Somatization, and Noncredible Cognitive Deficits.
4. STRICKER, JL Lessons for neuropsychologists from a connectionist architecture that can constructively solve multiple problems without interference.

11:00 AM–12:30 PM**Paper Session 10****Pediatric Imaging****Room: Grand Ballroom II**

1. EWING-COBBS, L Regional Brain Volumes in Young Children with Traumatic Brain Injury: Relations with Neuropsychological Outcomes.
2. WOZNIAK, JR Diffusion Tensor Imaging in Mild to Moderate Pediatric Traumatic Brain Injury.
3. ELKANA, O Neuroanatomical Representation of Language Recovery Following Unilateral Brain Damage in Children: Preliminary Data from fMRI and Neuropsychological Testing.
4. CORBETT, BA Exploring the Amygdala in Children with Autism Using Structural and Functional MRI.

11:15 AM–12:45 PM**Poster Session 11: Executive and Emotional Functions****Executive Abilities/Frontal System**

1. BARBER, CE Clustering and Switching as Underlying Components of Verbal Fluency.
2. BERKELHAMMER, LD Attention and Executive Deficits in Children with Sickle Cell Disease without CNS Infarct.
3. BIRD, A Neuroanatomical Correlates of Verbal Abstract Reasoning.
4. BOEKA, A Neuropsychological Performance of Obese Individuals Seeking Bariatric Surgery.
5. BYLSMA, FW Does the Frontal Systems Behavior Scale (FrSBe) Assess Frontal System Behaviors.
6. CHESTNUT, J Associations between Executive Functions and Self-reported Risk Taking Behavior in College Students.
7. DAMON, J Neuroanatomical Correlates of Planning Ability and Rule Monitoring.
8. DULAY, MF Depression and Executive Functioning After Unilateral Frontal Lobectomy.
9. DUMITRESCU, CC Executive Dysfunction in Acute Medical Inpatients: Implications for Functional Outcome.
10. EASTVOLD, A Inverse relationship between inhibition and switching: Evidence from the BDS-EV and the DKEFS Color-Word Interference.
11. GARCIA-BARRERA, MA Development of a Screener for the Behavioral Assessment of Executive Functions in Children -Pilot Study.
12. GIBBS, C Neurocognition and Parent Reported Sleep Problems in Children with Autism.
13. GRAVER, C Perceived Need for Treatment and its Relationship to Neuropsychological Performance.
14. HERNANDEZ, C Executive Functioning and Categorical Classification in Spanish-Speaking Children with Attention-Deficit/Hyperactivity Disorder.

15. HOLLAND, JD A Comparison of Manual and Computerized Versions of the Tower of Hanoi and the Contribution of Inhibition to Performance.
16. ISOMURA, A Anterior Medical Prefrontal Cortex and Self-Generated Information Processing: A Near-Infrared Spectroscopy Study.
17. JOHNSON, AR Squirmy Snackers vs. Still Snowmen: Assessing Preschool Self-Regulation in a Snack Delay task.
18. JOHNSON, CP Children's Response Accuracy, Speed and Consistency on a Computerized Test of Executive Control.
19. JOHNSON, CP Development of a Computer-Administered Working Memory and Inhibitory Control Battery for Adolescents.
20. KANG, Y Cognitive Changes in the Frontal Lobes Across the Lifespan.
21. KELDERMAN, J Right Frontal Lobe Impairment In a 10-year-old with a History of Medullablastoma.
22. KERNS, KA Investigation of Performance Monitoring: The Effect of External Feedback on Error Correction in Children & Adults.
23. KRAYBILL, M Trail Making and Simple Choice Reaction Time: Double Dissociation of Motor Speed and Executive Abilities.
24. LENGENFELDER, J Using the Frontal Systems Behavior Scale to Assess Behavior in Individuals with TBI.
25. LIEBERMANN, D The Relation Between Preschoolers' Executive Functioning and Their Everyday Behaviors.
26. LOKKEN, K Executive Dysfunction in Obese Binge Eaters.
27. MARSHALL, RC Problem Solving by Subjects with and without Diffuse Neurologic Involvement on the Rapid Assessment of Problem Solving Test (RAPS).
28. MERKER, BM Neuropsychological Functioning in Essential Tremor Patients Following Deep Brain Stimulator Surgery.
29. MITCHELL, MB Deconstructing The D-Kefs Trail Making Test: Prediction Of Functional Status In Older Adults.
30. PATEL, SM The Impact of Coronary Artery Bypass Grafting on Neuropsychological Functions Mediated by the Frontal Lobes.
31. PILARSKI, CR An Investigation into the Influence of Personality and the Short-Term Physiological Effects of Nicotine on Decision-Making.
32. RANSOM, MT Executive Function Differences in Medicated Depressed, Non-Medicated Depressed, and Non-Medicated Non-Depressed Individuals.
33. SHIVAPOUR, SK The Importance of Numeracy to Complex Decision-Making.
34. SIMMONDS, DJ Correlation between functional brain activation and response time variability in children performing a Go/No-go task.
35. SIMMONDS, DJ Activation Likelihood Estimate (ALE) meta-analysis across event-related fMRI studies of healthy adults performing a Go/No-go task.
36. SKEEL, R Relationship between Risk-Taking, Personality, and Violation of Self-Imposed Drinking Limits.
37. TAMEZ, E Sensitivity of Tests of Executive Function in a Stroke Population: Are Backward Digit Span and Trails B Really More Sensitive to Brain Damage?
38. VERDEJO, AJ Effects Of Polysubstance Abuse And Drug Of Choice On Inhibition Measures Taxing Orbitofrontal Dysfunction.
39. VERNEY, SP Executive Functioning in a Combined Heat and Exercise Stress Environment.
40. WELSH, M Executive Function Performance in Low-Income Hispanic 2nd-grade Children and their Parents.
41. WIEBE, SA Genes and Behavior in Preschool Children: The Relation Between Dopamine Genotype and Latent Executive Control.
42. YOCHIM, B Set-Shifting on the D-KEFS Trail Making and Color Word Interference Tests in Patients with Lateral Prefrontal Cortex Lesions.

1:30–3:00 PM**Paper Session 11
Developmental Imaging
Room:Pavilion**

1. SUSKAUER, SJ fMRI Evidence that Children with ADHD Recruit Different Brain Structures in a Simple Task of Motor Inhibition.
2. RICH, BA fMRI Studies of Face Emotion Processing and Pediatric Bipolar Disorder: Behavioral Deficits and the Role of the Amygdala.
3. LU, LH Right hemisphere involvement in language development observed with magnetic resonance imaging and neuropsychological measures.
4. MOSTOFSKY, SH Abnormal Cerebral Cortex Structure in Children with ADHD.

1:30–3:00 PM**Paper Session 12
Innovative Approaches to Assessment and Treatment
Room:Grand Ballroom I**

1. ALL, SD Attention Shaping as a Cognitive Rehabilitation Technique for People with Schizophrenia.
2. BILDER, RM Mapping Cognition: Cognitive Ontologies for Visualization and Modeling of Brain-Behavior Relationships.
3. FOLDI, NS The Aging Of Attention: Capacity And Orienting In Visual Attention In Late Life.
4. MCDONALD, S Outcome Of A Randomised Controlled Trial To Remediate Social Skills After Severe Traumatic Brain Injury.

1:30–3:00 PM

**Paper Session 13
Executive Functions
Room:Grand Ballroom II**

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|--------------------|---|
| 1. KERR, PL | Executive Functioning in Children Exposed to Pesticides. |
| 2. NIKOLAS, M | Executive Functioning in Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD). |
| 3. MACALLISTER, WS | The Ecological Validity of the Tower of London in Pediatric Multiple Sclerosis. |
| 4. LARSON, JC | Multiple Components of Executive Function Contribute to Poor Use of Strategy in Children. |
| 5. KARANTZOULIS, S | The Relation of Frontal Lobe Integrity to Source Memory in Amnesic Mild Cognitive Impairment. |

Abstracts Presented at the Thirty-Fifth Annual Meeting International Neuropsychological Society

February 7-10, 2007
Portland, Oregon, USA

WEDNESDAY AFTERNOON, FEBRUARY 7, 2007

Poster Session 1: Assessment/Aging/HIV

4:15-5:45 p.m.

Aging

K.J. BANGEN, N.R. HORNE, A.J. JAK, S. HAN & M.W. BONDI.
Complex Activities of Daily Living and Cognition in Mild Cognitive Impairment.

Objective: Mild cognitive impairment (MCI) has been defined as involving cognitive decline in the absence of declines in activities of daily living (ADL). However, some studies have found reduced complex ADL in MCI suggesting that ADL do not accurately distinguish MCI from dementia. We hypothesized that (a) MCI participants would demonstrate poorer performance on complex ADL, (b) ADL performance would be positively correlated with cognitive performance, and (c) impaired performance on complex ADL would predict MCI status.

Participants and Methods: Sixteen MCI (mean age = 77.29, sd = 6.86) and 38 normal control (NC) participants (mean age = 77.18, sd = 6.78) were administered a neuropsychological test battery including subscales of the Independent Living Scales (ILS), a performance-based measure of instrumental ADL involving situations relevant to independent living (e.g., managing money).

Results: Results demonstrated that MCI participants performed significantly more poorly than NC participants on ILS Money Management subscales. Performance on ILS subscales was positively correlated with several measures of object naming ($r = .36, p = .008$) and visual ($r = .40, p = .004$) and verbal memory ($r = .36, p = .008$). Logistic regression of diagnosis by ILS performance was performed, resulting in the accurate classification of 70.4% of participants as MCI or NC ($p = .04$).

Conclusions: Our findings provide evidence of poorer performance of complex ADL in MCI. These results support the potential utility of combined cognitive and ADL assessment for the diagnosis of MCI and for intervention planning.

Correspondence: *Katherine J. Bangen, Joint Doctoral Program in Clinical Psychology, San Diego State University/University of California, San Diego, 1259 Johnson Avenue, San Diego, CA 92103. E-mail: kbangen@ucsd.edu*

H.C. BOORSTEIN, M. BUTTARO, J. CHASMAN, R.F. KAPLAN & L. WOLFSON.
Predicting Relative Impairment from the Wechsler Test of Adult Reading (WTAR) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in a Sample of Normal Elderly Volunteers.

Objective: The Wechsler Test of Adult Reading (WTAR) provides a reliable estimate of premorbid IQ. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is a popular dementia screening tool. This study compared the incidence of cognitive impairment based the published age-corrected norms to relative impairment based on differences between WTAR and RBANS, using the Revised Standardized Difference Test (Crawford and Garthwaite, 2005).

Participants and Methods: The participants were volunteers ($N = 102$) from a study of gait and balance in the elderly. Their mean age was 82 ($SD = 3.0$) and mean education 14.9 ($SD = 3.1$) years. In addition to gait and balance testing, each was administered a diagnostic interview, a WTAR, and the RBANS.

Results: The mean estimated IQ for this sample was 111.7 ($SD = 12.6$), the mean Total RBANS score was 100.9 ($SD = 15.7$), and the correlation between WTAR and RBANS Total score was .32. Based on a cutoff score of 75, four participants (3.9%) had Total RBANS scores at the 5th percentile or lower, our criteria for impairment. Of those with an estimated IQ of 115 or above ($n=53$), only one had a score below the 5th percentile (1.9%). However, when difference scores were computed, an additional five participants (9.4%) had difference scores between the WTAR and RBANS below the 5th percentile, which is indicative of impairment.

Conclusions: Discrepancies between indices of premorbid functioning and cognitive impairment provide a more sensitive way of assessing cognitive change in the elderly than cutoff scores alone, particularly in individuals with above average premorbid IQ scores.

Correspondence: *Hilary C. Boorstein, B.A., Psychology, University of Connecticut, 406 Babbidge Road, Unit 1020, Storrs, CT 06469. E-mail: h_boorstein@yahoo.com*

P.A. CERNIN & P.A. LICHTENBERG.
Cognitive Functioning Tasks as Related to Self-Rated and Objectively Measured Successful Aging in a Sample of Urban, African American Older Adults.

Objective: Traditional concepts of successful aging are based on cognitive and physical functioning cutoff scores. Often, few individuals are considered successful based on such criteria, and this becomes amplified in minority samples, because of differences in test performance. This study sought to examine cognitive test scores within objective as well as self-rated successful aging paradigms in an urban minority sample.

Participants and Methods: Sixty-seven community dwelling ($N = 67$) African American older adults were divided into successful and non-successful aging groups based on MacArthur objective criteria (i.e., physical and cognitive test scores), and based on self-rated success (i.e., self-rated health).

Results: Executive functioning and intelligence were significantly related to objective successful aging ($p < .05$), whereas no cognitive test was related to self-rated success. Tests of visuo-spatial ability were not related to either objective or subjective successful aging. After taking all other cognitive variables into account, logistic regression revealed that WRAT-3 Reading, commonly used as an index of education quality, mediated the relationship between education and cognition for objective successful aging. In this way, maintenance of cognition is not related to objective successful aging so much as is quality of education. Self-rated successful aging was best predicted by older age and health behaviors.

Conclusions: These findings not only underscore the distinction between self-rated and objective successful aging constructs, but also highlight the importance of interpreting cognitive test scores within the context of the sample. The use of cognitive test scores in African American older adults to define objective successful aging may be severely limited compared to self-rated success.

Correspondence: *Paul A. Cernin, M.A., TLLP, Institute of Gerontology, Wayne State University, 87 E. Ferry Street, Detroit, MI 48202. E-mail: cerninp@wayne.edu*

Y. CHANG, D.W. LORING, K.M. HEILMAN & R.M. BAUER. Age Difference in Memory for Relational Associations.

Objective: The current study examines age-associated memory deficits for relational associations after matching item memory. Studies in animals and functional imaging in humans have suggested that relational memory, an ability of integration and flexible expression between elements of previously memorized associations, is a function of the hippocampus. Thus, given that older adults experience hippocampal atrophy relative to the young based on MRI studies, it was hypothesized that relational memory would be more affected by aging than item memory.

Participants and Methods: Twelve healthy old adults and 12 young adults, who were matched on education and general IQ level, were administered an experimental face-house paired associated task, which presented pairs of faces which shared an association with the same house. Following the study phase, all participants received a forced-choice item memory test. A matching procedure was employed in order to equate item memory in both groups. All participants then received a relational association test, in which the participants were asked to identify two faces that shared the same house without showing the picture of the house.

Results: The data were analyzed by two independent sample t tests. The findings revealed that both groups had comparable item memory performance, but the older group demonstrated significantly worse performance than a younger comparison group in relational memory.

Conclusions: These findings suggested that older adults are less adept in relational (associative) memory than are young adults, and this age difference is disproportionately greater than for item memory.

Correspondence: *Yu Ling Chang, Clinical and Health Psychology, University of Florida, 101 South Newell Drive, Room 3151, Gainesville, FL 32611. E-mail: ychang@phhp.ufl.edu*

A. DOODY, L. LEACH & J. RIVEST. The Baycrest Attention Test and Normal Aging.

Objective: We describe a new clinical tool—the Baycrest Attention Test (BAT)—to assess selective and divided attention within and between the visual and auditory modalities of younger and older individuals.

Participants and Methods: Adapting the flanker paradigm, the BAT requires paying attention to commonly seen and heard stimuli. In the aim of validating its use, and evaluating its sensitivity to aging, we compare the reaction time (RT) and precision (RT variance) of 35 younger (18 to 30 years) and 30 older adults (above 50 years) on their correct trials (above 90% for both groups).

Results: Analyses of variance and effect sizes were calculated. As expected, older adults are slower in the auditory selective and divided attention tasks. Surprisingly, they were not slower, nor more variable in their RT in the selective visual attention task. This was true whether they had to ignore misleading cues or not. Older adults were at a disadvantage when attention had to be divided between stimuli. While all were slower when attention had to be divided between two visual stimuli than between one visual and one auditory, older adults are particularly slower and more variable when they had to pay attention to two visual stimuli. Older adults were worse when they had to ignore misleading visual cue while paying attention to other visual stimuli simultaneously.

Conclusions: The BAT was shown to be sensitive to normal aging in that divided attention was more affected than selective attention. In particular, visual divided attention was more affected than cross-modal divided attention.

Correspondence: *Josee Rivest, Ph.D., Psychology, York University- Glendon College, 2275 Bayview Avenue, Toronto, ON M4N 3M6, Canada. E-mail: jrivest@yorku.ca*

M. DUX, J.L. WOODARD, J.E. CALAMARI, H. CHIK, N. PONTARELLI, M. MESSINA, S. ARORA & B. GOLDMAN. A Longitudinal Analysis of Negative Affect as a Moderator between Objective Cognitive Functioning and Subjective Memory Complaints in Older Adults.

Objective: Subjective memory complaints are part of the diagnostic criteria for Mild Cognitive Impairment, yet little is known about their etiology. Our previous work has suggested cross-sectionally that negative affect (NA) moderates the relationship between objective cognitive functioning and subjective memory complaints (SMCs). The purpose of the current study was to evaluate this moderator model using a longitudinal analysis in a sample of older adults.

Participants and Methods: Cross-sectional analyses were performed on 144 elderly participants (age, $M = 76.7$ years). Longitudinal analyses were performed on a subset of 40 participants (age, $M = 74$ years) who completed a 6-month follow-up (Time 2) assessment. Participants completed measures of NA, objective cognitive functioning, and SMCs.

Results: Replicating previous work, four measures of NA significantly moderated the relation between objective cognitive functioning (Dementia Rating Scale-II [DRS-II] total score) and SMCs (Memory Functioning Questionnaire [MFQ] - Frequency of Forgetting subscale score). The four measures of NA were then aggregated to form a NA composite score for the longitudinal analysis. The NA composite score interacted with change in objective cognitive functioning (DRS time 2 – DRS time 1) to predict Time 2 subjective memory complaints (MFQ frequency of forgetting factor) [$F = 5.231$, $p = .030$, $R^2 \Delta = .125$].

Conclusions: Cross-sectional and longitudinal analyses suggest that increased levels of negative affect moderate the relation between objective cognitive performance and subjective memory complaints. Specifically, increased levels of NA predicted increased levels of subjective memory complaints in the absence of objective declines in cognitive performance over time.

Correspondence: *Maira Dux, Psychology, Rosalind Franklin University of Medicine and Science, 4837 N. Claremont, Chicago, IL 60625. E-mail: maira.dux@rfums.org*

V. ELDERKIN-THOMPSON, M. BALLMAIER, H. LAVRETSKY, D. PHAM, J. MINTZ & A. KUMAR. Relationship Between Executive Performance and Prefrontal Volumes among Healthy and Depressed Elderly.

Objective: Significant bilateral reductions in prefrontal cortical volumes and cognitive deficits, particularly executive dysfunction, have been reported among late-life depressed patients. The executive dysfunction may not return to baseline with remission. This study investigated the relationships between volumetric measures of specific regions of prefrontal brain and executive performance.

Participants and Methods: Cross-sectional sample of late-life depressed (N=26) and nondepressed elders (N=23) were screened for other psychiatric disorders, medical comorbidity, and indications of mild cognitive impairment. Magnetic resonance imaging was performed and anterior cingulate, orbitofrontal and gyri recta regions segmented and normalized as ratios of total intracranial volume. Performance scores on six clinical measures of executive function were regressed on white and gray matter ratios from each of the three brain regions.

Results: White and gray matter volumes of the gyri recta were associated with better scores on two of the six measures of executive performance and three error scores. This association was strongest among healthy controls. White matter volume of the anterior cingulate was positively associated with performance on two nonverbal reasoning tasks, and it was again stronger for healthy controls. Orbitofrontal white and gray matter volumes were negatively associated with both the total number of responses on verbal and nonverbal generative tasks and the number of errors.

Conclusions: Volumes of anterior cingulate and gyri recta are associated positively with specific types of executive function. In contrast, volumes of orbitofrontal are associated inversely with both correct and incorrect production during fluency tasks. Thus, brain atrophy, even that considered a normal part of aging, has adverse implications for multiple areas of executive performance. The problem is compounded if depression exacerbates the atrophic process, which is unlikely to be reversed with remission.

Correspondence: *Virginia Elderkin-Thompson, Ph.D., UCLA, 760 Westwood Plaza, Los Angeles, CA 90024-1759. E-mail: velderkin@mednet.ucla.edu*

B.A. FISCHER, C.E. GLEASON & J. MAHONEY. Orientation, but not Recall Performance, Predicts Falls in Elderly Community-Dwelling Subjects: The Kenosha County Falls Prevention Research Study.

Objective: Falls present a major health risk for elderly patients. Clinical scientists are exploring the relationship between cognitive function and falls, recognizing that cognitive impairment may present as great a risk for falls as physical disability. Additionally, the combined presentation of cognitive and physical impairment may result in a compounded risk for falls. In this analysis, we attempted to identify cognitive factors predicting risk for fall.

Participants and Methods: A group of 349 elderly, community-dwelling adults were followed for one year. Baseline MiniMental State Exam Score's were compared to overall rate of falls. In order to increase sensitivity of this commonly-used screening measure, we attempted to identify the most useful MMSE items in predicting fall rate. Items from the MMSE were selected based on face validity as assessing the cognitive domains of Working Memory, Recall, or Orientation. These groups of MMSE items were used to predict number of falls, using regression analysis.

Results: The number of falls occurring in each patient was significantly related to their MMSE ($F(2,345)=6.75, p=0.001$). Level of impairment on orientation items was inversely related to the number of falls ($p=0.02$). There was a trend toward significance for the relationship between the Working Memory domain and number of falls ($p=0.07$). The score on Recall items was not related to falls.

Conclusions: As expected the level of impairment was related to risk for falls. Interestingly, impairment in Recall did not correlate with number of falls. These data suggest that simply querying patients' orientation may assist clinicians to quickly identify those at risk for falls.

Correspondence: *Carey E. Gleason, PhD, Department of Medicine, University of Wisconsin, Madison, Madison VA GRECC (11G), 2500 Overlook Terrace, Madison, WI 53705. E-mail: ceg@medicine.wisc.edu*

J. HILBORN, E. STRAUSS, H. DAVID & M. HUNTER. Intraindividual Variability Across Cognitive Domains: Investigation of Dispersion Levels and Performance Profiles in Older Adults.

Objective: To investigate the relationship between aging and within-person variability across tasks (dispersion) cross-sectionally in older adults. Dispersion was evaluated by examining both overall levels of dispersion and patterns of dispersion.

Participants and Methods: 304 non-demented, older adults ranging in age from 64-92 years ($M=74.0$) were tested on a cognitive battery evaluating perceptual speed, fluid reasoning and memory. A measure of overall dispersion level was calculated for each participant across the various cognitive tasks. The dispersion score was examined by age and cognitive status. To examine possible patterns of dispersion, clustering procedures were used to classify individuals based on their pattern of performance across the tasks. Individual differences in demographic, health and performance characteristics were then examined in order to clarify the functional relevance of the subgroups identified.

Results: Higher levels of dispersion were observed in older-old adults and those identified as having suffered cognitive decline. Three distinct dispersion profiles were identified through the clustering methods and membership in the performance profile groups was related to demographic, health and performance characteristics of the individuals.

Conclusions: Results suggest that both overall level of dispersion and dispersion patterns may serve as meaningful indicators of individual differences. In addition, the results suggest that level of dispersion may serve as a marker of cognitive integrity.

Correspondence: *Jennifer Hilborn, MSc, Psychology, York University, 80 Cranbrooke Ave, Lower Unit, Toronto, ON M5M1M4, Canada. E-mail: jhilborn@yorku.ca*

M. HISCOCK & M.D. DICKINSON. The True Effect of Aging on Verbal and Nonverbal Abilities: An Examination of Wechsler Subtest Norms after Adjustment for the Flynn Effect.

Objective: Because age-norms for IQ tests are based on cross-sectional data, differences among age groups reflect not only the true effect of aging but also a cohort effect. Studies of this cohort effect (the "Flynn effect") indicate that it elevates Wechsler and Stanford-Binet scores by 3 IQ points per decade, but the rate of increase varies across subtests. In the present study, we adjust age-norms for each Wechsler subtest to account for the Flynn effect.

Participants and Methods: WAIS-R and WAIS-III test manuals were consulted to obtain differences between the means for 20- and 70-year-olds on each subtest. The manuals also provide scores for 264 individuals who were administered both the current and previous versions of the IQ test at the same age. From these published data we were able to estimate the magnitude of the Flynn effect for each subtest (in z-units per year) and to compare it with the corresponding mean difference between age groups (in z-units per year).

Results: The Flynn effect accounted for 48 to 78% of the difference between age groups on the Performance subtests. Similarly, the Flynn effect accounted for 77% of the difference between age groups on the Digit Span subtest from the Verbal scales. For the other five Verbal subtests, the magnitude of the Flynn effect exceeded the difference between age groups.

Conclusions: Adjusting age-group norms for the Flynn effect has a dramatic effect. For the five Performance subtests, as well as Digit Span,

the true age-related decline in mean ability between the ages of 20 and 70 years is substantially smaller than that indicated by the published norms. For the five remaining Verbal subtests, the Flynn effect is larger than the age-group differences, which seems to indicate that the abilities being assessed actually increase between the ages of 20 and 70 years. For these subtests, a modest age-related rise in scores is masked by a larger decline attributable to the Flynn effect.

Correspondence: *Merrill Hiscock, Ph.D., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu*

R. HOLTZER, C.I. HIRSHSON & J. VERGHESE. The Cognitive Determinants of Gait in Aging.

Objective: Decline in gait is common in aging and is related to loss of independence and dementia. Among the cognitive correlates of gait velocity, executive attention is the most potent irrespective of whether gait is assessed in single or dual-task conditions (Holtzer et al., 2006). This research extends our previous cross-sectional findings and identifies prospectively cognitive mechanisms of gait in aging.

Participants and Methods: The participants were cognitively normal elders (N=357, mean age= 78.9, female=55%) enrolled in the Einstein Aging Study. Neuropsychological tests were administered at baseline. Quantitative measures of gait (velocity, cadence, stride length and swing time) assessed in single and dual-task conditions, were administered one year after the baseline neuropsychological testing.

Neuropsychological tests were submitted to factor analysis with varimax rotation to extract orthogonal cognitive factors. The resultant cognitive factors were predictors in linear and logistic regressions with continuous and binary measures of gait serving as the outcome measures, respectively. Analyses controlled for age, sex, education, disease comorbidity, and clinical gait abnormality.

Results: The factor analysis yielded exactly three orthogonal factors capturing the domains of executive attention, verbal IQ and memory. These factors were significant predictors of continuous and binary measures of gait but the relationship varied depending on the task condition (single vs. dual-task) and gait parameters assessed. Furthermore, we replicated our previous cross-sectional findings showing the central role of executive attention in gait.

Conclusions: Identifying prospectively cognitive mechanisms of gait has implications regarding the assessment and treatment of elder individuals at risk of significant gait decline.

Correspondence: *Chari I. Hirshson, MA, Psychology, Yeshiva University, Albert Einstein School of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461. E-mail: charicohen@gmail.com*

R. HOLTZER, Y. GOLDIN & M. ZIMMERMAN. Comparison of Robust Versus Conventional Norms of Neuropsychological Tests in Aging.

Objective: The advantage of using robust, versus conventional, norms in older adults has been previously demonstrated for the Selective Reminding Test (Sliwinski et al., 1996). Here, we provide robust norms using longitudinal data for a few selected neuropsychological tests that are commonly used for clinical and research purposes. Further, we compare the robust sample to conventional and dropout samples.

Participants and Methods: The robust sample (n = 323; mean age = 77yrs) was obtained from a randomly selected and prospectively followed cohort of ethnically diverse individuals 70 and older who were enrolled in the Einstein Aging Study. Inclusion criteria for the robust sample required that the participants did not meet criteria for dementia or MCI at baseline and at two consecutive yearly follow-up visits. Robust norms were provided for the following tests: Boston Naming Test, Trail Making A and B, FAS, Category Fluency, and Free and Cued Selective Reminding Test.

Results: Means and standard deviations of the neuropsychological tests, stratified by age and education, were provided for the robust, conventional and dropout samples. Also, the results showed that the robust sample achieved higher scores on several neuropsychological tests compared to the conventional and dropout samples.

Conclusions: By excluding individuals who were classified as cognitively normal at baseline but who either dropped out or converted to meet criteria for dementia or MCI, the robust sample provides a more accurate and reliable estimate of cognitive test performance in normal aging. These findings have implications with respect to aging research and clinical practice.

Correspondence: *Roe Holtzer, Ph.D., Ferkauf and the Department of Neurology, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461. E-mail: rholtzer@aecom.yu.edu*

A.J. JAK, J. COREY-BLOOM & M.W. BONDI. Diagnostic Characterization of MCI Subtypes in a Naturalistic Sample.

Objective: The scope of mild cognitive impairment (MCI) has broadened with the advent of the use of both amnesic and non-amnesic subtypes (Petersen & Morris, 2005). We sought to investigate the applicability of diagnostic criteria for clinical subtypes of MCI in a naturalistic research sample of community elders.

Participants and Methods: 87 nondemented older adults were initially assessed and 55 were seen for follow-up one year later. Participants were classified via consensus diagnosis as either neuropsychologically normal, single domain amnesic MCI, single domain non-amnesic MCI, or multiple domain MCI. For the diagnoses, we utilized at least three neuropsychological measures from each of the following domains: attention, language, visuospatial functioning, executive functioning, and memory. All participants were neurologically normal and without functional impairments.

Results: Principle components analyses revealed support for the clinically driven test selection and conceptually derived cognitive domains, although screening measures tended to load poorly onto otherwise cohesive cognitive components. MCI percentages approximated 24% at each year. However, changing diagnostic categories over time was common, including improving, declining, and changing subtype of MCI. The non-amnesic subtype diagnosis was particularly prone to alternate to a re-classification of normal over time.

Conclusions: Our findings provide empirical support for a neuropsychologically derived operational definition of clinical subtypes of MCI and point to the importance of using comprehensive neuropsychological assessments, not simply broad screening measures or ratings, when diagnosing MCI subtypes. Diagnoses, particularly involving non-amnesic MCI, were variable over time. The applicability and utility of this particular MCI subtype warrants further investigation.

Correspondence: *Amy J. Jak, Ph.D., VA Healthcare System, San Diego/Veteran's Medical Research Foundation, 3350 La Jolla Village Dr., 151B, San Diego, CA 92161. E-mail: ajak@ucsd.edu*

A.L. JEFFERSON, L.K. BYERLY, S. LAMBE, S. WONG & A. OZONOFF. Activities of daily living in individuals with mild cognitive impairment.

Objective: Examination of activities of daily living (ADLs) in mild cognitive impairment (MCI) may increase our understanding of the functional decline that precedes Alzheimer's disease (AD). We sought to determine if MCI participants differ from controls and patients with AD on ADL measures and to identify cognitive functions associated with ADLs among MCI participants.

Participants and Methods: Functional and neuropsychological assessments were administered to 97 participants (cognitively normal old-

ers $n=45$; MCI $n=38$; AD $n=14$), age 60 to 90 years (73.6 ± 7.0 years; 54% female). Reliable informants completed two ADL questionnaires, including the Lawton & Brody IADL-PSMS, assessing independence for instrumental (IADL) and basic ADLs (BADL), and the Functional Capacities of ADL questionnaire (FC-ADL), assessing functional errors.

Results: ANOVAs yielded significant differences among groups for the IADL-PSMS IADL ($p < 0.001$) and BADL subscales ($p = 0.001$). Bonferroni post-hoc comparisons revealed that the cognitively normal elders and MCI group performed comparably while both groups outperformed AD participants on the IADL and BADL subscales. An ANOVA for the FC-ADL measure revealed significant differences among all groups ($p < 0.001$) in the hypothesized direction (cognitively normal elders' errors < MCI errors < AD errors). Among the MCI participants, only CVLT-II Trial 1-5 total recall was associated with FC-ADL performance, so as memory performance decreased, functional errors increased ($r = -0.39$, $p = 0.02$).

Conclusions: These findings suggest that traditional ADL measures may not be sensitive to early functional changes associated with MCI; however, error-based measures may be better indicators of evolving functional compromise associated with MCI. Among MCI participants, memory performance was the only significant neuropsychological correlate of functional errors, which may be secondary to the hallmark memory impairment associated with the MCI diagnosis.

Supported by: AG026610, HD043444, AG013846, RR005533

Correspondence: *Angela L. Jefferson, PhD, Alzheimer's Disease Center, Department of Neurology, Boston University School of Medicine, Robinson Complex, Suite 7800, 715 Albany Street, Boston, MA 02118. E-mail: angelaj@bu.edu*

E. KIM, K. BAYLES & P. BEESON. Effects of Visual vs. Auditory Presentation on Memory Span Tasks in Young and Older Adults.

Objective: Individuals 65 years of age and older represent the fastest growing segment of the population. Despite the high incidence of sensory deficits in this population, relatively little attention has been directed toward the effects of the modality of stimulus presentation and its interaction with task complexity and performance on measures of memory span. We investigated the effects of visual vs. auditory presentation on young and older adults' performance across four memory span tasks ranging in complexity.

Participants and Methods: Participants were 41 young adults ($M = 22.5$ years) and 37 older adults ($M = 72.1$ years) matched for years of education and estimated verbal IQ. After passing vision and hearing screenings, all were administered the forward digit span, word span, sentence span tasks (Daneman & Carpenter, 1980), and an experimental procedural instruction task administered both visually and aurally.

Results: Performance was analyzed using a repeated measures ANOVA with group (young, older) and modality (auditory, visual) and as the between and within subjects factors, respectively. Significant main effects for group and modality were observed across all tasks. Young adults scored higher than older adults, and both groups performed better when tasks were administered aurally. The performance difference between auditory and visual conditions increased with complexity across the three span tasks and the experimental instruction task.

Conclusions: Across four tasks ranging in complexity, both young and older adults performed better when stimuli were presented aurally, suggesting that in the absence of sensory deficits, auditory presentation of stimuli is appropriate for this population.

Correspondence: *Esther Kim, Ph.D., Department of Speech, Language, and Hearing Sciences, University of Arizona, 1131 E. 2nd St., Tucson, AZ 85721-0071. E-mail: eskim8@gmail.com*

S. LEE, J. CHEY, Y. KWAK & S. KIM. Physiological stress response is associated with increased regional glucose metabolism in anterior cingulate cortex and poor episodic memory in normal elderly adults.

Objective: This study purported to examine the influence of autonomic nervous system on cognitive function in elderly subjects, clarifying brain

regions and neurocognitive functions related to the effects of vagal tone. We consider the autonomic nervous function as the hippocampus-independent stress axis in order to distinguish it from HPA axis which is well known for its association with hippocampus-dependent memory decline in chronic stress.

Participants and Methods: This study focused on the High Frequency (HF) component of the HRV (Heart Rate Variability), as a measure of stress in autonomic nervous system. Twenty seven healthy normal elderly subjects (mean age 70.7 ± 4.5) were grouped into a low HF group and a high HF group depending on their HF power, which reflects the parasympathetic function of the individuals. We examined the group difference in neuropsychological functions measured by the Korean version of the Dementia Rating Scale and the Elderly Memory disorder Scale. The differences of cerebral glucose metabolism measured by FDG PET were examined between the two groups.

Results: The study found that the Low HF, indicating heightened sympathetic system, was associated with poor episodic memory performances, specifically the Delayed Recall ($F(1, 25) = 13.943$, $p < .001$) and the Recognition ($F(1, 25) = 4.446$, $p < .05$) of the Elderly Verbal Learning Test (EVLTL) in the EMS. The Low HF group demonstrated significantly higher level of cerebral glucose metabolism in the proximate anterior cingulate cortex in resting state ($X = 0$, $Y = 33$, $Z = 0$, uncorrected, $p < .001$, uncorrected, $k = 100$) as measured with the FDG PET.

Conclusions: This study provides evidence that stress as measured with heightened sympathetic response is associated with poor episodic memory performance, possibly via elevated activity in the anterior cingulate cortex. This may be another route for stress-mediated cognitive decline in addition to the HPA axis which affects the hippocampal function.

Correspondence: *Sungha Lee, SNU, 3361 John Hinkle Place, Bloomington, IN 47408. E-mail: sunghalee@gmail.com*

J. LEE, J. CHEY, S. LEE & H. KIM. Psychosocial Stress Induced Cortisol Response, Basal Cortisol Level, and Cognitive Functions in Healthy Elderly Adults.

Objective: Several studies have reported that elevated basal cortisol level was associated with memory impairment and smaller hippocampal volume in elderly populations. The present study investigated the relationship between basal cortisol level and cortisol responses induced by psychosocial stressors. The study also examined the relationship between psychological stress and cognitive functions in elderly with high and low basal cortisol levels.

Participants and Methods: Healthy elderly subjects with high ($n=13$) and low ($n=14$) basal cortisol levels were recruited from a larger study on community center elderly. We administered the Trier Social Stress Test (TSST) for psychosocial stress, which comprised of public speaking and mental arithmetic tasks. Before, during, and after the TSST, 7 saliva cortisol samples were collected using the Salivette procedure. Psychological stress and symptoms were measured by the Perceived Stress Scale and the Elderly Life Stress Inventory, along with the Symptom Check List-90 and the Geriatric Depression Scale. Cognitive functions were assessed with the Korea version of the Dementia Rating Scale and the Elderly Memory disorder Scale.

Results: While the low basal cortisol (LBC) group showed normal cortisol increase in response to the TSST, the high basal cortisol (HBC) group could be divided into responsive and non-responsive subgroups according to the presence of normal cortisol increase response. The non-responsive HBC subgroup was characterized by elevated initial cortisol level and also by the absence of increase response to the TSST. This subgroup also demonstrated poorer cognitive performance and higher level of psychological stress than the responsive HBC subgroup.

Conclusions: These results suggest that it is necessary to characterize basal cortisol level in elderly population according to one's psychosocial stress-induced cortisol response. Cognitive decline in the elderly appear to be associated with high basal cortisol level that does not fluctuate according to environmental stress.

Correspondence: Jeongmi Lee, Psychology, Seoul National University, 25/5 103-324 Shinlim2-Dong, Kwanak-Gu, Seoul 151-856, South Korea. E-mail: jm0123@snu.ac.kr

S. MCGILLIVRAY & G. FEIN. Cognitive Performance in Long-Term Abstinent Elderly Alcoholics.

Objective: Active alcoholism negatively affects cognitive function. We recently reported essentially normal cognitive function in middle-aged (mean age 46.8 years) long-term abstinent alcoholics (average abstinence 6.7 years) compared to controls.

Participants and Methods: The current study examines 91 elderly abstinent alcoholics (EAA) (49 men and 42 women; average age = 67.3 years; abstinent 0.5 to 45 years, mean abstinence 14.8 years) and age and gender comparable light/non-drinking controls. The EAA group drank 166 drinks/month for 33 years, with a peak dose of 332 drinks/month. The EAA group was broken down into three sub-groups, individuals who attained abstinence before the age of 50, between the ages 50 and 60, and after the age of 60. Attention, verbal fluency, abstraction/cognitive flexibility, psychomotor, immediate memory, delayed memory, reaction time, spatial processing, and auditory working memory were assessed.

Results: Overall, the EAA groups performed comparably to controls. Our data suggest that it's possible for elderly abstinent alcoholics to demonstrate normal cognitive performance.

Conclusions: These results don't imply that all individuals with long-term abstinence will attain normal cognition. It's possible that selective survivorship may play a part in these findings (e.g. cognitively healthier alcoholics may be more likely to live into their sixties, seventies, or eighties). In addition, selection bias may also play a role in these findings. Cognitively intact elderly abstinent alcoholics may be more likely to volunteer for this type of study than elderly individuals with cognitive impairments. Despite these limitations, the results clearly show that it's possible for elderly alcoholics with long-term abstinence to attain normal cognitive functioning.

Correspondence: Shannon McGillivray, B.A., Neurobehavioral Research, Inc., 201 Tamal Vista Blvd., Corte Madera, CA 94925. E-mail: shannon@nbresearch.com

A.E. MIKOS, M. WOOD, C. PRICE & D. BOWERS. Aging, Emotional Memory, and the Hippocampus.

Objective: We investigated whether patients with mild cognitive impairment (MCI), a condition characterized by impaired memory in the context of preserved general cognition and normal activities of daily living, show enhanced memory for emotionally arousing compared to neutral pictures. Additionally, we examined the relationship between hippocampal volume and memory for these materials.

Participants and Methods: Twelve MCI patients and 13 age and education-matched controls were presented with emotional and neutral photographs, followed by four recognition tests ten minutes, one hour, two weeks, and three months later. The percentage of correctly recognized pictures was calculated for low, medium, and high arousal pictures. Self-reported ratings of arousal and a physiological measure of arousal (skin conductance) were obtained during initial picture presentation.

Results: Both groups had similar arousal ratings and skin conductance responses for the low, medium, and high arousal pictures. The groups did not differ in their overall picture recognition performance and neither group showed enhanced recognition performance for emotionally arousing pictures. Due to concerns about accurate group classification, however, we examined emotional memory performance using a continuous indicator of general memory status instead of the between-groups classification. Memory status was significantly associated with two-week recognition memory performance for high arousing pictures. Additionally, hippocampal volumes were positively correlated with recognition memory performance for arousing but not neutral stimuli.

Conclusions: This study suggests that individuals with better memory status benefit more from emotional arousal than those with poorer memory status, and that the hippocampus is involved in enhanced consolidation of emotional information.

Correspondence: Ania E. Mikos, M.S., Clinical and Health Psychology, University of Florida, College of Public Health and Health Profession, P.O. Box 100165, Gainesville, FL 32610. E-mail: amikos@phhp.ufl.edu

K.J. MILLER, P. SIDDARTH, L. ERCOLI & G. SMALL. Verbal Memory Declines with Age and Alzheimer's Disease Risk Factors.

Objective: Identifying preclinical risks for Alzheimer's disease (AD) may give clinicians an opportunity for early intervention. This study examined memory functioning in asymptomatic individuals with a preclinical risk for developing AD by virtue of their family history or possession of the APOE4 genetic allele.

Participants and Methods: 21 participants in a longitudinal study received 4 neuropsychological evaluations across 4-6 years. Memory was assessed by the following tests: Buschke Selective Reminding, WMS-III Logical Memory, Benton Visual Retention and Rey-Osterreith Complex Figure. Statistical analyses examined whether cognitive decline was associated with increasing age and how it differed for those at risk for AD. The General Linear Model was used, with cognitive scores at the four time points as dependent measures, age as a time-varying within-subject factor, risk factor and interaction of age and risk factor as predictors.

Results: There was a statistically significant age by risk factor interaction effect for Buschke, including total recall ($F(1,19) = 4.31, p = .05$) and long term storage ($F(1,19) = 17.15, p < .001$). Subjects at risk for AD exhibited significant decline in performance with increasing age ($\beta = -0.68$, total recall; $\beta = -1.0$, long term storage) in contrast to subjects without risk factors.

Conclusions: These results suggest that individuals at risk for AD may show earlier memory impairment as they age in comparison to individuals without a clear risk for AD, extending our understanding of how family history, genetics, and aging are risk factors that may contribute to early memory decline in asymptomatic individuals.

Correspondence: Karen J. Miller, Ph.D., NPI, UCLA Medical Center, Suite 88-201, 760 Westwood Plaza, Los Angeles, CA 90024. E-mail: kmiller@mednet.ucla.edu

K.J. MILLER, J. BEDICS, A. KAPLAN, S. GIURGIUS & G. SMALL. Semantic Fluency as a Screening Tool.

Objective: Clinicians are often in search for simple tools that can be used within a screening process for patients presenting with memory complaints/deficits. Tools like the Mini-Mental Status Exam (MMSE) are used widely, but may not be sensitive enough to early changes and a referral for full neuropsychological evaluation may be overlooked. A recent research study (Cunje et al, 2006) was able to demonstrate the efficacy of using a semantic fluency task like Animals to differentiate between controls, mild cognitive impairment (MCI) and dementia. The goal of this study was to replicate how these diagnostic categories perform on the Animals task, suggesting its use as a possible screening tool.

Participants and Methods: Our study consisted of 101 participants (57 controls, 6 MCI, 38 dementia), including 53 women, with the mean age of 69.98 (SD 9.6). All participants completed the semantic fluency task, Animals, and their diagnosis was based on a complete neuropsychological work-up.

Results: ANCOVA revealed that those with MCI or dementia exhibited significantly lower scores than the controls (i.e. normal aging), $F(2,98) 61.39 (p < .000)$. More specifically, controls ($M=20.68, SD=5.30$), MCI ($M=12.67, SD=2.50$) and the dementia group ($M=8.74, SD=5.31$) named a similar number of animals reported by Cunje and colleagues.

Conclusions: These results suggest that the semantic fluency task, Animals, is sensitive to cognitive changes and may be useful as a screening tool. If clinicians were able to use these means and standard deviations as a guide, more patients might be referred for a full neuropsychological work-up to better determine cognitive status.

Correspondence: *Karen J. Miller, Ph.D., NPI, UCLA Medical Center, Suite 88-201, 760 Westwood Plaza, Los Angeles, CA 90024. E-mail: kmiller@mednet.ucla.edu*

L.S. MILLER & G. WILLIAMSON. Preliminary Results from the FRILL-2 Study: Caregiver cognitive performance and quality of elder care.

Objective: Miller, et al. (2006) reported a high percentage of cognitive impairment in older caregivers (39%) and suggested that caregiver cognitive impairment predicts level of potentially harmful caregiving behaviors as reported by elder care recipients. The current study expands that work with a comprehensive assessment battery, large population of caregiver/care recipient dyads, additional measures of quality of care, and measures of activities of daily living.

Participants and Methods: More than 400 caregiver (CG) / elder care recipient (CR) dyads from 4 sites around the United States participated. Participants were administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Interviews were conducted gathering self and collateral ADL/IADL information, measures of CG and elder CR physical and psychological health, and multiple measures of quality of care factors from both CGs and CRs.

Results: As found previously, a significant percentage of CGs presented with cognitive impairment (13.6% > 2 s.d. below expectation; 37.6% > 1 s.d. below expectation). Analyses indicated significant relationships between RBANS total index scores and CG and CR reports of physical injury, social isolation, and amount of help needed. Similarly, RBANS total index scores were related to CG resentment, depression, and anxiety. Finally, cognitive impairment was related to CG reports of Financial Exploitation.

Conclusions: A substantial percentage of caregivers suffer from some level of cognitive impairment, raising concern about the quality of their caregiving. From past research it was hypothesized that CR and possibly CG reports of harmful behavior would be predicted by level of cognitive impairment in CGs. The current study was only partially supportive of this previous work but identified heretofore unidentified additional measures including CR social isolation and reports of CR physical injuries. Specific domains of cognition related to potentially harmful caregiving behaviors are discussed.

Correspondence: *Lloyd S. Miller, Ph.D., Psychology, University of Georgia, Rm 163, Psych Bldg, 110 Hooper St, Athens, GA 30602-3013. E-mail: lsmiller@egon.psy.uga.edu*

J.D. NICOSIA, C.C. PRICE, M. MARSISKE & I.L. KELLISON. Verbatim and Paraphrase Recall: Older Adults' Performance on a Story Memory Task.

Objective: This study investigated age differences on a story memory task. Both verbatim and paraphrase recall were assessed and their associations with executive function and memory explored. We hypothesized a negative association with age and verbatim recall and a positive relationship between verbatim recall and executive function.

Participants and Methods: 50 non-demented older adults (age M \pm SD = 70.48 \pm 5.49) were divided into two groups: 29 younger old (60-70) and 21 older old (71-83) adults. Participants were administered immediate and delayed conditions of an unpublished story memory task that yielded verbatim and paraphrase scores, an executive function test (Stroop Color-Word Test), and a list-learning memory test (HVLT-R).

Results: A 2x2x2 ANOVA was conducted, with the between-subjects factor of Group (younger old, older old) and the within-subjects factors of Type (verbatim, paraphrase) and Time (immediate, delayed). A three-

way interaction was found between Group, Time, and Type $F(1,48) = 37.35, p = .041$. Only verbatim recall showed a trend with Stroop performance (Immediate $r = .27, p = .06$; Delayed $r = .27, p = .07$) while delayed paraphrase recall was significantly correlated with the HVLT-R discrimination index ($r = .32, p = .03$).

Conclusions: These results suggest age differences in immediate and delayed verbatim and paraphrase recall for story details. Both groups, especially the older group, demonstrated increased paraphrase recall and decreased verbatim recall in the delayed condition (relative to immediate). The findings may suggest a compensatory recall strategy where older adults rely on paraphrasing to offset lost verbatim details.

Correspondence: *Jacquelynn D. Nicosia, B.S., Department of Clinical and Health Psychology, University of Florida, 510 SW 34th Street Apt #23, Gainesville, FL 32607. E-mail: jnicosia@phhp.ufl.edu*

A.A. PELOQUIN, H.R. FRANKLIN, M.E. MCFARLAND, L. WILLIAMS & L. MILLER. RBANS Normative Samples: A Comparative Examination of the use of the RBANS Norms versus the OKLAHOMA Norms with High-Risk Older Adults.

Objective: This study examined differences in performance scores on the RBANS for functionally independent, frail elders, using two different normative samples. The OKLAHOMA norms were selected to evaluate the impact of education corrected norm use on this population.

Participants and Methods: Participants were 40 community-dwelling older adults from Northeast Georgia (mean age = 77.47, SD = 9.52; mean education = 6.48 years, SD = 3.74). The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was used to measure immediate memory, language, visuospatial-constructional abilities, attention, and delayed memory. The protocols were scored first using the RBANS age-corrected norms and then the OKLAHOMA age-education corrected norms. Functional status and Instrumental Activities of Daily Living (IADL) were also assessed.

Results: Regression equations were used to assess the variance accounted for in the model using age and age-education corrected norms. Using the OKLAHOMA norms, the Immediate Memory Index score significantly predicted IADLs, $\beta = .552, t(33) = 2.08, p < .05$, as compared to RBANS norms, $\beta = .175, t(23) = .514, p = .612$. The Index scores also explained a greater proportion of variance in IADL scores when using the OKLAHOMA norms, $R^2 = .179$; RBANS norms $R^2 = .126$.

Conclusions: Results demonstrate that the OKLAHOMA norms are sensitive to age and education factors and are also more appropriate for this particular elder sample. Results also suggest that normative samples should be carefully considered for accurate measurement of neuropsychological functioning when working with distinct patient populations. Possible contributing factors to these findings are discussed.

Correspondence: *Amie A. Peloquin, M.A., Clinical Psychology, University of Georgia, 750 Sawdust Trail, Nicholson, GA 30565. E-mail: peloquin@uga.edu*

G.G. POTTER, M.J. HELMS & B.L. PLASSMAN. Occupational Complexity, Intelligence, and Education as Predictors of Cognitive Status in Late Life.

Objective: Research suggests that higher levels of lifetime occupational complexity are associated with better cognitive status in late life, but this relationship may be due to premorbid intelligence or education. The current study examined cognitive status assessed by the Modified Telephone Interview of Cognitive Status (TICS-m) in a sample of male World War II veterans aged 60 and older, who also had scores from Armed Services intelligence tests administered in early adulthood.

Participants and Methods: Occupational histories of 1000 individuals screened for absence of dementia were coded for job complexity scores from the Dictionary of Occupational Titles (DOT).

Results: In bivariate analyses, we found significant correlations between TICS-m performance and several specific measures of occupational complexity. Age, education level, and intelligence also had significant positive associations with TICS-m performance. Each of the occupational variables was examined in a multivariate model predicting TICS-m score and covarying for age, intelligence score, and education level. In these models, better TICS-m performance was predicted by higher complexity of work with Data and People, and longer periods of Specific Vocational Preparation; in contrast, higher scores for work with Things predicted lower TICS-m performance.

Conclusions: The current results are consistent with “Use it or lose it” theories that suggest a cognitively or socially stimulating work environment is protective of cognitive function in late life independent of premorbid intelligence and education, but that manual work may be a risk factor for decreased cognitive performance.

Correspondence: *Guy G. Potter, Ph.D., Psychiatry and Behavioral Sciences, Duke University Medical Center, Box 3925, Duke University Medical Center, Durham, NC 27710-3925. E-mail: guy.potter@duke.edu*

E.C. RECKNOR, A. BECHARA & N.L. DENBURG. Decision-Making Deficits are Related to Heightened Reward Responsiveness in Older Adults.

Objective: Gray (1970) argued for a neuropsychological theory of temperament, involving the behavioral activation system (BAS), which underlies pleasure and reward-seeking behavior, and the behavioral inhibition system (BIS), which determines avoidance and cautious behaviors. Research with young adults has established that individuals scoring high on the BAS are more likely to make choices leading to decision-making failure (Peters & Slovic, 2000). However, investigation of temperament as it relates to judgment and decision-making has not been conducted in older adults, despite anecdotal and controlled data suggesting vulnerability. The purpose of the present study was to examine the influence of the BIS and BAS on decision-making in older adults.

Participants and Methods: Decision-making was assessed in 50 healthy older adults (aged 60-87) using the Iowa Gambling Task (IGT), in which participants select between decks of cards with varying amounts of reward and punishment. We divided older adults into two groups based on their overall IGT performance: Those who were impaired on the IGT (Older-Impaired) and those who were not (Older-Unimpaired). Participants also completed a self-report scale assessing individual differences in the sensitivity of the BIS and BAS (Carver, 1994).

Results: Using an independent samples *t*-test, we found that the two groups differed significantly on BAS Reward Responsiveness, with Older-Impaired showing higher Reward Responsiveness ($p < .05$).

Conclusions: The greater reactivity to rewarding events in the Older-Impaired participants may translate into an increased tendency for these individuals to choose from the decks of cards with the highest monetary payoffs (but even greater monetary loss), which will ultimately lead to failed performances on the IGT.

Correspondence: *Emily C. Recknor, B.S., Psychology, University of Arizona, 1503 E. University Blvd., PO Box 210068, Tucson, AZ 85721. E-mail: erecknor@email.arizona.edu*

S.A. ROGERS, P.H. LU, S. MCPHERSON & J. CUMMINGS. Differences in Stroop Performance Between Normal and MCI Patients.

Objective: Research has revealed age-related declines in the color naming, word reading, and response inhibition tasks of the Stroop test. This study examined if the Stroop measures can be used to discriminate between normal older adults and those with mild cognitive impairment (MCI), as well as between the four subtypes of MCI.

Participants and Methods: 127 normal adults and 164 adults meeting criteria for MCI, ages 47-90, voluntarily completed a comprehensive neuropsychological battery that included Stroop measures of color naming, word reading, and color-word interference. MCI was divided into single-domain amnesic, multiple-domain amnesic, single-domain nonamnesic, and multiple-domain nonamnesic subtypes.

Results: MCI patients demonstrated significantly lower scores on Stroop color naming, word reading, and color-word interference tasks, $t(282) = 5.27, 3.8,$ and $7.31,$ respectively, all $ps < .001$. Significant differences emerged between MCI subtypes for color naming, $F(3,154) = 2.8, p < .05,$ word reading, $F(3,153) = 4.36, p < .01,$ and color-word interference, $F(3,152) = 7.51, p < .001$. Single-domain amnesic MCI patients had better color naming than multiple-domain, amnesic patients and better word reading than multiple domain, nonamnesic patients. Those with single-domain amnesic and single-domain nonamnesic MCI had better color-word interference scores than multiple-domain, amnesic MCI patients.

Conclusions: Performance on the Stroop measures appears to clearly differentiate between normal controls and those with MCI, making the Stroop measures useful neuropsychological markers of MCI. Having impairment in more than one domain appears to exacerbate deficits on the Stroop for those with MCI, with the least level of deficit among those whose MCI is restricted to memory.

Correspondence: *Steven A. Rogers, Ph.D., Psychology, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: sarogers@westmont.edu*

S.A. ROGERS & K.J. MILLER. Cognitive Functioning in Older Adults: Looking Closer at the Role of Hormones.

Objective: There has been a growing interest in how hormone levels may be central to many of the cognitive changes associated with aging. This presentation will explore the impact of various hormones, namely estrogen, thyroid, and testosterone, on cognition in older adults.

Participants and Methods: First, the actual changes in cognition that are associated with normal aging will be explored. Using case examples, the authors' research, and recent literature, discussion will focus on the loss of memory, changes in executive functioning, and reduced fluency and processing speed experienced by older adults. The effects of estrogen, testosterone, and thyroid hormones on the brains of older men and women will then be explored, including how each of these hormones may directly influence the cognitive changes in aging, as well as the way they indirectly impact the genetics, neurotransmitter activity, and brain metabolism involved in aging.

Results: Next, we will discuss how these hormonal effects translate into the specific neuropsychological changes seen in aging. The authors' original neuropsychological research will be presented to demonstrate how high thyroid levels have been associated with significant difficulties in verbal learning, visuospatial functioning, and executive skills in older adults. Findings from PET imaging will be used to show how estrogen replacement therapy has been associated with preserved memory and executive functioning among perimenopausal and postmenopausal women. Similarly, research will be used to show how the age-related loss of testosterone in men has been associated with reduced memory and visuospatial functioning.

Conclusions: Finally, this presentation will focus on the implications of the hormone-cognition link for working with older adults, including how neurologists and psychologists can treat older adults with age-related cognitive changes.

Correspondence: *Steven A. Rogers, Ph.D., Psychology, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: sarogers@westmont.edu*

S.A. ROGERS, P.H. LU, S. MCPHERSON & J. CUMMINGS. Normative Data on the Stroop Measures for Older Adults.

Objective: Much research has suggested that performance on the Stroop measures steadily declines with age. However, many of the existing Stroop norms are devoted to the full age spectrum of adults, not exclusively to the older adults experiencing these changes. This study provides normative data on the Stroop measures for older adults stratified by age.

Participants and Methods: 152 non-neurological older adults, ages 55-88, voluntarily completed a comprehensive neuropsychological battery that included Stroop measures of color naming, word reading, and color-word interference, as well as the uncorrected errors for each measure. All participants underwent complete evaluations, including an examination by a neurologist, and were deemed to be normal.

Results: Age was positively correlated with performance on Stroop color naming, $r(149) = .38$, $p < .001$, word reading, $r(149) = .31$, $p < .001$, and color-word interference, $r(149) = .41$, $p < .001$. Education and gender did not account for a significant level of variance in Stroop performance, so descriptive normative data were stratified by age groups (55-60, 66-70, 75-80, 80-90). Significant differences emerged between these age groups for color naming, $F(5,143) = 4.91$, $p < .001$, word reading, $F(5,143) = 3.30$, $p < .01$, and color-word interference, $F(5,142) = 6.33$, $p < .001$.

Conclusions: There are strong age-related declines in performance on the Stroop tasks, with significant differences among advancing age groups. The norms that are provided will more accurately represent Stroop performances among older adults and provide more accurate detection and discrimination of patients' scores on the spectrum between impaired and non-impaired performance.

Correspondence: Steven A. Rogers, Ph.D., Psychology, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: sarogers@westmont.edu

B. SCHNEIDER & P.A. LICHTENBERG. Executive Functioning as Related to Disability and Physical Function in Urban African American Elders.

Objective: Measures of executive functioning have been shown to be related to changes in physical function and disability; however, few studies have examined this specifically within African Americans. The present study sought to examine the relationship between cognitive functioning, disability and physical function within community-dwelling African American older adults.

Participants and Methods: Sixty-three ($N=63$) participants were administered a self-report measure of disability (Instrumental Activities of Daily Living scale), a performance-based measure of physical function (physical performance battery; Guralnik et al., 2005) and measures of cognitive functioning.

Results: Executive functioning (Trail Making Test, Part B) was the only cognitive domain significantly associated with both physical functioning and IADL disability. A hierarchical regression demonstrated that executive functioning accounted for a unique proportion of variance in physical functioning after accounting for demographics, general cognitive functioning (Mini Mental Status Exam) and reading ability (WRAT-3 Reading). The final model accounted for 44.2% of the variance in scores on the physical performance battery. After taking demographics and all other cognitive variables into account, executive functioning remained the only significant predictor of IADL disability.

Conclusions: The results suggest that, within African Americans, executive functioning is uniquely related to scores on measures of both physical function and disability. Measures of executive functioning should be included, along with general cognitive measures, in neuropsychological batteries examining disability and physical function impairments within older adults.

Correspondence: Brooke Schneider, M.A., Institute of Gerontology, 87 E Ferry, Detroit, MI 48202. E-mail: bc_schneider@wayne.edu

L. SPINA. Education Corrections for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Are They Necessary?

Objective: The RBANS is commonly used for cognitive screening of elderly patients. Previous research has found a significant influence of education on RBANS performance and education corrections have since been published. Clinicians may use education corrections to improve screening; researchers may make corrections in order to approximate normal sample distribution for statistical purposes. This study aims to cross-validate and examine distribution effects of education corrections in a sample with a high mean education.

Participants and Methods: 250 healthy elderly completed the RBANS (age: 73.88 (8.31), education: 16.36 (2.48)). Participants with MMSE < 26 were excluded, as were those with cognitive or psychiatric disorders. Education corrections were applied to indices. Correlations and the Kolmogorov-Smirnov test for normality were compared before and after corrections.

Results: Correlations between education and Visual Construction, Language and Total were no longer evident after corrections; skewness and kurtosis improved. Language and Total were normally distributed even before corrections. Indices not correlated with education (Immediate Memory, Attention, Delayed Memory) were not normally distributed either before or after corrections. After corrections, Visual Construction and Attention became normally distributed.

Conclusions: The influence of education was not uniform across the RBANS and the normality of the distribution of individual indices is not related to education effects, at least in this highly educated sample. It is possible that education corrections may be more beneficial to individuals with less education. Thus clinicians should apply education corrections with careful consideration and researchers may find that correcting for education removes correlations where they exist, but corrections will not necessarily normalize sample distributions.

Correspondence: Laila Spina, Psy.D., Posit Science, 225 Bush St 7th Floor, San Francisco, CA 94104. E-mail: lspina@hotmail.com

L. SPINA. The Stability of the Mini Mental Status Exam (MMSE) in Cognitively Intact Elderly.

Objective: The MMSE is used regularly by various health professionals and researchers as a brief cognitive measure, and to monitor the cognitive status of individuals over time. There have been conflicting reports regarding the stability of the MMSE in cognitively intact individuals. This study aims to provide further information on the test-retest reliability of the instrument in a healthy elderly sample.

Participants and Methods: 71 individuals living in the community were administered the MMSE twice, with approximately a 10 week interval. The mean age was 73.15 (8.79); mean education was 17.7 (2.31). Participants were part of a larger study. Participants with an MMSE below 26 were excluded, as were those who had diagnoses of any memory disorder, stroke, TBI, psychiatric disorder or substance abuse.

Results: The Pearson correlation was .31 ($p=.009$).

Conclusions: This study suggests a lower test-retest reliability coefficient in cognitively intact elderly individuals at a 10 week interval than might have been expected. One possibility is that lower test-retest reliability coefficients in intact samples compared with individuals with dementia may be a function of the restricted range of scores generated by higher functioning individuals. However, in the context of other available studies, it is proposed that the stability of the MMSE is adequate at very short periods (i.e. a day) or very long periods (i.e. a year), but must be used with considerable caution at relatively short periods apart (i.e. 1-3 months), at least in healthy elderly individuals.

Correspondence: Laila Spina, Psy.D., Posit Science, 225 Bush St 7th Floor, San Francisco, CA 94104. E-mail: lspina@hotmail.com

J. SUHR, M. KEIL, E. MARK, M. BUELOW & P. DEMIREVA. Relation of Executive Dysfunction to Memory Performance in an Assisted Living Population.

Objective: Research suggests performance on learning and memory tests may be affected by the presence of comorbid cognitive impairment. For example, deficits in executive functioning are related to patterns of impaired verbal memory performance in a variety of clinical populations, including traumatic brain injury, dementia, and various other neurological conditions, making differential diagnosis problematic. Overall, studies suggest impaired executive skills affect learning and memory tasks without contextual cues to aid learning or retrieval, such as list learning tasks.

Participants and Methods: In the present study, we assessed whether the presence of executive dysfunction was related to memory performance in a sample of 83 residents of assisted living facilities (ages 63-94, $X = 82$, education 6 to 20 years, $X =$ high school, RBANS age- and education-corrected total scores 62-138, $X = 90$). Impaired executive functioning was defined as scoring at the 10th percentile or less on either COWA or TMT part B, using age- and education-corrected MOANS norms.

Results: As expected, those with impaired executive functioning performed worse on RBANS list learning, $t = -1.76$ 1-tailed $p < .05$, and list recall, $t = -3.72$, 1-tailed $p < .001$, but were not different from controls on story learning or recall (all $p > .5$). Those with impaired executive functioning were also worse in list recognition, $t = -2.04$, 1-tailed $p < .05$.

Conclusions: Results are generally consistent with prior studies in clinical populations, and suggest that interpretation of memory performance must take into consideration the presence/absence of comorbid executive functioning impairment.

Correspondence: *Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

J. TAN, D.F. HULTSCH, M.A. HUNTER & E. STRAUSS. Cognitive Functioning and Independent Behaviors in Older Adults.

Objective: The current study examined the relationship between cognitive functioning and the modified Scales of Independent Behavior-Revised (SIB-R), a measure of functional status.

Participants and Methods: Self-reports of functional status were completed by 258 community-dwelling older adults, ranging in age from 64 to 90. Informants' ratings (e.g. spouse, adult child, friend) of participants' functioning were also obtained. Participants also completed specific measures of speed of processing, executive functioning, episodic memory, and verbal ability.

Results: Regardless of mode of report (self, informant), total SIB-R scores correlated with all cognitive variables. As expected, functional independence was associated with high cognitive functioning. For informant ratings, the SIB-R subscales correlated with all cognitive variables except verbal ability. For self reports, the pattern of association between subscales and cognitive variables was less consistent. Hierarchical regression analyses also revealed results that were dependent on the mode of report (self, informant). Measures of global cognitive status, speed of processing, episodic memory, and verbal ability were significant predictors of total SIB-R scores on informant ratings, after adjusting for demographic and health variables. Global cognitive status, however, was not predictive of informant ratings after accounting for variance associated with the specific cognitive variables. On the other hand, only measures of speed of processing and episodic memory were predictive of total SIB-R scores on self ratings, after adjusting for demographic and health variables.

Conclusions: These findings suggest that cognitive functioning affects functional status, but the specific relationship is dependent on the mode of report (self, informant).

Correspondence: *Jing Ee Tan, BSc, Department of Psychology, University of Victoria, PO Box 3050 STN CSC, Victoria, BC BC, Canada. E-mail: jtan@uwic.ca*

B. UTTL & A.L. SIEGENTHALER. Factors Influencing Size of Age-Related Declines in Prospective Memory.

Objective: We rely upon prospective memory proper (ProMP) to bring back to awareness previously-formed plans and intentions at the right place and time, for example, a plan to buy groceries as we drive by a supermarket. ProMP is distinguished from other subdomains of prospective memory (ProM) such as vigilance and habitual ProM. We conducted a meta-analysis of thirty years of research to determine the size of age-related differences in ProM and the factors that modulate the size of such age-effects.

Participants and Methods: We conducted a systematic quantitative review of thirty years of research on age-effects in ProM using graphical and modeling methods as well as more traditional meta-analytic methods.

Results: Our key findings reveal substantial age declines in ProM, but the size of age declines depends on ProM subdomain. Specifically, age declines in ProM Proper are larger than age declines in vigilance. Surprisingly, the review also revealed a number of severe methodological problems with previous research on ProM including poor reliability, poor validity, prevalent ceiling effects, and frequent age confounds in study designs that invalidate findings of many previous studies.

Conclusions: Our findings demonstrate conclusively that there are substantial age-related declines in ProM and that magnitude of such declines depends on ProM subdomain.

Correspondence: *Bob Uttl, Private, 33 Scenic Glen Mews, Calgary, AB T1L3L1, Canada. E-mail: uttlbob@gmail.com*

S. ZINN, Y. GOLIGHTLY, K. MCCULLOUGH & M. DOUGLAS. Relationship Between Executive Functioning and Balance and Mobility in Cerebrovascular Disease.

Objective: Functional loss has been related to executive function decrements in older community-dwelling adults. We hypothesized that reduced speed and attention from cerebrovascular disease create information processing limitations that would impair balance and mobility in complex environmental conditions.

Participants and Methods: We evaluated this hypothesis using a recently developed instrument that assesses the impact of cognitive resources on mobility using a dual task paradigm (the Walking and Remembering Test; WART). The WART uses Digit span as its cognitive task performed concurrently with brisk walking on a narrow path. Primary care patients with likely cerebrovascular disease (diagnosis of two or more stroke risk factors) completed the WART, the Berg Balance Scale, the Symbol Digit Modalities Test (SDMT), and a Stroop task (Color Word Test; CWT) from the DKEFs battery. Pearson correlations were conducted on the 22 subjects assessed to date.

Results: Balance was associated with the SDMT ($r=0.54$, $p<0.01$) and completion times for each CWT trial ($r's=-0.41$ to -0.59 , $p<0.05$). Walking speed during the dual task condition of the WART was associated with SDMT ($r=-0.42$, $p=0.05$) and CWT trials for color naming, reading, and switching ($r's=0.55$ to 0.69 , $p<0.01$). Longest digit span attained was associated with balance ($r=0.54$, $p<0.01$), dual task walking speed ($r=0.48$, $p>0.05$) and self-report of instrumental functioning ($r=-0.70$, $p<0.001$).

Conclusions: We conclude that reduced processing speed and, to some extent, cognitive flexibility, are related to balance and mobility in cerebrovascular disease patients. Specific relationships and modifier variables will be examined once enrollment is complete.

Correspondence: *Sandra Zinn, Research & Development (151), Durham VA Medical Center, 508 Fulton St, Durham, NC 27705-3875. E-mail: sandra.zinn@duke.edu*

M. ROSSELLI & Y. ZOLLER. The effects of education on different types of verbal fluency tasks among Hispanic elders.

Objective: It has been well documented that education and level of literacy influence the individual's performance on verbal fluency tasks.

However, the association of education attainments and scores on category test of different ecological relevance is still unclear. This study aims (1) to analyze the effect of level of education on different types of category fluency tasks (i.e. animals, fruits, vegetables and clothing) and (2) to explore the semantic strategies (clustering and switching, number and size of semantic subcategories) used by the individuals with different educational levels to successfully perform the fluency tasks.

Participants and Methods: The study compared the performance on four category fluency tests on 100 normal elder Hispanic individuals (age 57 to 98; 28 males and 72 females), divided into three groups based on educational level (<6 years, 6-11 and >11 years of education). The groups did not differ in age.

Results: A stepwise regression analysis was performed to examine the effects of education on each category fluency task and on the different semantic strategies. Results indicated that education is a strong predictor of performance in verbal fluency for the categories animals and clothing with increasing educational attainment being associated with higher category fluency scores and with more and larger cluster sizes. Education was not associated with number of switches or number of categories.

Conclusions: The education effect may or may not be observed depending on the semantic condition. Results suggest that the categories vegetables and fruits are more ecologically valid tests across different educational groups. The present study also suggests that there are no substantial differences in the educational groups in terms of semantic processing as measure by the category fluency tests.

Correspondence: *Yaron J. Zoller, MA Psychology, Florida Atlantic University, Department of Psychology, 2912 College Avenue, Davie, FL 33182. E-mail: yzoller@fau.edu*

Agnosia/Disordered Representations

K.H. DEMERTZIS & J.N. BROWNDYKE. Neuropsychological and Neuroanatomical Correlates of Topographical Disorientation Following Right PCA Infarct.

Objective: Topographical orientation refers to navigation skills in one's environment and is reliant upon visual perception and memory processes. Damage to posterior medial temporal lobe and supplementary visual regions has been associated with impairment in topographical orientation, and while conceptually useful, taxonomies of topographic disorientation tend to result in an artificially parsimonious view of the highly complex cognitive processes involved in the impairment. The goal of the study was to provide further clarity on the cognitive networks involved in landmark agnosia, a subtype of topographical disorientation typically associated with right PCA infarctions. Detailed neuropsychological and imaging methods were used in a single case design.

Participants and Methods: We examined the neurocognitive and behavioral performance of a 46-year-old female who was status-post right PCA infarct and presented with landmark agnosia. Deficits in function were examined using detailed neuropsychological assessment. These findings were then related to regional volumetric MRI findings.

Results: Data suggested that the patient relied upon verbal cues (e.g., street signs, building numbers) rather than salient, environmental features (e.g., buildings, common landmarks) for orientation and navigation in novel and previously familiar environments. Comprehensive neuropsychological evaluation and imaging data indicated specific processing deficits in aspects of form vision and visual memory which corresponded to lesion volumes in the right ventromedial occipitotemporal and retrosplenial regions.

Conclusions: Consideration of cognitive and imaging profiles may assist in discriminating between the contribution of perceptual and memory components of landmark agnosia.

Correspondence: *Kristen H. Demertzis, MA, Psychology, UCLA, 2616 Erwin Road, Apt. 2312, Durham, NC 27705. E-mail: kdemertz@ucla.edu*

M.A. WIEGAND, M.A. DIXON & B.M. WAGAR. Prosopagnosia Reflects a Lack of Caricature: The Differential Effects of Training on Object Recognition.

Objective: A debate exists concerning whether faces draw upon a neural architecture devoted solely to faces or whether other complex objects could potentially be processed by this same system, and that faces differ only in their higher degree of similarity. Support for an exclusive face system comes from the finding that persons with prosopagnosia cannot identify faces, but can learn to identify greebles (novel stimuli classified by their different features), a classification process similar to faces. We question the generalizability of this finding by presenting evidence of a subtle deficit in greeble identification in a prosopagnosic.

Participants and Methods: Patient MA, a developmental prosopagnosic (age = 22 years), and 9 healthy, undergraduates completed five individual training sessions on consecutive days. In each session, blocks of 16 greeble-name pairs were presented, followed by cued recognition testing (i.e., presentation of a greeble with yes/no recognition of a name).

Results: MA showed normal learning during training. However, she was significantly better than controls in discriminating the trained greebles from mirror image versions that were mildly distorted. Specifically, controls had difficulty detecting small over-exaggerations of greeble features.

Conclusions: Although all participants learned to identify greebles at similar rates, controls formed "caricatures" of diagnostic features, making discrimination of exaggerated greebles difficult. This strategy aids in efficient differentiation of similar features by storing representations as more dissimilar than the actual images, which may be used in the efficient identification of faces. MA stored more accurate representations, allowing her to detect slight changes in features. Her inability to form caricatures may reduce her ability to discriminate faces within and across people.

Correspondence: *Melanie A. Wiegand, BA, Psychology, York University, 4700 Keele Street, Toronto, ON M3J1P3, Canada. E-mail: mwiegand@yorku.ca*

J.L. WISNOWSKI, S. MEHTA, S.W. ANDERSON, D. RUDRAUF, J. BRUSS, T.J. GRABOWSKI, D. TRANEL & H. DAMASIO. What is the Relation between the Extent of Damage within Temporal-occipital Cortex and the Severity of Visual Recognition Impairments?

Objective: Most research on patients with focal brain lesions has served to identify the neural substrates of cognitive functions, while little research has examined the relation between the amount of damage to various neural systems and the severity of the observed behavioural outcome (i.e., the extent to which damage to particular structures predicts the severity of a patient's deficit.).

Participants and Methods: We examined the relation between damage to 20 regions within right and left temporal-occipital cortices and the severity of visual recognition impairments for faces, animals, fruits/vegetables and tools, while controlling for non-lesion factors (e.g., age of onset, age at exam, years of education, sex, visual perception) in 137 patients with unilateral lesions.

Results: The total model, which included the non-lesion factors and the extent of damage incurred within all 20 ROIs, accounted for 34% of the variance in face recognition, 48% in animals, 43% in fruits and 47% in tools. In each case, damage to the regions of interest added significantly to the model containing non-lesion factors alone. (R-squared change = 0.266 [faces], 0.354 [animals], 0.380 [fruits], and 0.393 [tools]). Additionally, for animal and tool impairments, interactions between the non-lesion variables and lesion variables added significantly to the model with non-lesion and lesion variables considered alone.

Conclusions: Overall, the present results suggest that severity may be predicted from a combination of lesion and non-lesion variables. Ongoing research is directed at determining the best models for predicting the severity of deficits in the recognition of faces, animals, fruits, and tools.

Correspondence: *Jessica L. Wisnowski, B.A., Neurology, Psychology, Univ of Iowa, 200 Hawkins Drive, Iowa City, IA 52242. E-mail: jessica-wisnowski@uiowa.edu*

Apraxia/Motor Sequencing

B. HANNA-PLADDY, H. LIU, E. DOUGLASS & W. LIU. Three Dimensional Kinematics of Tool Action: Comparison of Pantomime and Manipulation.

Objective: To determine if the retrieval of the spatiotemporal features of learned skilled movement representations is facilitated by the manipulation of the tool.

Participants and Methods: Twenty healthy participants between the ages of 50 and 76 completed tasks of skilled movement. A six degrees of freedom measuring device (Mini-bird electromagnetic sensory system) was utilized to measure multi-joint movement trajectories of the forelimb during a tool-use pantomime task and actual tool manipulation. Two sensors were attached to the centers of the elbow, and wrist joints of arm/hand. Each sensor generated signals of three dimensional coordinates of its center point and the orientation of a local coordinate system affixed to the sensor in a reference coordinate system on a common receiver.

Results: Significant kinematic differences were found between the pantomime condition and actual tool manipulation. The velocity of the movement trajectory was greater for the wrist and elbow during pantomime. The angular elevations were larger in the tool manipulation condition relative to pantomime for the following angles: i) upper arm in the vertical plane, ii) forearm in the vertical plane, and iii) forearm in the horizontal plane relative to the anterior direction. There was no significant effect of age on performance.

Conclusions: The presence of visual and tactile cues during tool manipulation facilitate the retrieval of spatiotemporal features of movement representations. The results support the premise that learned skilled movement representations are accessed differentially depending on whether elicited via linguistic or visual-tactile routes.

Correspondence: *Brenda Hanna-Pladdy, PhD, Landon Center on Aging, Neurology, University of Kansas Medical Center, 3901 Rainbow Blvd, MS1005, Kansas City, KS 66160. E-mail: pladdybh@kumc.edu*

A.M. RAYMER, K.A. LONGHINI, K.R. PEGRAM, S. NADEAU, K. HEILMAN & L.J. GONZALEZ ROTH. Gesture Recognition and Production in Patients with Left Hemisphere Stroke.

Objective: Models of gesture processing distinguish praxis conceptual and movement knowledge represented within left hemisphere cortex. Most studies have examined this distinction within gesture production, with less known about gesture recognition. We examined this distinction for gesture production and recognition in patients with left hemisphere stroke.

Participants and Methods: The 24 participants with left hemisphere stroke completed five tasks incorporating transitive tool use gestures, intransitive symbolic gestures, and meaningless gestures: gesture movement yes/no verification (n=50; Is this exactly how to use a toothbrush?), gesture concept yes/no verification (n=60; Is this brushing teeth?), gesture to command (n=30; Show me how to...), gesture to viewed tool (n=20), and gesture imitation (n=50). We calculated percent accuracy in each task. Interjudge reliability on gesture coding was at 98.7%.

Results: Performance was significantly poorer in the gesture production tasks than in gesture recognition, and poorer in gesture to viewed tools than all other production and verification subtests. No difference was evident between the gesture verification subtests. Significant correlations were evident among gesture production tests and gesture recognition tests. Concept verification correlated with gesture production tests, while movement verification did not. When grouped by lesion site, those with pre+post-rolandic lesions were significantly more impaired in gesture production and concept verification tasks than other groups. When grouped by presence or absence of limb apraxia, there was no difference on the gesture verification subtests.

Conclusions: Whereas gesture production is susceptible to left hemisphere damage, extensive portions of the distributed neural architecture for praxis processing must be disturbed before gesture recognition is disrupted.

Correspondence: *Anastasia M. Raymer, Ph.D., Dept of ESSE, Old Dominion University, 110 Child Study Center, 45th & Hampton, Norfolk, VA 23529-0136. E-mail: sraymer@odu.edu*

E.A. ROY. Tool and Action Recognition and Gesture Production in Left Hemisphere Stroke.

Objective: Apraxia is a disorder in performing hand gestures that is often seen in stroke, most frequently to the left hemisphere. One question of much interest has been what is the relationship between disorders of conceptual and/or motor processes. The purpose of this study was to investigate the relationship between tool and action recognition and gesture production in left hemisphere stroke.

Participants and Methods: Forty-eight right-handed, left hemisphere stroke patients and 30 age-matched controls completed a praxis assessment battery. Participants' performance was assessed on five conceptual tests: tool identification, tool identification by function, action identification, action identification by function, and gesture matching, and on a gesture pantomime test involving performing 8 tool-related gestures to verbal command.

Results: Analyses of performance revealed significantly lower accuracy for the patients on the pantomime and action recognition tests, but not on the tool identification or the gesture matching tests. Correlation analyses revealed a significant relationship between performance on the pantomime and action recognition tests.

Conclusions: These findings support other work showing some relationship between conceptual and production processes in apraxia. As others have found, this relationship appears to be stronger for action recognition than tool recognition. The implications of these findings for understanding apraxia will be discussed.

Correspondence: *Eric A. Roy, PhD, Kinesiology, University of Waterloo, 200 University Ave, Waterloo, ON N2L 3G1, Canada. E-mail: eroy@healthy.uwaterloo.ca*

V. STAMENOVA, S.E. BLACK, C. MAMOLO, G. DESMARAIS, M. DIXON, N. PARK, D. HEBERT, J. DANCKERT, S. ADAMS, Q. ALMEIDA & E.A. ROY. Tactile and Visual cues facilitate performance of transitive gestures in patients with Corticobasal Degeneration.

Objective: Limb apraxia is a higher order motor disorder assessable through the production of tool use gestures. Some investigators have examined the effects of different modalities such as vision or touch on gesture performance and have found selective modality impairments suggesting different routes to action. Others have found that a combination of vision and touch, such as holding the tool, facilitates performance relative to that when only vision or touch alone are available. While apraxia is one of the commonest cortical signs of Corticobasal Degeneration (CBD), no studies have directly compared performance under distinct modalities, such as vision or touch, in this disorder.

Participants and Methods: We compared performance of 8 transitive gestures in three modalities: to verbal command (no contextual cues), to the picture of the tool (visual cues), or while holding the tool (both tactile and visual cues, often referred to as the object use condition) in 12 patients meeting clinical criteria for CBD and 25 age-matched controls participants.

Results: A 3 (task) x 2 (group) repeated measures ANOVA showed main effects of group and task, with performance while holding the tool being significantly better than either verbal command or tool picture, with a trend for worst performance with pictures. There was also a significant interaction between task and group showing larger advantage for object use for the CBD patients.

Conclusions: While remaining impaired in comparison to controls, CBD patients improved when holding the actual tool, supporting the finding from studies of stroke that the more sensory information available the better the performance. Visual cues alone, however, did not aid performance. The poor performance on picture versus verbal command suggests distinct routes of action for these two modalities.

Correspondence: *Vessela Stamenova, PhD (C), University of Toronto, 43 Baybrook Cres., Toronto, ON M1H2R7, Canada. E-mail: viussi@gmail.com*

Behavioral Neurology

V. DRAGO, G.R. FINNEY, P. FOSTER, M. AMENGUAL, J. YEONG, T. MIZUNO, G. CRUCIAN & K.M. HEILMAN. Spatial-Attention and Emotional Evocation: Line Bisection's Performance and Visual Art's Emotional Evocation.

Objective: Line bisection studies (LB) of brain injured subjects have revealed that the right posterior temporal- parietal region (PBR) is important for mediating attention. Although milder, even normal people vary in their ability to allocate spatial attention as assessed by LB. The PBR is also involved in emotional experiences and people enjoy paintings because art can evoke emotional experiences. Thus, people who can better allocate attention, as measured by the LB, might also be more influenced by the paintings' emotional messages (evocative impact).

Participants and Methods: Seventeen healthy, right-handed participants were asked to judge ten paintings on evocative impact, aesthetics, novelty, technique, and closure by marking responses on 10cm lines from 1 (low degree) to 10 (high degree). The participants also attempted to bisect one unlabeled 10cm line. Their performance on the LB was used to create two groups, individuals who were more (MA) and less accurate (LA).

Results: A one-way between groups ANOVA indicated significant differences in accuracy on the LB between the MA and LA groups. One-way between group ANOVAs using quality ratings as the dependent measure, revealed the MA group scored the Evocative Impact significantly greater than did the LA group.

Conclusions: The difference in the performance on the LB task that differentiated our two groups might not only assess these participants' attentional abilities, that could influence evocative impact, but also LB performance might also be a 'barometer' of other functions mediated by the normal PBR, including emotional processing, understanding 'visual metaphor' and making visuo-spatial computations.

Correspondence: *Valeria Drago, MD, Neurology, University of Florida, 100 S. Newell Drive, Room L3-100, Gainesville, FL 32610. E-mail: valeria.drago@neurology.ufl.edu*

V. DRAGO, P.S. FOSTER, F. SKIDMORE, D.B. FITZGERALD, B.M. KLUGER, D. ANTONIELLO & K.M. HEILMAN. Pseudoneglect in Parkinson's Disease.

Objective: The line bisection task evaluates spatial attentional biases. Subjects' age significantly influence line bisection performance such that older subjects err rightward, and younger subjects err leftward (pseudoneglect). Parkinson's patients have been reported having visuo-spatial problems although the nature of these remains controversial. We compared line bisection performances of PD patients with age matched controls.

Participants and Methods: 16 right handed PD patients and 7 right handed controls were asked to bisect 154 lines of different lengths having at each end either a right side cues or a left side cues or bilateral cues or no cues.

Results: To learn if the performance of the PD subjects was abnormal based on the controls' performance, we computed 95% confidence interval. Of the 16 PD patients, 5 exhibited in the uncued condition an abnormal leftward bias.

Conclusions: The mechanisms underlying this leftward bias is not known and further investigations are underway.

Correspondence: *Valeria Drago, MD, Neurology, University of Florida, 100 S. Newell Drive, Room L3-100, Gainesville, FL 32610. E-mail: valeria.drago@neurology.ufl.edu*

B. KLUGER & K.M. HEILMAN. Dysfunctional Generation and Interpretation of Emotional Faces in a Patient with Corticobasal Degeneration.

Objective: Corticobasal degeneration is a neurodegenerative syndrome that typically presents with a unique constellation of symptoms, including asymmetric apraxia, rigidity, dystonia, cortical sensory abnormalities and cognitive deficits. While orofacial apraxia and speech apraxia have been previously reported to be associated with this syndrome, there have been no reports specifically examining facial expressions.

Participants and Methods: A 68-year-old woman with corticobasal degeneration and reported treatment-resistant depression was examined for her ability to generate and interpret emotional facial expressions.

Results: This patient had an orofacial apraxia including a severely impaired ability to voluntarily generate emotional facial expressions despite preserved speech and emotional prosody. She also had a severely impaired ability to interpret facial expressions. She had no vegetative symptoms of depression, dysphoria or apathy.

Conclusions: While corticobasal degeneration is frequently associated with disturbances of mood, it is also important to assess for primary disturbances of emotional expression and interpretation which can mimic depression or apathy. As patients with corticobasal degeneration are known to manifest both orofacial apraxia and visuospatial dysfunction this patient's expressive and receptive deficits may be independent manifestations of the same underlying disease process. Alternatively, these functions may share a common neuroanatomic substrate.

Correspondence: *Benzi Kluger, MD, Neurology, University of Florida, 1411 NW 31st DR, Gainesville, FL 32605. E-mail: benzi.kluger@neurology.ufl.edu*

M.C. WILDE. Inter-hemispheric Differences in Motor Impersistence Performance in Acute Stroke.

Objective: The present study was undertaken to reevaluate the relationship between motor impersistence and lesion side in a sample of acute stroke patients who were characterized using modern neuroimaging technology.

Participants and Methods: Fifty-eight ischemic and hemorrhagic stroke patients served as subjects for this study. None of the patients had a pre-existing neurologic, psychiatric or substance abuse disorder. The average age, education, National Institutes of Health Stroke Scale (NIHSS) score and time post injury were 56.39 (sd = 14.92), 13.06 (sd = 2.45), 7.32 (SD = 4.58), and 9.20 (sd = 4.05) respectively. There were 23 and 35 patients with left and right hemisphere lesions as determined by CT and/or MRI. Group differences were evaluated using t tests for independent samples or Chi Square tests.

Results: The groups were comparable in terms of their NIHSS score (p = .25), age (p = .96), years of education (p = .42), Mini Mental Status Examination (MMSE) score (p = .18) and time post onset (p = .15). The groups were also comparable in terms of gender (p = .21) and ethnicity (p = .64). A comparison of the two groups on the number of Motor Impersistence Test items failed disclosed that patients with right hemisphere lesions failed a significantly greater number of items (p = .007) (d = .66). While there were similar proportions of patients with no or moderate motor impersistence in the left and right hemisphere groups, marked motor impersistence only occurred in right hemisphere patients.

Conclusions: Stroke patients with right hemisphere lesions are more likely to have motor impersistence than those with left hemisphere lesions.

Correspondence: *Mark C. Wilde, Psy.D., Physical Medicine and Rehabilitation, UT Medical School Houston, 6411 Fannin 4 East Jones Pavilion, Houston, TX 77030. E-mail: mark.c.wilde@uth.tmc.edu*

Cognitive Neuroscience

K.E. BECERRIL, E. AGUILAR, M. ITURBE, M. VEGA, P. ROJAS, S. GOMEZ-LLATA, P. SALGADO, E. PASAYE & A. SOSA. Cortical Reorganization of Language Areas in Patients with Brain Tumors: fMRI and Neuropsychological Evidence.

Objective: It has been proposed that slow growing tumors induce functional changes in cortical organization by recruiting peri-tumoral and contralateral brain areas. However to our knowledge changes in language organization have not been systematically studied in parallel to changes in neuropsychological functioning. Our aim is to describe the nature of possible changes in cognitive functioning and in the cortical organization of language in patients with slow growing tumors adjacent to language areas using neuropsychological testing and fMRI before and after neuro-surgery.

Participants and Methods: Clinical cases design. 6 neurosurgical patients with diagnosis of cerebral neoplasm near language areas (3 meningiomas, 3 gliomas, age range 25-55 (43.7 mean), 2 women, all right handed, years of school range 9-15) were evaluated pre (one week before) and post- surgery (at least 3 months later) using a screening test of the cognitive functioning and domain specific tests as well as language related fMRI tasks. The cognitive profile and detected activations in the pre and post-surgical conditions were compared.

Results: None of the patients had language deficits before surgery, but all showed aphasia signs in the days following surgery. However, in all cases these improved at reevaluation at least three months later. The fMRI studies show contralateral activations in the presurgical condition and the activation of perilesional areas after surgery as well.

Conclusions: We found changes in the cortical organization of language both before and after surgery. Contra-lateral compensation seems to be a long term plasticity mechanism that instaurates when the tumor alters the correct functioning of language areas. After surgery areas in the dominant hemisphere seem to recover its function. A better understanding of the nature of brain functional changes can help in the planning and improvement of rehabilitation.

Correspondence: *Karla E. Becerril, Bsc., Unidad de Cognición y Conducta, Instituto Nacional de Neurología y Neurocirugía "Manuel Velasco Suárez", Insurgentes Sur 3877 Col La Fama, México, DF 14269, Mexico. E-mail: k_becerril@yahoo.com.mx*

J. BERGERON, E. POURCHER & H. COHEN. The Influence of Cerebrovascular Risk Factors on Non-motor Procedural Learning in Parkinson's Disease Patients.

Objective: Procedural learning has been the object of a number of studies in Parkinson's disease (PD) patients. However, PD patients can also present symptoms or risk factors for a number of other diseases, among them cerebrovascular disease. The objective of the present study is to assess the differences between PD patients and PD patients with cerebrovascular risk factors.

Participants and Methods: Parkinson's disease patients (n= 14) with cerebrovascular disease risk factors (PD-C) and PD patients without vascular disease risk factors (n= 15) were compared on a non-motor procedural task involving semantically-related inverted word pairs (mirror reading), and 12 months later (Time 2) to determine evolution of performance.

Results: ANOVAs were carried out on reading times in order to determine if there were any differences between PD patients and PD-C patients. PD-C patients' results were found to be worse than those of PD

patients in all aspects of performance (acquisition of procedural skill, semantic processing, task repetition). Results on post-tests a year later showed that the differences in performance initially observed have remained stable across time. Both groups of patients showed neither an improvement nor a decrease in performance a year later. The results obtained on the different components of the test at Time 2 are equivalent to those observed at time 1.

Conclusions: There are differences between both groups for all procedural learning tasks, with poorer performance from PD-C patients. Since PD-C patients can be considered in the brain-at-risk end of the vascular-related cognitive impairment continuum, it is likely that PD-C patients present with greater basal ganglia and prefrontal cortex cognitive processing impairment than patients without vascular risk factors in the acquisition, maintenance or consolidation of new skill or routines.

Correspondence: *Jacynthe Bergeron, Université du Québec à Montréal, 1520 Saint-Jacques, Saint-Bruno-de-Montarville, QC J3V 6K6, Canada. E-mail: bergeron.jacynthe@courrier.uqam.ca*

R.M. BOWLER, J.B. MORTON & R. HEVERLY. Memory Enhancement Rehabilitative Training of Manganese Exposed Welders: Pre and Post-Test Results*.

Objective: Welding fumes contain manganese (Mn) which is bio-available to and neurotoxic for the central nervous system, resulting in a syndrome similar to Parkinson's disease, described as parkinsonism or manganism. Health problems in the literature on Mn are neurological (tremor, bradykinesia, postural instability) and neuropsychological (disturbances in attention, concentration, memory, motor and mood, with increased irritability, sexual dysfunction and sleep problems).

Participants and Methods: Five welders (mean age 46.6+ 5.94, years of education 12.8+ 1.92) were tested as part of a larger study of 49 welders working in confined spaces without protection and adequate ventilation on the San Francisco/Oakland Bay Bridge. All were overexposed to Mn; biomarkers of blood Mn and Mn in air were elevated. The 5 welders participated in a 10-week, 40 session memory enhancement computer training program designed to improve concentration, memory, and the brain's ability to process auditory speech and visual stimuli. The RBANS (Forms A & B) and mood tests were given prior and post to the memory enhancement program.

Results: Results of baseline testing indicate impaired verbal learning, visuospatial/constructional abilities, executive function, immediate memory and digit coding. Post training test scores indicate significant improvement in all but immediate memory and digit coding scores, which showed a trend for improvement (p<.10). Welders had elevations on depression and anxiety on the SCL90-R and the Profile of Mood States (POMS) prior to the treatment but no change after treatment was found.

Conclusions: This program may be a useful rehabilitative treatment for welders impaired from overexposure to Mn.

Correspondence: *Rosemarie M. Bowler, Ph.D., Psychology, San Francisco State University, S371 Kent Drive, El Cerrito, CA 94530. E-mail: rbowl@sfsu.edu*

J.N. BROWNDYKE, S. DASELAAR, R. CABEZA, K. HAYDEN, K.A. WELSH-BOHMER, J.R. BURKE & D.E. SCHMECHEL. Functional Neuroanatomical Correlates of Subsequent Memory for Object Concept and Response Certainty in the Elderly.

Objective: Event-related fMRI was employed to elucidate patterns of neural activity associated with object encoding predictive of subsequent conceptual recognition (i.e., memory for objects divorced from perceptual priming cues) and response certainty in the elderly.

Participants and Methods: Fourteen healthy elderly subjects, screened for cognitive impairment, were enrolled in the study. Imaging data were collected during three runs of an object encoding task with a levels-of-processing manipulation (i.e., living/non-living decisions), after which subjects were administered a subsequent recognition memory and item

confidence task for the in-scanner stimuli. Memory for object concept was isolated by removing perceptual priming cues during subsequent recognition. BOLD signal associated with encoding of object concepts that were subsequently remembered and forgotten were modeled with a canonical HRF within a general linear model (GLM). A first-order, parametric regressor was added to the model to identify regions associated with conceptual recognition that correlated positively with response confidence. Fixed-effect contrast for successful conceptual encoding (hits > misses) and the effect of the confidence modulator were conducted and compared at the group-level.

Results: Analyses revealed suprathreshold activity for successful concept memory relative to forgetting in the left MTL and middle frontal gyrus (MFG) and right inferior parietal lobule (IPL) and MFG, indicating that conceptual recognition, independent of perceptual priming cues, may be reliant upon verbal encoding of object features.

Conclusions: Confidence for successful encoding responses modulated activity in the left anterior MTL, suggesting that the addition of confidence ratings may be a useful proxy of recollective strength and helpful in the assessment of geriatric patient populations.

Correspondence: *Jeffrey N. Browndyke, Ph.D., Department of Psychiatry, Duke University Medical Center, 2200 West Main Street, Suite A-230, Durham, NC 27705. E-mail: j.browndyke@duke.edu*

C.A. CHAMBERS, R.O. HOPKINS & L.K. WEAVER. Cognitive and Affective Outcomes in Patients with Intentional and Accidental Acute Carbon Monoxide Poisoning.

Objective: Carbon monoxide (CO) poisoning is common and results in cognitive and affective sequelae. Studies comparing outcomes in patients with intentional and accidental CO-poisoning are lacking.

Participants and Methods: We prospectively assessed cognitive and affective outcomes in patients with intentional compared to accidental CO-poisoning at 6-weeks, 6 and 12-months. 152 patients from our randomized trial and 102 non-randomized trial patients were followed similarly (N=256).

Results: Fifty-five patients had intentional (mean age 34 ± 10 years) and 201 had accidental CO-poisoning (mean age 36 ± 15 years). There were more males with intentional CO-poisoning (82% vs. 60%; $P=0.003$). The initial COHb level was higher in patients with intentional compared to accidental CO-poisoning ($27 \pm 11\%$ vs. $20 \pm 11\%$; $P < 0.001$). Cognitive sequelae occurred in 25% vs. 39% at 6-weeks, 35% vs. 34% at 6-months, and 29% vs. 31% at 12-months. Depression occurred in 32% vs. 13% at 6-weeks, 27% vs. 10% at 6-months, and 24% vs. 6% at 12-months. Anxiety occurred in 21% vs. 15% at 6-weeks, 21% vs. 12% at 6-months, and 9% vs. 8% at 12-months in patients with intentional compared to accidental CO-poisoning, respectively. There was no difference in cognitive sequelae ($P=0.74$) or anxiety ($P=0.28$) for patients with intentional vs. accidental CO-poisoning at 6 weeks, 6 and 12 months. Patients with intentional CO-poisoning were more likely to have depression at 6 weeks, 6 and 12 months (all $P < 0.006$).

Conclusions: Patients with intentional CO-poisoning had a higher rate of depression but not cognitive sequelae or anxiety than accidental CO-poisoned patients.

Correspondence: *Chelsea A. Chambers, Masters, Psychology, Brigham Young University, 1294 N. Lakeview Dr., Provo, UT 84604. E-mail: chambers.chelsea@gmail.com*

K. GOODALL & L. ELIAS. Asymmetry in Spatial Judgments: Bins vs Spatial Frequency in a Double Double Dissociation.

Objective: This study sought to determine whether asymmetry in spatial judgment was due to spatial frequency of the stimulus or size of the attended stimulus area. Left and right hemisphere advantages have been found for topological and metric spatial judgments respectively. This asymmetry has been attributed to either the size of the attended recep-

tive field (called the attentional bin) or to spatial frequency of the stimulus. A left hemisphere advantage has been reported for processing through small bins and a right hemisphere advantage for large. A left hemisphere advantage for high spatial frequencies and a right hemisphere advantage for low has also been reported.

Participants and Methods: Thirty right-handed participants (16 males, 14 females) performed topological and metric judgments presented in a visual half-field paradigm (100 ms presentation followed by a 100 ms mask). Bar/circle and dot stimuli varied by bin size and spatial frequency. A double double dissociation was developed to pit these asymmetrically distributed input conditions against each other using asymmetrically distributed tasks.

Results: No asymmetry in processing spatial frequency was found, but the anticipated right hemisphere advantage for the metric task was found for male participants only when processing through small attentional bins, $F(1, 11) = 5.107$, $MSE = .001$, $p = .043$.

Conclusions: These findings suggest the previously reported right hemisphere advantage for metric tasks is attributable to the small size of the attended area in which the stimulus is presented.

Correspondence: *Kathleen Goodall, Ph.D., E.Spellacy & Associates, 1005 Balmoral Rd, Victoria, SK V8T 1A7, Canada. E-mail: kmg126@mail.usask.ca*

R.M. LALCHANDANI, F. MELISSA & S. VINOGRADOV. "Subtyping" Schizophrenia by Higher-Order Cognitive Functions.

Objective: Processing speed, verbal memory, and executive functioning, are the three key cognitive domains which predict long-term vocational and adaptive functioning in schizophrenia. "Subtyping" patients according to their level of performance in these domains therefore has more ecological validity and clinical value than subtyping patients by symptom profile.

Participants and Methods: Neurocognitive data from 83 clinically stable outpatients were analyzed using K-Means Cluster Analysis, with z-scores for the following measures entered as variables of interest: Trails B (total time); Stroop interference trial (total time); CVLT immediate recall (number of words); WCST (number of categories); and WAIS-III Vocabulary (premorbid IQ).

Results: Cluster analysis revealed three distinct groups. Z-scores for the first, and highest, cognitive functioning group ranged from $-.11$ to $-.60$ on tasks of processing speed, verbal memory, and executive functioning ($n = 51$). In the second, and lowest, cognitive functioning group, z-scores ranged from $-.88$ to -2.38 ($n = 23$). The third group had scores that were intermediate between the first and second groups ($n = 9$). No significant between-group differences on the Positive and Negative Symptom Scale-Extended were revealed. In contrast, the two groups with the highest and lowest cognitive functioning differed significantly on two of the four subscales of the Quality of Life Scale: Intrapsychic Foundations (e.g. sense of purpose, motivation) and Environmental Engagement (daily activities), as well as total QLS score.

Conclusions: We conclude that subtyping schizophrenia via these three key neurocognitive deficits is a more valid and useful method of classifying individuals than relying on symptom profiles (e.g., for cognitive remediation and other psychosocial interventions), given the relationship of the cognitive subtypes to quality of life.

Correspondence: *Rinku M. Lalchandani, MA, CLINICAL PSYCHOLOGY, ALLIANT INTERNATIONAL UNIVERSITY-SFBAY, 507 30TH Street, San Francisco, CA 94131. E-mail: rlalchandani@alliant.edu*

M. RIES, M. FITZGERALD & S. JOHNSON. Functions of the Posterior Cingulate Cortex: Interaction of Memory Retrieval and Self-Appraisal.

Objective: The posterior cingulate cortex (PCC) is a brain region that shows some of the earliest neuropathological changes associated with

Alzheimer's disease (AD). Prior fMRI research indicates PCC involvement in both memory retrieval and self-appraisal. The current fMRI study examined the PCC's response to memory retrieval (i.e., old versus new words) and self-appraisal (i.e., self-appraisal versus semantic-decision during the fMRI task) as well as the interaction between these cognitive tasks. We hypothesized that the PCC would be most active during presentation of old words in the self-appraisal condition.

Participants and Methods: 25 cognitively-healthy volunteers (mean age = 67.3 (4.5), mean education = 15.7 (3.1)) participated; none had a parental history of AD. The fMRI task allowed examination of memory retrieval (old versus new words), self-appraisal (self-appraisal versus semantic-decision), and the interaction between these factors.

Results: Analyses were restricted to a 5 mm radius sphere in the PCC. A 2 (memory type) x 2 (appraisal type) ANOVA revealed a highly-significant interaction ($p_{FWE} < .05$), with the PCC being most active during self-appraisal of old items. Adjacent medial parietal regions showed a main effect of appraisal type (self-appraisal > semantic-decision; $p_{FWE} > .05$). No PCC regions showed a main effect of memory type.

Conclusions: Results provide new information about cognitive functions in which the PCC is involved. Our ongoing follow-up of these data includes examination of preclinical AD-like changes in the PCC, stratifying participant groups based on parental AD history and APOE status.

Correspondence: *Michele Ries, University of Wisconsin - Madison, 2500 Overlook Terrace, GRECC 11G, Madison, WI 53705. E-mail: mlr@medicine.wisc.edu*

K. SUBRAMANIAM & M. JUNG-BEEMAN. Mood Effects on Insight Problem Solving.

Objective: To use fMRI to describe distinct insight and non-insight problem-solving processes and to test the effects of affect manipulations on these solving strategies. We will compare activation patterns between positive, neutral, and anxious mood inductions (MI) prior to stimulus onset, at stimulus onset, and at solution point. Because positive affect (PA) facilitates insight, and preparatory brain states influence solving strategy, PA is likely to influence preparatory activity to facilitate insights.

Participants and Methods: Initial findings were based on affect assessment in 79 subjects. Subjects saw 135 Compound Remote Associate problems, each of which can be solved with or without insight. Insights arise suddenly, with an "Aha!" They require cognitive restructuring - shifting attention from prepotent, incorrect associations to the non-prepotent correct solution. On each trial, subjects saw 3 words (tooth, potato, heart) and tried to find a solution word (sweet) forming a compound word with each of the 3 words. If solved, subjects indicated whether or not they had an insight. Behavioral results were correlated with neural activity across 27 subjects who were scanned while solving problems, with focus on Anterior Cingulate Cortex (ACC) involved in cognitive control.

Results: PA correlated with insights ($r(77) = .4, p < .001$), increasing preparatory ACC activation ($r(26) = .5, p < .01$), while anxiety inversely correlated with insights ($r(77) = -.34, p < .005$), decreasing preparatory ACC activation ($r(26) = -.44, p < .05$).

Conclusions: Preparatory activity in ACC and insights both positively correlated with PA. Thus, we predict that positive MIs will increase insights by enhancing ACC activation, while anxiety will inhibit insights by decreasing ACC activation, compared to neutral MIs. Understanding the component processes that facilitate insight has implications for psychotherapy. We can test whether "training" subjects to have more insights would enhance mood via cognitive restructuring to enhance ACC activation.

Correspondence: *Karuna Subramaniam, NUIN, 244 E Pearson, apt 411, Chicago, IL 60611. E-mail: k-subramaniam@northwestern.edu*

P.A. TAYLOR-COOKE, J.G. CHACKO, K.C. CHELETTE & M.S. MENNEMEIER. Repetitive Transcranial Magnetic Stimulation Alters Higher Cortical Visual Processing.

Objective: Troxler fading (TF), habituation to stationary stimuli in peripheral vision, is thought to reflect a resistance of parvocellular (PC) visual processing system because the magnocellular (MC) system habituates too rapidly. To learn how PC and MC processing influence TF, we examined performance effects on PC, MC and TF tasks after low frequency, repetitive Transcranial Magnetic Stimulation (rTMS; suggested to reduce excitability of underlying cortex) to cortical sites implicated in PC and MC processing. If the PC system influences TF, then rTMS that alters PC function should also alter TF.

Participants and Methods: Five healthy subjects aged 22 to 24 participated. Fade times (TF) were assessed for stationary targets at 8 points in peripheral vision before and after rTMS. PC and MC processing times were similarly assessed for texture and motion detection. rTMS was applied to 6 sites in the posterior temporal, posterior superior parietal and frontal convexity of both cerebral hemispheres using an MRI-guided, coil navigation system. Repeated measures were used to assess overall differences with specific contrasts to assess task performance across locations.

Results: Overall, an interaction was found between tasks and target location, $F(14, 56) = 10.01, p < .0001$. Left parietal rTMS led to prolonged image fading, $t(1) = 10.32, p < .05$, and faster Texture Detection, $t(1) = 6.99, p = .05$.

Conclusions: TF takes longer and texture and motion detection are faster on the horizontal than vertical meridian. Low frequency rTMS over the left, superior parietal cortex resulted in slower image fading and faster texture detection. As predicted, this suggests TF is influenced more by PC than MC processing.

Correspondence: *Patricia A. Taylor-Cooke, M.A., Department of Psychology, University of Alabama at Birmingham, 11500 Pleasant Ridge Rd, Apt 376, Little Rock, AR 72223. E-mail: patataylor@uab.edu*

S. TLUSTOS & P. CHIU. Neural Correlates of Comprehension of Distorted Speech.

Objective: Acoustic distortions introduced into speech signals can make comprehension more challenging particularly for individuals with less cognitive reserve. It is unclear what neurocognitive processes at peripheral or central levels are recruited in this process.

Participants and Methods: We explored in 14 healthy adults with normal hearing the neural substrate of comprehension of distorted speech characteristic of cochlear implants (i.e., noise vocoded speech) using an event-related fMRI protocol called HUSH with scanner-silent intervals to reduce scan time. Subjects rested or heard short sentences across trials and pressed one button when they understood all the words and another if they did not. The sentences were either presented clear and unprocessed, or digitally processed to simulate a cochlear implant generating signals with low (i.e., 1-channel) or high intelligibility (i.e., 7-channels).

Results: Preliminary analyses using the General Linear Model (GLM) revealed that relative to listening to unprocessed sentences, comprehension of vocoded speech that is relatively intelligible activated the inferior frontal gyrus (BA 44, 45, 47) primarily on the left and "deactivated" inferior parietal cortex bilaterally (BA 39,40), whereas comprehension of unintelligible vocoded speech activated the midline dorsal frontal gyrus (BA 8) and right inferior / middle frontal gyrus (BA 44, 46, 10) and "deactivated" superior temporal gyrus bilaterally (BA 22,21).

Conclusions: These results suggest that when there is enough acoustic information in the distorted speech signal, neurocognitive processes related to working memory are recruited to assist the default comprehension process, but this comes at a cost to the ability to engage in integrative or higher order linguistic/semantic processes.

Correspondence: Sarah Tlustos, Psychology, University of Cincinnati, 401A Dyer Hall, ML 0376, Cincinnati, OH 45221-0376. E-mail: sjtlustos@yahoo.com

HIV/AIDS

Y. BOGDANOVA, M. DIAZ SANTOS & A. CRONIN-GOLOMB. Relation of Alexithymia to Cognition in Asymptomatic Individuals with HIV.

Objective: Alexithymia is often associated with human immunodeficiency virus (HIV) and may reflect direct effects of the virus on the brain, especially on the anterior cingulate and dorsolateral prefrontal cortex, which are also important for multiple cognitive functions. The goal of this study was to examine the association between alexithymia and cognitive function as well as its relation to immune system status and quality of life.

Participants and Methods: Twenty-eight asymptomatic HIV+ participants and 28 matched HIV- volunteers were administered the 20-item version of the Toronto Alexithymia Scale, Beck Depression Inventory, and a series of neuropsychological tests.

Results: The HIV+ participants were significantly more alexithymic than the control group. Extent of alexithymia correlated with performance on measures of selective attention, working memory, and cognitive flexibility, and was specifically associated with perseverative and impulsive errors. Alexithymia ratings did not correlate with CD4 cell count or disease duration, but did correlate with quality of life ratings.

Conclusions: Increased alexithymia among asymptomatic HIV+ adults may reflect HIV-associated neurological dysfunction, specifically in anterior cingulate and dorsolateral prefrontal cortex.

Correspondence: Yelena Bogdanova, PhD, Boston University, 648 Beacon Street, 2nd Floor, Boston, MA 02215. E-mail: bogdanor@bu.edu

R. FAMA, J.R. SANDLER, A. O'REILLY, M.J. ROSENBLUM, S.A. SASSOON, A. PFEFFERBAUM & E.V. SULLIVAN. Attentional and Memory Deficits in HIV Infection Comorbid with Alcoholism.

Objective: The comorbidity of HIV infection and alcoholism (ALC) is highly prevalent and each condition independently affects selective cognitive and motor functions. Compromised attention and information processing speed in HIV and speed/accuracy trade-off and working memory in ALC characterize these deficits in the separate disorders, but the deficit pattern of HIV+ALC comorbidity is seldom considered.

Participants and Methods: We examined 167 individuals (40 HIV; 39 ALC; 48 HIV+ALC; 40 normal controls) on the Attention/Mental Control and Memory subtests of the MicroCog, a computerized battery that yields accuracy scores and time to initiate a response.

Results: Age-corrected Z-scores based on controls indicated that HIV+ALC scored significantly below HIV and controls on Digit Span Forward, Immediate and Delayed Memory, and Arithmetic, and below ALC and controls on Digit Span Backwards. The single diagnosis groups did not differ from the controls on any measure. Response time did not differ among groups. Group differences were not related to level of depression, CD4 count or viral level (HIV groups), or to lifetime alcohol consumption (ALC groups). Multiple regressions indicated that attention scores predicted immediate memory scores in ALC, whereas working memory scores predicted delayed memory scores in the ALC and HIV groups.

Conclusions: These findings demonstrate a compounded effect of HIV infection and alcoholism on attention, mental control, and working and delayed explicit memory, but not in response time. Thus, attentional and memory deficits, while not observed in either single diagnosis, did occur in HIV-alcoholism comorbidity and are suggestive of a liability carried by each condition made manifest when combined.

Correspondence: Rosemary Fama, PhD, Department of Neuroscience, SRI International, BN 185, 333 Ravenswood Avenue, Menlo Park, CA 94025. E-mail: rfama@synapse.sri.com

S. FULLER, L. HARRIS, C. KOZINETZ, J. FEHLIS, P. BROUWERS, S. FOSTER, A. LOEB, D. GLAZE, J. REUBEN, M. PAUL, E. COHEN, B. LEE, S. CRON, C. JACKSON, P. FRERKING, H. SCHWARZWALD, M. KLINE & W. SHEARER. Sleep Disturbances, Fatigue, and Cognition in Children with Perinatal HIV Infection.

Objective: To study if HIV+ children experience more sleep disturbances, associated with disease severity, compared to non-infected controls, and if HIV+ children with sleep disturbances experience increased fatigue that adversely impacts neurocognition.

Participants and Methods: Subjects (ages 8-17 years) included HIV+ children subdivided into 2 groups based on viral loads: > 400 (n = 7; High) and < 400 RNA copies/ml (n = 6; Low) and 15 controls. Wrist actigraphy and validated parent-report and child self-report questionnaires assessed sleep patterns and fatigue. All children completed an adapted neuropsychological battery. Spearman Rho and Kruskal-Wallis were calculated.

Results: HIV+ children slept more overall (p = .05), but no significant differences in prevalence of parent-reported sleep disturbances were found among the three groups. HIV+ children with higher viral loads reported significantly more fatigue (p < .03). HIV+ children who reported more fatigue showed higher levels of bedtime resistance (p < .01) and sleep anxiety (p < .03), per parent report. Fatigue among these HIV+ children was also associated with weaker performance on some measures of working memory (p < .04, CMS) and potentially with reduced concentration (p = .06, Children's PASAT).

Conclusions: The prevalence of sleep disturbances was not different in HIV+ children compared to controls. However, disease severity appears to be an important determinant of sleep patterns and fatigue in HIV+ children that have an effect on neurocognitive functioning. Other factors (e.g., medication side effects, cytokine levels, emotional stress, etc.) that may affect HIV+ children's sleep patterns, experience of fatigue, and neuropsychological functioning will be discussed.

Correspondence: Shannon Fuller, Ph.D., Learning Support Center, Texas Children's Hospital/Baylor College of Medicine, 2120 Kipling Street, #302, Houston, TX 77095. E-mail: smfuller@texaschildrenshospital.org

F. GOULD, J.L. WOODARD, L. RUBIN, L. DROGOS, K. WEBER, M. COHEN, E. MARTIN & P.M. MAKI. Procedural Memory Function in HIV + Women.

Objective: The present study aimed to characterize procedural memory function in HIV-1 infection among women. In order to examine the relationship between procedural memory and HIV status, performance on the Serial Reaction Time task (SRT) was examined. The relative contributions of motor speed, processing speed and inhibition hypothesized to support procedural memory were also assessed.

Participants and Methods: Participants were 37 HIV+ women and 16 seronegative control women, who did not differ significantly with respect to age, education, or depression. Women were tested on the SRT, as well as on a battery of standard neuropsychological measures and experimental measures of inhibition, motor speed and processing speed.

Results: Using multilevel modeling, SRT performance was compared for HIV+ and HIV- participants. As hypothesized, implicit sequence learning performance differentiated group membership; initial and overall reaction time on the SRT was diminished in HIV+ women. Rate of implicit learning was equivalent between the groups. Separate hierarchical regressions were used to test the hypothesis that inhibitory capacity would predict SRT performance after controlling for motor speed and perceptual speed. However, inhibitory capacity did not predict additional variance in SRT performance for either group.

Conclusions: Rate of procedural learning remained intact despite significantly slower reaction times in the HIV+ group. Intact rate of motor sequence learning with overall motor slowing may designate a valuable, yet overlooked aspect of the neurocognitive profile in HIV+ women. Further study is needed to determine whether this pattern of performance reflects specific basal ganglia dysfunction or more global impairment that produces slowed processing speed.

Correspondence: *Felicia Gould, MS, Rosalind Franklin U of Medicine and Science, 17104 Carrington Park Dr., #508, Tampa, FL 33647. E-mail: felicia.gould@gmail.com*

M.J. HALL & R.A. BORNSTEIN. The effect of anxiety and depression on neuropsychological performance for those with HIV/AIDS.

Objective: It has been well established that individuals with HIV and AIDS develop cognitive problems. It has also been well documented that individuals with HIV/AIDS are at increased risk for affective disorders. However, less attention has been paid to the relationship between affective problems and neuropsychological performance in these groups.

Participants and Methods: This study assessed the effects that anxiety and depression had on neuropsychological performance in individuals with HIV/AIDS.

Results: It was found that anxiety was significantly related to neuropsychological functioning in multiple domains when depression was controlled for statistically. Depression was used as a covariate because depression levels as measured by clinicians and by self-report were significantly related to levels of anxiety as measured by the Hamilton Anxiety Scale. Specifically, anxiety was significant related to performance on measures of intellect, visual attention, fine motor speed, verbal learning and memory, and executive functions. Of note, anxiety was found to be related to neuropsychological performance to a greater degree when a self-report measure of depression (Beck Depression Inventory-II) was used as a covariate compared to clinician ratings (Hamilton Depression Scale). The same was not found for depression, as performance on only several cognitive tasks were affected by levels of depression when anxiety was controlled for statistically. The effects of anxiety on neuropsychological performance was not affected by HIV status including individuals who were asymptomatic, symptomatic, and met criteria for AIDS.

Conclusions: Consequently, the results of this study show that anxiety had a significant impact on neuropsychological performance in individuals with HIV/AIDS. The implications of these findings will be discussed. Correspondence: *Michael J. Hall, Ph.D., Department of Mental Health and Behavioral Sciences, Chalmers P. Wylie Veterans Clinic, 543 Taylor Avenue, Columbus, OH 43203. E-mail: michael_hall6@ra.gov*

L. HARRIS, P. BROUWERS, C. CHU, R. LAW, R. SMITH, J. HITTELMAN, C. MELLINS, J. MOYE, N. BOREK & J. VELEZ-BORRAS. Attentional Problems in Young Children with Vertically-Acquired HIV-Infection.

Objective: Children infected with HIV appear to exhibit attention problems. However, there has been no investigation into subtyping of attentional difficulties among these children. We sought to determine if children infected with HIV manifest a particular subtype of attentional problem (Inattentive, Hyperactive, Combined, Normal) compared to uninfected children. We also examined other factors potentially contributing to their attentional problems.

Participants and Methods: The WITS is a national consortium examining long-term outcomes among HIV-infected and uninfected children, born to HIV-infected women. Clinical and laboratory data are routinely collected, including caregiver ratings of neurobehavioral functioning (CPRS) and measures of cognition (MCSA). We used retrospective data, classifying children (N=82 HIV-infected, N=90 uninfected) into attentional subtypes based on caregiver ratings and compared prevalence and subtype distributions.

Results: Statistical analyses included frequency table analysis, using Fisher's exact test, and generalized linear modeling with Bonferroni correction. 29% of the children in each group had CPRS ratings indicative of attentional problems with no group differences in subtype distribution. Potentially contributory factors (caregiver, race, gender, in utero exposure to ART or illicit drugs, encephalopathic event) did not affect subtyping. Interestingly, treatment with ART appeared to have no beneficial (nor adverse) effect on attention. Children in Inattentive subtype had lower cognitive abilities than children in Normal subtype ($p < .0001$).

Conclusions: Children born to HIV-infected mothers have a significantly higher rate of reported attentional problems compared to normative expectations. The increase was not directly associated with HIV. Environmental factors (parent's death, chaotic family environments, poverty, social isolation, exposure to toxic substances) may contribute to this problem with attention.

Correspondence: *Lynnette Harris, PhD, llharri1@texaschildrenshospital.org, 6621 Fannin, CC-1630, Houston, TX 77030. E-mail: llharri1@texaschildrenshospital.org*

J. IUDICELLO, S. WOODS & M.S. DAWSON. Both semantic memory and executive functions predict action (verb) fluency in HIV infection.

Objective: HIV infection is associated with impairments in action (verb) fluency (AF), a novel measure of verbal fluency based on the hypothesized dissociation between noun and verb retrieval from semantic memory. HIV-associated deficits in AF are correlated with impairments in executive functions; however the possible contributions of semantic memory to AF deficits in HIV have not yet been evaluated. Thus, this study sought to examine the specific contributions of semantic memory to AF performance in HIV-infected individuals.

Participants and Methods: Seventy-eight HIV-infected individuals were administered the AF test as part of a comprehensive neuropsychological test battery. Raw scores on measures of executive functions (i.e., Self Ordered Pointing Task, Digits Backwards, and Trailmaking Test, Part B-A) and semantic memory (Boston Naming Test, Wechsler Test of Adult Reading, and Famous Faces) were converted to z-scores and averaged to create composite domain scores.

Results: Regression analyses revealed that while both executive functions and semantic memory were significant individual predictors of AF performance ($p_s < .05$), semantic memory accounted for significant additional variance in AF performance beyond that of executive functions (R^2 change = .18, $p = .001$).

Conclusions: Findings highlight the involvement of semantic memory in the generation of verbs and suggest that verb retrieval deficits in HIV-infected individuals may be reflective of impairments in both executive functions and semantic processing. Future research should explore the component cognitive processes of action fluency (e.g., semantic clustering, switching) in HIV in order to further identify the cognitive abilities required for optimal performance.

Correspondence: *Jennifer Iudicello, HNRC, UC San Diego, 150 W. Washington Street, San Diego, CA 92103. E-mail: spwoods@gmail.com*

T. LOVEJOY, J. SUHR, T.G. HECKMAN, K.J. SIKKEMA, A. KOCHMAN, N. HANSEN & S. NEUFELD. Neuropsychological Functioning and Risk Behavior in Persons 50-Plus Years of Age Living with HIV/AIDS.

Objective: To examine the relationship between neuropsychological functioning and risk behaviors in HIV-infected older adults.

Participants and Methods: Participants (Mean Age = 55.2 years) were 259 persons (60% male, 31% Caucasian) enrolled in a three-arm, randomized clinical trial evaluating a coping improvement group intervention for HIV-infected persons 50-plus years of age. At pre-interven-

tion, participants completed a psychosocial battery and neuropsychological screening that included the Modified Mini Mental Status Exam, the Controlled Oral Word Association task, and the Trailmaking B task (TMB). In addition, participants reported recent drug use and sexual behaviors.

Results: Thirty-three percent ($n=85$) of participants were sexually active in the past three months (37% of whom engaged in one or more high-risk sexual encounters), while 22% ($n=58$) used illicit drugs in the past 60 days. Two multiple logistic regression analyses were conducted to model the criterion risk measures of sexual risk taking and drug use (0=low risk, 1=high risk). For sexual risk, Block 1 consisted of sociodemographic and health-related variables, of which HIV symptom severity was significantly associated with sexual risk taking (AOR =4.09, $p<.05$). Block 2 consisted of the three neuropsychological measures, which were marginally associated with sexual risk taking above-and-beyond Block 1 variables ($\chi^2(3)=6.42$, $p<.10$). Specifically, participants with lower executive functions as estimated by the TMB were more likely to have had sexual risk encounters (AOR=1.18, $p<.10$). Neuropsychological functioning, however, failed to predict drug use beyond psychosocial and demographic control variables ($\chi^2(3)=2.91$, $p>.10$).

Conclusions: Age-appropriate risk reduction interventions—that take cognitive impairment into account—will be needed for HIV-infected older adults who have difficulty refraining from high-risk sexual practices.

Correspondence: *Travis Lovejoy, B.A., Psychology; Ohio University; Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: tl399805@ohio.edu*

J. MONZONES, M. RIVERA MINDT, D. BYRD, E. RYAN, I. PALTIN & S. MORCELLO. Neuropsychological and Sociocultural Determinants of Activities of Daily Living Among Ethnic Minority HIV+ Adults.

Objective: HIV-related neuropsychological (NP) impairment is associated with real-world functioning. However, little research exists on this association among ethnic minorities, already affected by low socioeconomic status (SES) and literacy. This study posited that such sociocultural factors as well as NP performance will determine activities of daily living abilities (ADLs) among HIV+ ethnic minority adults.

Participants and Methods: Advanced HIV-infected participants [$N=156$; 71 African American, 44 non-Hispanic White (NHW), 41 Hispanic] completed a comprehensive NP examination and ADL questionnaire (Heaton et al., 2004).

Results: All ethnic groups were comparable in age, CD4-count, NP functioning, and ADLs (58% ADL-Dependent; i.e., ≥ 2 ADL impairments). African American and Hispanic groups had significantly lower SES (median income) and literacy (WRAT-3 Reading T-score) than NHWs (all p 's $<.05$). Global NP T-score was significantly associated with ADLs (ADL-Total Score) among the ethnic minority group (African Americans and Hispanics combined; $r = -.39$, $p<.01$) and NHWs ($r = -.43$, $p<.01$). A multiple regression analysis of the minority group using SES, literacy, global NP and CD4-count to predict ADLs was significant ($R^2 = .21$; $p<.01$), with Global NP ($p<.01$) and SES ($p <.05$) as significant predictors. Follow-up multiple regression of the NHW group, using global NP and SES to predict ADLs, revealed that only global NP ($p<.01$) made a significant contribution ($R^2 = .20$; $p<.05$).

Conclusions: Findings support the validity of global NP functioning in predicting ADL ability among HIV+ ethnic minority adults, and highlight the unique contribution of SES when evaluating ADLs in this population. Additional research should examine associations between SES-correlates (poverty, healthcare access, etc.) and ADL ability among HIV+ ethnic minorities.

Correspondence: *Jennifer Monzones, BA, Fordham University, 218 Adelphi Street #2, Brooklyn, NY 11205. E-mail: iamjennm@gmail.com*

J. MUÑOZ-MORENO, C. FUMAZ, M. FERRER, R. AVILA, A. PRATS, N. GUILLAMON, E. NEGREDO, M. GAROLERA & B. CLOTET. Benefits of a Cognitive Rehabilitation Program on Neurocognitive Impairment in HIV-Infected Patients. Preliminary Findings.

Objective: Cognitive rehabilitation has been proposed as a useful and recommended strategy in neurological diseases which progression induces an impairment of neurocognitive functioning (NF). Because such disruption is associated with HIV infection, we developed a cognitive rehabilitation program (CRP) to study its impact on NF in HIV-infected patients. Results at month (M) 2 are presented.

Participants and Methods: HIV-infected patients showing impairment on NF by traditional and computerized neuropsychological tests were included in this prospective longitudinal study, in which a self-administered 3-month CRP was developed. Significant NF domains in HIV infection were evaluated by neuropsychological tests at baseline (BL). NF was also determined by MAPS questionnaire, an instrument to assess self-reported cognitive performance, at BL, M1 and M2. Depression, anxiety and a rating scale of functioning in cognitive activities of daily living were measured in the same visits. Compliance with CRP was also controlled (0-100%).

Results: Twenty-seven (27) patients were included in the study, and 10 (37.03%) of them achieved M2. MAPS scores confirmed impairment on NF in 25 (92.59%) subjects at the inclusion of the study. At M2, MAPS revealed an improvement on NF in 4 (40%) out of the 10 patients. At BL, 3 (13.63%) and 7 (31.81%) patients showed scores above cut-off points of depression and anxiety, respectively. These rates decreased to 0 (0%) and 3 (30%) subjects at M2. Cognitive activities of daily living increased significantly among participants (mean \pm SD): BL: 24.66 \pm 4.22; M2: 28 \pm 3.88 ($p = .042$). Mean compliance with CRP at M2 was high: 85%.

Conclusions: Neuropsychological tests are required to know better the impact of a CRP on NF in HIV infection. Clear benefits by self-reported NF are not observed at short term. Depression, anxiety and cognitive activities of daily living may improve as a result of an intervention through cognitive rehabilitation in HIV infection.

Correspondence: *Jose A Muñoz-Moreno, MA, Lluita contra la SIDA - Germans Trias i Pujol University Hospital, Carretera del Canyet, SN, Planta 2, Edifici Maternal, Badalona (Barcelona) 08916, Spain. E-mail: jmunoz@fhsida.org*

I. PALTIN, M. RIVERA MINDT, D. BYRD, E. RYAN, J. MONZONES & S. MORCELLO. Predictive Utility of Neuropsychological Functioning and Depression on Activities of Daily Living in HIV+ Adults.

Objective: HIV-associated neuropsychological (NP) impairment and depression have been associated with activities of daily living (ADLs) in predominantly non-Hispanic white cohorts. It remains unclear if similar associations exist in the U.S. epicenter of the epidemic (New York City) among urban, ethnically diverse HIV+ populations. This study examined whether NP functioning and depression predict ADL impairment in such a cohort.

Participants and Methods: Advanced HIV-infected adults ($N=102$; 14 Hispanic, 59 African American, 27 non-Hispanic white, and 2 Other; 67% men), completed comprehensive neuromedical, psychiatric and NP evaluations. Depression was assessed with the Beck Depression Inventory-II (BDI-II). A modified ADL scale (Heaton et al., 2004) assessed participants' self-reported current ADL ability (ADL Total Score) and ADL-Dependence (dependence in ≥ 2 ADL areas). Demographically corrected average T-scores were used for NP data.

Results: For the entire sample, ADL-Dependence was significantly associated with global NP functioning ($p<.001$) and depression ($p<.001$). A multiple regression utilizing BDI-II Total Score and 7 NP domains (processing speed, executive functioning, motor skills, learning, delayed recall, verbal fluency and attention/working memory) was computed to predict ADL ability. The model was significant ($R^2(8,79) = .36$; $p<.0001$), and BDI-II ($p<.001$), motor skills ($p<.05$), learning ($p<.05$), and delayed recall ($p<.05$) were unique contributors to ADL ability.

Conclusions: This study supports the predictive roles of NP functioning and depressive symptomology on ADL ability among urban, ethnically diverse HIV+ adults, and points to the importance of considering both neuropsychological and psychiatric functioning when assessing ADL ability and rehabilitation issues.

Correspondence: *Iris Paltin, Fordham University, 1 West 100th St, Apt 2R, New York, NY 10025. E-mail: ipaltin@gmail.com*

Normal Aging

J. BEDICS, K.J. MILLER, S.A. ROGERS, P. SIDDARTH, L. ERCOLI & G.W. SMALL. Normative Data Stratified by Age for Measures of Semantic Fluency: Animals and Fruits/Vegetables.

Objective: Measures of verbal fluency have consistently been shown to be sensitive predictors for a variety of neuropsychological impairments. Despite their clinical utility, there has been a relative paucity of normative data for categories of semantic fluency other than animal naming. The lack of normative data is disconcerting in light of the frequent clinical use of other categories such as fruits/vegetables. The goal of the present study is to provide normative data for a category of semantic fluency that is widely utilized, yet infrequently studied, fruits/vegetables. Differential effects of age, education, and gender will also be examined across semantic and phonemic fluency tasks.

Participants and Methods: A total of 373 participants (228 women; M age = 63.46, SD = 11.22) completed the FAS, Animal Naming task and Fruits/Vegetables Naming task. All participants were cognitively intact, as determined by a MMSE score of 28 or greater (M=29.38, SD=.74).

Results: Normative data will be presented in a table format and stratified into eight categories by ages and means, standard deviations, along with minimum/maximum scores. Demographic variables accounted for the most variance in semantic categories accounting for 28% of the variance in fruit/vegetable naming scores, $F(3, 327) = 42.40, p < .000$.

Conclusions: The present results provide additional normative data for a frequently used semantic category of verbal fluency: fruits/vegetables. Fruits/Vegetables naming was the only task to be affected by all three demographic variables age, education and gender, with women performing better than men.

Correspondence: *Jamie Bedics, MS, Fuller Graduate School of Psychology, 839 Woodland Drive, Sierra Madre, CA 91024. E-mail: jbedics@hotmail.com*

N. BELFOR, S.C. CHAN, P. TALLAL & H.W. MAHNCKE. Reliability, cross validation and age norms of a modified Token Test for use with the elderly (ages 60+).

Objective: The Token Test is used to assess comprehension, working memory and global functioning of children and adults with receptive language deficits. This test was modified by Tomblin et. al. for use with healthy adults. This study investigates psychometric properties of modified Token Test (mTT), including cross-validation with the Repeatable Battery for Neuropsychological Functioning (RBANS) and Digit Span Backwards (DSb from WMS-III), and test-retest reliability; and establishes age norms for healthy older adults ages 60+.

Participants and Methods: Data from 298 participants (ranging in age from 60 to 93) was analyzed to establish cross validation and age norms. Correlation analysis was run with raw data subtests of RBANS and DSb. Test-retest reliability was calculated by correlating second testing scores with first testing data following an 8-12 week period. Scaled score lookup tables were developed by fitting the observed distribution of scores by decade to a cumulative Gaussian function.

Results: The modified Token Test showed strongest correlation with Coding ($r^2 = 0.57$), Story Memory (0.45), Figure Recall (0.45), and DSb (0.43). Test-Retest reliability is adequate at 0.79. Raw scores show decline with age. Lookup tables for by decade for scaled scores with a mean of 10 and standard deviation of 3 were developed.

Conclusions: The mTT is a valid and reliable test of working memory and attention in healthy elderly. Since the score on the mTT decreases with age, age-corrected norms will allow better utilization of mTT for research and clinical practice with the elderly.

Correspondence: *Nataliya Belfor, Ph.D., Outcomes, Posit Science, 225 Bush Street, 7th Floor, San Francisco, CA 94104. E-mail: natasha.belfor@positscience.com*

B.M. BENAVIDES, C. RACINE, L. QUITANIA, M. MOK, B.L. MILLER & J.H. KRAMER. Congruency Effects in Normal Aging.

Objective: Normal aging is associated with declines in executive functioning. Most executive tasks are complex, however, requiring several cognitive skills. The goal of this study was to use a flanker task to more specifically assess age-related changes in inhibiting responses to irrelevant stimuli.

Participants and Methods: We studied 11 healthy controls with a mean age of 70.3 (range=57-79) and MMSE >29. Subjects were administered a flanker test in which a central target arrow was flanked by arrows pointing in the same (congruent) or opposite (incongruent) direction. Subjects indicated the direction of the central arrow; accuracy and reaction time (RT) were recorded for each trial. All subjects had accuracy rates > 90%. To control for possible age differences in overall RT, the congruency effect was operationalized as the proportional increase in RT on incongruent trials relative to congruent trial.

Results: Bivariate correlation between the congruency effect and age was .76 ($p < .01$). Data were further analyzed using multiple regression, with median RT on the incongruent trials as the dependent measure. Median RT on the congruent trials was entered into the model first, followed by age; age explained an additional 12.7% of the variance ($p < .01$).

Conclusions: These data indicate a direct relationship between the congruency effect and age in a small cohort of normal elderly. Results are consistent with the view that executive functioning declines with age, and further suggests that the ability to inhibit processing resources to irrelevant stimuli may be one of the specific cognitive mechanisms that contribute to age-related executive decline.

Correspondence: *Blair M. Benavides, B.S., Neurology, University of California San Francisco, 200 W. 85th Street, Apt. 3F, New York, NY 10024. E-mail: bmb2126@columbia.edu*

R.C. CHAN, L. ZHENG, H. LIN, T. YANG & Y. WANG. Multitasking performances in healthy older Chinese adults.

Objective: This study aimed to further explore the multitasking performances among a group of healthy Chinese elder people with the use of three ecological valid tests, the Six Elements Test (SET), the Hotel Test, and the Greenwich Test.

Participants and Methods: A sample of 65 healthy older adults was recruited from the general public, screened by semi-structured interview and MMSE. All of them received the three tests of multitasking tasks and other neurocognitive function tests.

Results: Age accounted for some but not all of the variance in these tests. Principal component analysis demonstrated a very similar 5-factor solution as compared to previous findings in younger Chinese adults. They were rule intentionality, plan, strategy allocation, prospective memory and monitoring, and memory and learning.

Conclusions: Aging seems to involve differential declines in some of the components of multitasking performance, particularly intentionality, strategy allocation, and memory and learning.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan2003@yahoo.com.hk*

L.M. ERCOLI, S. DAVID, P. SIDDARTH, K. MILLER, J. DUNKIN, A. KAPLAN, D. DORSEY & G. SMALL. Memory Enhancement Training Effects in Healthy Older Adults Compared to Health Education and Wait List Conditions.

Objective: Memory enhancement training improves memory performance in persons with normal, age-related memory decline. We conducted a randomized clinical trial on the effects of memory training compared to control conditions in healthy older adults, and assessed for correct use of techniques (compliance with training) and generalizability of training.

Participants and Methods: Participants (age range 50-80 years) were randomized to: Memory Training (MT), Health Education (HE) control or Wait List (WL) control groups. Participants underwent pre- and post-condition memory testing for word lists. MT group learned the Method of Loci and Categorization techniques, the HE group received informative lectures, and the WL group received baseline and post-testing. Training compliance and generalizability were evaluated by self-report questionnaires.

Results: Repeated measures ANOVA indicated a trend for word list learning differences after MOL training [$F(2,60) = 2.92, p = 0.06$]. Within groups, only the MT ($p < 0.001$) and WL ($p < 0.01$) groups had significantly improved word list recall. There were no significant Categorization effects. At post-test, compared to control groups, only the MT group reported significantly increased correct use of MOL technique [$X^2(2) = 39.6, p < .001$]; and generalizability [$X^2(2) = 18.7, p < .001$].

Conclusions: As expected, the MT group word recall improved after training, and they reported generalizability of training and compliance. The question remains as to why memory improved in WL condition. Possibilities include: (1) WL is not a benign condition; (2) Non-training factors influenced MT participants; (3) Objective compliance measures are preferable to subjective reports.

Correspondence: *Linda M. Ercoli, Ph.D., Psychiatry, UCLA, 760 Westwood Blvd, Ste# 88-201, Los Angeles, CA 90024. E-mail: lercoli@mednet.ucla.edu*

N. HUBY, A. JOHNSON, B. GIORDANI, S. WRIGHT, C. PERSAD, L. NYQUIST & C. FEGAN. Impact of Early Mild Cognitive Change on Activities of Daily Living in Healthy Older Adults: Markers for Decline.

Objective: To discern whether individuals with mild cognitive changes with age demonstrate early signs of functional impairment in daily activities (ADLs). Recent findings have suggested that these individuals may demonstrate problems with higher level or more complex ADLs (IADLs). This study evaluates the relationship between age-associated changes in cognition and changes in basic functional status as part of an ongoing study of healthy aging.

Participants and Methods: One hundred, community dwelling participants were screened annually for 5 to 7 years on a cognitive and functional status telephone screening. Based on longitudinal change in cognitive status, participants were divided into four quartiles to reflect improvement and mild cognitive decline over time. Changes time in ADL and IADL responses were compared across these four groups over time.

Results: Results of a repeated measures ANOVA yielded no significant main effects or interactions. However, there was a trend ($p = .03$) in which persons with greatest change in overall cognitive status exhibited a greater overall percent change in functional status over time. Specific questions related to interactions with others and problems in gait and mobility appeared to underlie these changes.

Conclusions: Even mild changes in cognition can be accompanied by changes in basic functional ability on a daily basis. The most sensitive

ADL items appear to be those related to information processing and mobility. These findings suggest important avenues for monitoring both cognitive and functional changes with age, as well as highlighting possible areas for early intervention and rehabilitative approaches, including the use of the cost effective phone screening techniques.

Correspondence: *Nicole Huby, PsyD, University of Michigan Health System, 1500 E Medical Center Drive, Med Inn Bldg Rm C480 Box 0840, Ann Arbor, MI 48109-0840. E-mail: nhuby@umich.edu*

C. KANG, P.H. LU, K. TINGUS, S. ROGERS, S. TAKANAYAGI & J.L. CUMMINGS. Superior Intellectual Functioning and Cognitive Decline in Normal Aging.

Objective: Present research examined the relationship between superior cognitive reserve and neuropsychological test performance across time in a healthy sample.

Participants and Methods: Eighty-nine healthy elderly participants were drawn from a longitudinal cohort of subjects followed through the UCLA Alzheimer Disease Research Center. General intellectual functioning, as measured by the Full-Scale IQ score from either the Wechsler Abbreviated Scale of Intelligence (WASI) or the Wechsler Adult Intelligence Scale, third edition (WAIS-3) was used as a proxy for cognitive reserve. The subjects with $FSIQ \geq 120$ ($M = 130.3, SD = 7.29$, range 120-149) were classified as having superior cognitive reserve ($n = 54$) and participants with $FSIQ < 120$ ($M = 110.7, SD = 7.05$, range 91-119) were classified as having average cognitive reserve ($n = 34$). All the subjects underwent annual neuropsychological assessment in the domains of information processing speed, language, visuoconstruction, memory, and executive functioning. For each test, a slope was computed to represent change in performance over time (the difference between baseline and most recent test score divided by the number of months elapsed).

Results: The two groups did not significantly differ in age ($p = .99$) but the superior group had significantly more years of education than the average group ($t = -2.5, p = .01$). An analysis of covariance, controlling for education, revealed significant differences in slopes between the two groups on Trails B ($F = 8.43, df = 86, p = .005$) and FAS ($F = 4.23, df = 86, p = .043$), with the superior group demonstrating significantly less cognitive decline over time.

Conclusions: Results suggest that superior cognitive reserve may protect against declines in executive functioning related to the aging process among healthy individuals.

Correspondence: *Christine Kang, MA, UCLA-ADRC, 10911 Weyburn Ave, Suite 200, Los Angeles, CA 90024. E-mail: christinekang78@gmail.com*

A.L. LALOGGIA, T.H. YAMADA, A.R. KAUP, S.K. SHIVAPOUR, M.D. MCCOY, D. TRANEL, A. BECHARA & N.L. DENBURG. Working Memory Contributes to Iowa Gambling Task Performance in Older Adults.

Objective: We previously established that a sizeable subset of older adults perform disadvantageously on the Iowa Gambling Task (IGT), a complex decision-making measure involving reward, punishment, and risk. A neuroanatomical basis for this defect has not been established in older adults, and two competing explanations warrant examination: 1) Disproportionate involvement of prefrontal cortex; versus 2) Disproportionate involvement of mesial temporal lobe. As a first step toward such an examination, we employed a working memory (WM) task as an index of prefrontal function, and an anterograde memory (AM) task as an index of mesial temporal function. We hypothesized that WM would be a better predictor of decision-making than would AM.

Participants and Methods: The present study contrasted cognitive abilities in two groups of healthy older adults, divided according to IGT performance as having strong (Older-Unimpaired, $n = 45, M = 71.4 \pm 7.4$

years) or weak (Older-Impaired, $n = 25$, $M = 70.9 \pm 6.2$ years) decision-making. The participants were administered a battery of neuropsychological tests, including WM (WAIS-III Working Memory Index; WMI) and AM (Auditory Verbal Learning Test 30-minute delay condition; AVLT30).

Results: Using hierarchical linear regression, IGT was regressed stepwise on WMI and AVLT30. WMI entered significantly (r with IGT = .25; $p < .05$), while AVLT30 did not (r with IGT = -.10).

Conclusions: These data suggest that older adults may be vulnerable to a form of aging that preferentially impacts prefrontal cortex and associated cognitive functions, yet is distinct from well-known degenerative conditions, such as Alzheimer's disease. The data are also consistent with lesion studies demonstrating that dorsolaterally-mediated WM processes contribute to, but do not account fully for, the decision-making demands of the IGT (Bechara et al., 1998; Fellows & Farah, 2005). Correspondence: Anna L. LaLoggia, *Neurology, University of Iowa, 200 Hawkins Dr., Iowa City, IA 52242. E-mail: anna-laloggia@uiowa.edu*

S.C. LANTING, L.K. LEJBK, N.A. HAUGRUD & M.F. CROSSLEY. Sex and Age Differences in Performance and Strategy Use During Speeded Verbal Fluency Tasks.

Objective: Previous research indicates that age effects for word production rates are predictable and larger for semantic compared to phonemic fluency (e.g., Crossley et al., 1997); however, few studies have investigated sex differences in verbal fluency production rates or strategy use. Recent research reported a female advantage for total words produced and number of switches on phonemic fluency tasks while males showed a trend toward a larger cluster size (Weiss et al., 2006). The present study investigated sex and age differences in total word production, number of switches, and mean cluster size on phonemic and semantic fluency measures.

Participants and Methods: Sixty younger (18-40 years) and 72 older adults (65-91 years) completed phonemic and semantic fluency measures. A 2 X 2 ANOVA was performed on each of the dependent measures.

Results: As predicted, young adults generated significantly more words than older adults for both phonemic and semantic fluency ($p < .01$), and switched categories more frequently during both verbal tasks ($p = .03$ for phonemic and $p < .01$ for semantic fluency). A main effect of sex on number of switches during semantic fluency ($p = .05$) indicated that females switched more often than males, whereas males had a larger mean cluster size than females for both phonemic ($p = .03$) and semantic ($p < .01$) fluency.

Conclusions: There were no sex differences in total words produced for either task, suggesting that males use cluster size and females use switching rate to optimize word generation during verbal fluency tasks. However, switching as a processing strategy appears to be differentially affected by age, leading to fewer overall words produced by older adults. Correspondence: Shawnda C. Lanting, *Psychology, University of Saskatchewan, 9 Campus Drive, Saskatoon, SK S7N 5A5, Canada. E-mail: shawnda.lanting@usask.ca*

A. MACKAY & D. WHITE. Instructional set changes semantic clustering but does not improve memory in healthy older adults.

Objective: To test whether older adults change their semantic clustering strategy on a list-learning task if instructed to do so, and if item recall improves with increased semantic clustering.

Participants and Methods: Healthy older adults (age 63-85 years) completed two experiments in which they recalled an 18-item word list, with items from 3 semantic categories. Age, education, and IQ did not differ between the experiments. In the unconstrained recall experiment, participants were instructed to recall items in any order. In the constrained recall experiment, participants were instructed to recall items from one category at a time and not to return to a category after moving to the next.

Results: The effects of recall constraint were compared by examining: (1) amount of semantic clustering using an adjusted ratio of clustering (ARC) score to control for number of items recalled and (2) number of items recalled. Using ANOVA to examine performance across the experiments, a main effect of recall constraint was observed, $F(1, 77) = 21.95$, $p < .001$. Older adults clustered twice as much under the constrained recall instruction (ARC = .83) compared with the unconstrained recall instruction (ARC = .41). Recall, however, was the same in the unconstrained and constrained experiments, $F(1, 77) = 0.76$, $p > .05$.

Conclusions: Semantic clustering increased after providing specific instructions to do so, but it was not related to improved recall in older adults. Other targets for memory skill interventions may be beneficial in healthy older adults.

Correspondence: Anna MacKay, M.A., *Psychology, Washington University in St Louis, One Brookings Drive, MB 1125, St Louis, MO 63130. E-mail: ajmackay@artsci.wustl.edu*

R.S. MARSHALL & R. PANICO. A Pilot Study on the Effect of Unilateral Nostril Breathing on Mood, Verbal and Spatial Abilities.

Objective: Previous research with unilateral nostril breathing (UNB) has demonstrated increased verbal abilities individuals who complete right nostril breathing and enhanced spatial abilities with left nostril breathing (Jella & Shamahoff-Khalsa, 1993). Werntz et al., (1987) also suggested that unilateral nostril breathing could influence cognitive function in the contralateral hemisphere in non-brain damaged individuals. In preparation for a study for individuals after stroke, non-brain damaged individuals were studied to determine if prolonged use of unilateral nostril breathing (10 weeks) would impact cognition. It was expected that left nostril breathing may increase spatial abilities as right nostril breathing may increase language functioning. The implication is that if increased performance was observed, it could be applied to rehabilitation of the stroke population.

Participants and Methods: Thirteen individuals participated in a ten-week study with an initial, middle, and final assessment. Two groups were studied and placed in either right or left nostril breathing groups, with a four-week program practicing the breathing techniques, and six weeks of at-home practice.

Results: Improvements on the BDI and the BAI were observed for both groups after the four-week program, and again after six weeks of practice. Some improvement was also noted on verbal fluency. With this initial data there appeared to be little to no differences between right and left nostril breathing groups.

Conclusions: Based on these findings, a program in yogic breathing technique may be useful for decreasing scores on the BDI and the BAI. Further studies should be conducted with other non-brain damaged individuals and stroke participants to determine rehabilitation possibilities. Correspondence: Rebecca S. Marshall, PhD, *Communication Sciences & Special Education, University of Georgia, 570 F Aderhold Hall, CSSE, UGA, Athens, GA 30602. E-mail: rshisler@uga.edu*

B. SPRINGATE, M. BUTTARO, J. CHASMAN, T. ANDY & K. LUKATELA. Semantic Clustering on a Verbal Memory Task in Healthy Elderly.

Objective: In the present study, our goal was to examine the relationship between the use of semantic clustering and performance on a verbal memory task in highly active, healthy older adults. We expected that age would have a significant effect on both memory and semantic clustering measures.

Participants and Methods: Two groups of healthy, highly active elderly, younger (age 65-74; $n = 27$) and older (age 75-94; $n = 28$), were compared on their performance on the HVLT-R, a verbal memory test. In addition, their responses were scored for the use of semantic clustering.

Results: The age groups did not differ significantly on any of the control measures (education, verbal IQ, depression, and daily activity lev-

els). No differences were seen between age groups on all three trials and the delayed recall section of the HVLTR, although overall age negatively correlated with delayed recall ($r = -0.307$, $p = 0.002$). In both groups, there was a highly significant correlation between delayed recall and semantic clustering scores ($p < 0.001$). Age was significantly negatively correlated with semantic clustering ($r = -0.389$, $p = 0.41$) in the older seniors, but not in the younger group.

Conclusions: Our results indicate that healthy elderly use semantic clustering on verbal memory tests. Surprisingly, in our highly active, healthy elderly sample, no age group differences were found on standard HVLTR measures. In this population, the semantic clustering measure appears to be more age-sensitive than the standard HVLTR scores. These results will be discussed in terms of the importance of an active lifestyle on memory functions.

Correspondence: *Beth Springate, Psychology, University of Connecticut, 406 Babbidge Rd, Storrs, CT 06269. E-mail: beth.springate@uconn.edu*

S. TENG & M. HUA. Temporal Order Memory in Normal Elderly Individuals.

Objective: Impairments of temporal order memory have often been evident in patients with lesions of prefrontal lobes. Since a large body of studies indicates that the negative impact of aging process on the prefrontal lobes is greater than on other brain areas, it would be expected that older adults might also have difficulty in remembering temporal order of events. However, the findings remain controversial. The present study was thus to make an attempt to explore this issue.

Participants and Methods: Thirty normal healthy older adults and thirty normal healthy young adult controls matched for sex, education level and VIQ of the WAIS-R participated in the study. All subjects received a battery of neuropsychological tests, a temporal order memory task, and a recognition memory task.

Results: The results revealed that normal elderly individuals' performance on the temporal order memory function tasks was poorer than their normal young counterparts. Low temporal order memory scores in the elderly were associated with their poor performance on the frontal-related neuropsychological measures. Test items with semantic similarity tended to disrupt the elderly individuals' normal performance on the temporal order memory task.

Conclusions: Based on our results, it appears that poor temporal memory functioning in our normal elderly individuals is primarily associated with changes of the prefrontal function, and that true and false memory in the elderly individuals could be dissociable. Since the possible underlying neural substrates for temporal order memory in this study were merely inferred by neuropsychological measures, further investigation on this issue with structural or functional neuroimaging procedures is merited.

Correspondence: *Mau-Sun Hua, Ph.D., Psychology, National Taiwan University, Dept. of Psychology, National Taiwan University, #1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan. E-mail: huams@ntu.edu.tw*

E. VAN DER HULST, B. GORDON, G.D. PEARLSON & D.J. SCHRETLEN. Trait Openness Correlates More Highly with Crystallized Intelligence than with Executive Functioning.

Objective: Openness is a personality trait that has been linked to intelligence, divergent thinking and, most recently, a type of cognitive flexibility that depends on dopamine function, especially in the dorsolateral prefrontal cortex. Based on this "frontal/executive" model, we hypothesized that individual differences in self-rated Openness would correlate more strongly with performance on tests of executive function and fluency than intelligence.

Participants and Methods: Based on random-digit dialing and telephone calls to numbers selected randomly from residential directories, we recruited 335 reasonably healthy adults from two sites for a study of normal aging. Each participant completed neurocognitive testing and the NEO Five-Factor Inventory (NEO-FFI).

Results: We conducted a factor analysis with Varimax rotation. This yielded four factors that accounted for 71.0% of the total variance. Four composite cognitive indices were computed and correlated with the five NEO-FFI personality factor scores, controlling for age, sex and race. Contrary to our hypothesis, Openness correlated more strongly with verbal/crystallized intelligence (Gc; $r=0.44$) than with both executive functioning ($r=0.16$) and fluency ($r=0.24$) in the pooled sample. Assuming that high trait Openness manifests as an enduring orientation toward intellectual stimulation and learning, we hypothesized that its correlation with verbal/crystallized ability would become increasingly evident over the adult life span. As predicted, the partial correlation between Openness and Gc increased from $r=0.26$ among young adults to $r=0.53$ among elderly adults.

Conclusions: These findings suggest that Openness is more closely associated with the acquisition of broad verbal intellectual skills and knowledge than with executive abilities localized to a specific brain region or neurotransmitter system. This association seems to either strengthen or become increasingly apparent with normal aging.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 21S, Baltimore, MD 21287-721S. E-mail: dschret@jhmi.edu*

R.F. ZEC, N.R. BURKETT, S.J. MARKWELL & D.L. LARSEN. Comparison of Cross-Sectional and Longitudinal Data on the Boston Naming Test.

Objective: To compare the findings from our cross-sectional and longitudinal studies on the effects of age on confrontation naming (60-item BNT) in normal older adults.

Participants and Methods: There were 1111 "normal" elderly (age 50-101) in the cross sectional analysis and the number of participants with at least 2-10 annual visits in the longitudinal study were 544, 347, 235, 175, 135, 73, 47, 27, and 17.

Results: The magnitude of the BNT decline was considerably greater in our cross-sectional study in which there was an accelerating decline with successive age groups from 50-89. There was a 0.55-word decline (1.0%) when comparing the 50s and 60s age groups, a 2.15-word decline (3.8%) when comparing the 50s and 70s, and a 4.43-word decline (7.9%) when comparing the 50s and 80s. In our longitudinal study, we found a small mean improvement (1.31 words, 2.3%) in the 50s age group when projected over 10 years, no change (+0.03 words, 0.05%) in the 60s, and small declines (1.57 and 1.46 words, both 2.8%) in the 70s and 80s.

Conclusions: The findings from both our cross-sectional and longitudinal studies demonstrate that the clearest BNT declines occur after age 70. There were likely cohort effects in our cross-sectional study that exaggerated the age differences in BNT performance, whereas there likely was a selective attrition bias and practice effects in our longitudinal study that minimized the age declines. Considering the findings from both studies, an estimate of the "true" mean BNT decline is 2-3 words from the 5th to 8th age decade.

Correspondence: *Ronald F. Zec, Ph.D., Neurology and Alzheimer Center, SIU School of Medicine, 751 North Rutledge, Springfield, IL 62794-9643. E-mail: rzec@siumed.edu*

Executive Abilities/Frontal System

N. CRUZ & G. HOLMBECK. The Link Between Executive Functioning and Academic Performance Ratings Among Clinically-Referred Children.

Objective: Poor performance-based executive functioning (EF) is associated with academic difficulties, though little research measures everyday EF behaviors. This study explores links between EF to math and reading ratings, using both performance-based measures and behavior ratings of EF.

Participants and Methods: Participants were 79 clinically-referred children (ages 9-14) who completed the Conner's Continuous Performance Test (CPT-II), Trail Making, Children's Category Test, and WISC-IV subtests including Working Memory Index (WMI) as well as Vocabulary and Matrix Reasoning (to control for IQ). Parents and teachers completed the Behavior Rating Inventory of Executive Function (BRIEF), Child-Behavior Check-list (yielding academic ratings) and ADHD-IV Rating Scale (to control for attention problems). Regression analyses were conducted to examine the hypotheses.

Results: Lower parent-reported EF ratings across several BRIEF domains predicted lower math ratings, with lower WMI and Trail Making scores being the only significant performance-based predictors. Only parent-reported planning and CPT-II predicted reading, with the direction of the latter association dependent on the child's age. Vocabulary scores accounted for most of the variance when analyzing reading as an outcome. Most results held after controlling for attention problems. Additionally, performance-based EF tests were not significantly correlated with expected BRIEF domains.

Conclusions: Multi-method findings supported a strong association between EF (especially everyday EF behaviors) and academic ratings, particularly math. This challenges the sole reliance on performance-based measures of EF by researchers and clinicians. Although EF may have a more direct link to the explicit problem-solving characterizing math demands, results provided some evidence for the EF-reading association that warrants further exploration.

Correspondence: *Nicole Cruz, Ph.D., Loyola University Chicago, 5317 North Kenmore Ave, #3A, Chicago, IL 60640. E-mail: ncruz@luc.edu*

Paper Session 1

4:45–6:15 p.m.

Cross Cultural Issues

N. WOLFE, K. SAKAI, D.C. DELIS & J.H. KRAMER. Comparison of Semantic Fluency Performance of Healthy Elderly in Japan and the United States.

Objective: This research compared semantic verbal fluency performance of healthy elders in Japan and the United States. We hypothesized that there would be no significant difference between cultural groups in semantic verbal fluency.

Participants and Methods: Healthy elderly individuals aged 50 years or older were recruited from two countries. Japanese subjects ($n = 57$) were recruited from senior centers in the Tokyo metropolitan area as part of a validation study of the Cross Cultural Cognitive Exam (CCCE) (Wolfe, N., et al. 1992). Participants from the United States ($n = 451$) completed their semantic fluency testing (animal naming from the COWAT) as part of the normative testing of the Delis-Kaplan Executive Function System (D-KEFS) (Delis et al., 2001). Ninety one percent of the United States sample was Caucasian.

Japanese and United States subjects did not differ in age (Japanese subjects' mean age was 69.04 years, $SD = 10.17$ years, United States subjects' mean age was 69.34 years, $SD = 10.50$, $t(506) = .21$, $p > .05$). Education level was lower in Japanese elders (mean = 1.91, $SD = 1.18$) than in those from the United States (mean = 3.21, $SD = 1.25$) ($t(506) = 7.82$, $p < .001$). Qualitative differences in education between the two groups were not assessed.

Results: Japanese named an average of 15.70 ($SD = 4.60$) animals in one minute compared with 16.51 ($SD = 4.28$) for US subjects. The difference was not significant ($t(506) = 1.35$, $p > .05$, NS). Overall, verbal fluency declined with age ($r = -.312$, $p < .01$).

Conclusions: Japanese and U.S. subjects of similar ages did not differ on this semantic verbal fluency task, in spite of differences in culture, race, and educational attainment. Results support the cross-cultural applicability of this verbal fluency test.

Correspondence: *Nicola Wolfe, PhD, Psychology, University of San Francisco, 2130 Fulton St, San Francisco, CA 94117. E-mail: nwolfe@usfca.edu*

J. CHEY, K. SHIN, H. KIM & Y. SHIN. Illiteracy is a Risk for Dementia: A Seven-Year Follow-Up Study of Community Residing Elderly Koreans.

Objective: A longitudinal study investigated the risk factors for dementia in elderly Koreans with various educational attainment, 0-18 years, some of whom were illiterate. Cognitive reserve theory (Stern, 2002) predicts that illiteracy and education would be a risk factor for dementia in elderly population with wide range of education.

Participants and Methods: At baseline 243 nondemented elderly subjects participated in the study. At the 7-year follow-up, 138 subjects were evaluated, and 15 individuals were diagnosed with dementia. A battery of neuropsychological tests, semi-structured interview, depression scales were utilized for evaluation and diagnosis in the four follow-up evaluations. Korean-Dementia Rating Scale (Chey, 1998; Mattis, 1988) was used to assess the general cognition, while the Elderly Memory disorder Scale (EMS; Chey, 2006) was utilized to evaluate various aspects of memory, visuoconstruction, and language. Clinical Dementia Rating was administered to the elderly individuals with the low cognitive performance (Chey et al., 2006), the mild cognitive impairment (Peterson et al., 2004) or the dementias, and apo e genotyping was performed. Discriminant analyses were performed to identify which of the following factors would predict dementia in the 7-year follow-up: age, gender, apo e4, illiteracy, education, and job history.

Results: Illiteracy was a significant factor predicting dementia along with age. It was also significant in predicting dementia of the Alzheimer's type but was not included in the discriminant function, while age and apo e4 status was included in the function. Illiteracy was a significant predictor for vascular dementia and was included in the function as well as age.

Conclusions: To our knowledge, this is the first longitudinal study to find evidence for illiteracy as a significant risk factor for dementia. In societies with many illiterate elderly people, intervention programs and public policies should make an effort to decrease this risk.

Correspondence: *Jeanjung Chey, Ph.D., Psychology, Seoul National University, San 56-1 Shillimdong, Kwanakgu, Seoul 151-742, South Korea. E-mail: jychey@snu.ac.kr*

L. HUMPHREY, N. HORTON, T. TAPIO, J. DANG, M. YANG, S.K. LOO, M. JARVELIN, I. MOILANEN, H. EBELING, A. TAANILA & S.L. SMALLEY. Rey Osterreith Performance in a Population Sample of Finnish Adolescents With and Without Attention Deficit Hyperactivity Disorder.

Objective: Attention Deficit Hyperactivity Disorder (ADHD) requires assessment that reflects its neuropsychological complexity. This study's objective was to identify how adolescents with and without ADHD differ on the Rey Osterreith (RO), a complex measure that is sensitive to ADHD in children.

Participants and Methods: Our study examined RO findings in adolescents aged 16-17 from the Northern Finland Birth Cohort, a population sample. Positive SWANN and KSADS results identified the ADHD sample; controls were negative on both. 125 randomly-selected RO productions were scored using the Developmental Scoring System (DSS), modified to include doubling errors (2 lines drawn when stimulus showed only one) and overshoot/gap errors. Also, on Organization the "first line drawn" was scored. Accuracy variables were not modified.

Results: ADHD subjects had significantly more doubling errors ($X^2=6.42; p<.01$) and more overshoot/gap errors ($X^2=3.99; p<.05$) on Copy. On immediate delay (IM), ADHD subjects omitted at least one Structural Accuracy item significantly more often than did controls ($X^2=4.40; p<.04$). Groups did not differ on scores of Organization for either copy or IM.

Conclusions: Our results indicate that, unlike children, ADHD adolescents no longer struggle with DSS-defined RO Organization. Issues with more specific aspects of process and production, however, are discriminative. ADHD adolescents have more trouble perceiving the figure so as to copy it efficiently, and also demonstrate visual/motor errors. Once the model is removed ADHD adolescents tend to omit structural elements, struggling to hold organizational components in working memory. We conclude that the RO discriminates ADHD subjects from controls in later adolescence, but in ways that differ from children.

Correspondence: *Lorie Humphrey, PhD, Medical Psychology/Neuropsychology, UCLA, 11340 West Olympic Blvd, Suite 250, Los Angeles, CA 90064. E-mail: lorieh90025@yahoo.com*

A. SALDIVAR & F. GONZALEZ. Development and Rationale for Hg Testing Protocol.

Objective: Neuropsychological testing has long been used as a method of documenting neurological insult as would be noted in toxic exposure, with numerous researchers and authors describing the methodology and areas that should be assessed. The objective of this discussion is to present the approach taken to conduct forensic neuropsychological testing for a population without norms.

Participants and Methods: Following the mercury spill in Peru, a protocol to investigate the effects of the mercury exposure was developed, based on the available literature and reflecting the earlier research by the World Health Organization (WHO) on developing culture fair instruments as well as recommendations by the WHO in the Neurotoxicity Risk Assessment for Human Health (2001).

Results: A battery was developed and used to assess a rural Peruvian population. The WHO report describes the general domains to be examined, including general intellect, attention, executive function, memory, verbal ability and language, visuospatial and visuo-motor ability, as well as mood and personality. To assist in the development of the protocol teachers within the affected schools were interviewed and the findings teachers are described as they relate to developing a battery/protocol and general implications.

Conclusions: From teacher interviews and initial evaluations it is readily apparent that mercury affects all cognitive domains and all areas need to be evaluated.

Correspondence: *Aida Saldivar, Ph.D., Rancho Los Amigos National Rehabilitation Center, 7601 E. Imperial Hwy., HB 226, Downey, CA 90242. E-mail: asaldivar@ladhs.org*

Paper Session 2

4:45–6:15 p.m.

Chronic Illness

R.S. PRAKASH, E.M. SNOOK, K.I. ERICKSON, S.J. COLCOMBE, M.W. VOSS, R.W. MOTL & A.F. KRAMER. Altered Patterns of Cerebral Activation During Response Inhibition in Multiple Sclerosis: An fMRI Investigation.

Objective: Neuroimaging studies with healthy young adults have reported that regions of the right dorsolateral PFC are activated during performance on the flanker task. Herein, we investigated patterns of cerebral activation during the flanker task in those with multiple sclerosis (MS). This was undertaken to identify potential differences in neural activation patterns associated with inhibitory processes in those with MS.

Participants and Methods: Participants were 24 individuals with relapsing remitting MS who performed the flanker task in a 3T MRI system. The flanker task required participants to identify the orientation of the central arrow, which is flanked on either side by two distractor arrows, which may (<<<<<) or may not (<<><<) be congruent with the target arrow. Interference is reflected in an increase in the reaction time during the incongruent trials over and above the congruent trials.

Results: Reaction time during the incongruent trials was significantly slower than during the congruent trials ($p < 0.01$). Functional magnetic resonance analyses suggested that in addition to the activation seen in standard regions of the cortex, those with MS recruited the homologous regions of the contralateral hemisphere (i.e. middle frontal gyrus) during task performance, particularly in the more difficult incongruent trials. This is in contrast to unilateral patterns of activation observed for non-MS patients.

Conclusions: The present data are potentially important in that they suggest that MS patients recruit additional brain regions, and more specifically homologous regions in the prefrontal cortex, to perform the same task as those without MS.

Correspondence: *Ruchika S. Prakash, MA, Psychology, University of Illinois, Urbana-Champaign, 405 N. Matthews Avenue Beckman Institute, MC-251, Beckman Institute, MC-251, Urbana, IL 61801. E-mail: rwadhwa@uiuc.edu*

R.M. BUSCH, T.T. LINEWEAVER, R.I. NAUGLE, K.H. KIM, Y. GONG, C.Q. TILELLI, R.A. PRAYSON, I.M. NAJM & R. DIAZ-ARRASTIA. The Relationship Between ApoE $\epsilon 4$ and Memory Performance in Patients with Medically Intractable Temporal Lobe Epilepsy.

Objective: The apolipoprotein (ApoE) $\epsilon 4$ allele has been associated with memory loss in many neurologic groups. Research has suggested that ApoE $\epsilon 4$ is related to word list learning in patients with newly diagnosed partial epilepsy and mild, well-controlled temporal lobe epilepsy (TLE). The goal of the current study was to investigate the relationship between $\epsilon 4$ and memory performance (verbal and nonverbal) in patients with intractable TLE who underwent temporal lobectomy.

Participants and Methods: Pre- and postsurgical memory scores were examined in 87 adult patients with TLE ($\epsilon 4=22$; non- $\epsilon 4=65$) to determine whether ApoE $\epsilon 4$ is associated with memory performance and to evaluate how this relationship is affected by duration of epilepsy. A doubly MANOVA was performed on memory scores as a function of ApoE genotype, duration of epilepsy, and time.

Results: Analyses revealed that the pattern of differences on memory indices between duration groups was significantly different between the $\epsilon 4$ and non- $\epsilon 4$ groups (Pillai's Trace=.179, $F=3.447$, $p<.01$). Univariate between-subjects effects averaged across time revealed a significant interaction between ApoE group and duration of epilepsy on all WMS-III indices. Specifically, $\epsilon 4$ -carriers with long duration of epilepsy demonstrated significantly lower memory scores than $\epsilon 4$ -carriers with short duration. This was observed for both immediate and delayed recall trials on both verbal and visual memory measures. There were no significant effects of surgery, suggesting that the observed relationships between $\epsilon 4$ and duration of epilepsy on memory were not significantly impacted by temporal lobectomy.

Conclusions: This study demonstrates that ApoE $\epsilon 4$ plays a significant role in memory performance among patients with medically intractable TLE, with the relationship heavily influenced by duration of epilepsy. If confirmed, these findings may provide a convincing argument for early surgical intervention in TLE patients who are $\epsilon 4$ -carriers to prevent declines in memory that accompany longstanding epilepsy. Correspondence: *Robyn M. Busch, Ph.D., Psychiatry and Psychology, Cleveland Clinic, 3672 W. 129th Street, Cleveland, OH 44111. E-mail: buschr@ccf.org*

M.R. SCHOENBERG, P.K. OGROCKI, B.N. MADDUX, D. RILEY, D. GOULD, C. WHITNEY & R.J. MACIUNAS. Neuropsychological outcome of a Prospective Clinical Trial of Thalamic Deep Brain Stimulation for Tourette Syndrome: 3-month post-op data.

Objective: Tourette Syndrome (TS) is a neuropsychiatric disorder associated with frontostriatal dysfunction. Some patients experience disabling motor/sonic tics into adulthood. Worldwide, there are limited case reports of DBS treatment for medically refractory TS. This study reports on the neuropsychological outcome of the first North American prospective study to evaluate the efficacy of bilateral anterior thalamic DBS for selected patients with medically refractory TS.

Participants and Methods: The study has an IDE waiver and is a repeated measures design with pre-test and 3- and 12-month follow-up. Participants: FDA restricted to 5 study participants. Ten subjects were screened and 5 males had DBS surgery for medically refractory TS. Measure(s): Neuropsychological (psychomotor speed, attention, memory, language, visuoconstructional, executive); psychiatric; neurosurgical; and neurological evaluations with video monitoring for tic counts and high resolution MRI.

Results: Average age was 28.2 years (SD = 7.5) with 12-17 years of education. Pre-operatively, participants were disabled from tics, with a minimum frequency of 37 motor and 4 sonic tics per minute. There were mild difficulties with rapid sequencing and mental flexibility (Trials B, COWAT) and mild to moderate depression and OCD symptoms (YBOCS total = 14). At 3 months post-op, 3 of 5 participants exhibited pronounced improvement in motor/sonic tics and an additional participant exhibited mild improvement. As a group, there was a significant decline in the average CPT-2 Hit Rate reaction time ($p=.05$), and non-significant declines in memory and verbal fluency scores. Symptoms of depression and OCD decreased at 3 months post-op.

Conclusions: These data suggest bilateral anterior thalamic DBS for medically refractory TS was not associated with pronounced cognitive impairments, and yielded a marked reduction in sonic and motor tics as well as a decrease in OCD and depression symptoms. 3-month post-operative cognitive changes were generally small to moderate.

Correspondence: *Mike R. Schoenberg, Ph.D., Neurology, University Hospitals of Cleveland/Case Western Reserve University School of Medicine, 11100 E. Euclid Ave., Cleveland, OH 44106-5000. E-mail: Michael.Schoenberg@uhhs.com*

C. BACK-MADRUGA, B. BECKER, L.A. BIELIAUSKAS, K. LINDSAY, E. WRIGHT & R. FONTANA. Cognitive Reserve as a Risk Factor for Neuropsychological Impairment in Patients with Chronic Hepatitis C.

Objective: The present study evaluated the influence of cognitive reserve on neuropsychological functioning in chronic hepatitis C patients who have not responded to prior antiviral therapy and are entering the NIH-NIDDK sponsored HALT-C Trial.

Participants and Methods: 198 chronic hepatitis C patients participated in the study. Cognitive Reserve Scores (CRS) were defined by a summation of the rank values of an individual's educational level, occupational category, and IQ score using the Shipley Institute of Living Scale vocabulary subtest t-score. Cognitive functioning was determined using a summary of standard scores from the neuropsychological test battery converted into a single Global Deficit Score (GDS). A GDS score ≥ 1.0 was used to define the presence of cognitive impairment.

Results: Sixty-three patients (32%) were classified as cognitively impaired. Patients classified as cognitively impaired had lower CRS, IQ scores, educational level, and occupational rating but had similar severity of liver disease compared to the nonimpaired group. Logistic regression analyses were performed using IQ and CRS to assess their influences on neuropsychological functioning. Shipley IQ ($p<.0001$) and CRS ($p<.0001$) were both found to be significant predictors of neuropsychological impairment, with CRS accounting for 15% of the variance in cognitive impairment and IQ alone accounting for 28% of the variance.

Conclusions: Our results suggest that patient with lower CRS appear to be more vulnerable to the problematic cognitive effects in the presence of hepatitis C infection. These results are similar to studies in HIV infected individuals and point to the importance of accounting for CRS when evaluating neuropsychological findings from clinical trials.

Correspondence: *Carla Back-Madruga, PhD, Psychiatry and the Biobehavioral Sciences, USC Keck School of Medicine, 1300 North Mission Road, Los Angeles, CA 90033. E-mail: cback@usc.edu*

THURSDAY MORNING, FEBRUARY 8, 2007

Paper Session 3

9:00–10:30 a.m.

Pediatric Oncology

H.M. CONKLIN, C. LI, X. XIONG, R.J. OGG & T.E. MERCHANT. Academic Achievement after Treatment with Conformal Radiation Therapy for Localized Ependymoma in Childhood.

Objective: Conformal radiation therapy (CRT) aims to limit the highest radiation doses to the volume at risk while sparing surrounding normal tissues. The current study investigated whether treatment of childhood ependymoma with CRT would preserve cognitive function. Academic achievement was chosen as the primary outcome measure given it is the most direct measure of real-world cognitive functioning for children.

Participants and Methods: Seventy-nine patients diagnosed with ependymoma (Males= 42; Females= 37) received CRT in which doses ranging from 54.0 to 59.4 Gy were prescribed to the post-operative tu-

mor bed with a 10 mm clinical target volume margin. Cognitive testing was conducted before CRT, as well as six months and yearly after the start of CRT. The median length of follow-up was 59.6 months (± 19.3 months). Testing included subtests from the Wechsler Individual Achievement Test (WIAT).

Results: Linear mixed models with random coefficients revealed a significant decline in reading scores during the follow-up time period (slope estimate $-0.08 \pm .03$ points/month; $p < .003$). Math and spelling performance remained stable. Supratentorial tumors, multiple surgeries, shunt placement for hydrocephalus and age less than three were predictive of worse reading performance at baseline. Male gender, shorter symptomatic interval, pre-existing endocrine deficiencies and absence of a permanent VP-shunt were predictive of a steeper decline in reading scores over time.

Conclusions: CRT may result in better long-term cognitive outcomes when compared to conventional radiation approaches. Reading ability appears to be more vulnerable than other areas of academic achievement. This specific finding may relate to disruption in brain lateralization processes that underlie typical reading development.

Correspondence: *Heather M. Conklin, Ph.D., Behavioral Medicine, St. Jude Children's Research Hospital, 332 N. Lauderdale St., Mail Stop 740, Memphis, TN 38105-2794. E-mail: heather.conklin@stjude.org*

K.R. KRULL, A. RENFRO, B. DINU, L. ZHANG, N. BARAHMANI, N. JAIN, J. YAN, L. BOMGAARS, S. BOTTOMLEY, Z. DREYER, G. AIREWELE, D. MAHONEY, P. BROUWERS & F. OKCU. Folate Pathway Polymorphisms are Related to AD/HD in Childhood Acute Lymphoblastic Leukemia Survivors.

Objective: Many children who survive acute lymphoblastic leukemia (ALL) suffer from neuropsychological impairment. Systemic and/or intrathecal Methotrexate (MTX) is often associated with attention disorders and slowed information processing speed. While the biological mechanism is unknown, limited data suggest free oxygen radical damage secondary to increased homocysteine and folate depletion as a potential cause. We hypothesized that folate pathway and glutathione S-transferase (GST) polymorphisms may explain individual variation in developing attention problems after ALL therapy.

Participants and Methods: Parents of 48 survivors of childhood B-precursor ALL (mean time off therapy 49 months) completed the Child Symptom Inventory and a semi-structured interview to identify diagnostic symptoms of AD/HD. Somatic genotyping was performed with peripheral blood DNA for 5, 10-methylenetetrahydrofolate reductase [(MTHFR)(C677T and A1298C)], GSTM1, GSTT1 and GSTP1 (A1404G and C2294T) polymorphisms.

Results: Logistic regression analyses were used to calculate odds ratios. Mean age at diagnosis was 49 months (range 8 - 109 months). No patient received cranial irradiation. Eleven (23%) patients displayed a pattern consistent with inattentive type of AD/HD. All children who met AD/HD criteria had genotypes related to lower folate levels (11 out of 39), while none of the children with genotypes related to higher folate levels had AD/HD (0 out of 9). Age at diagnosis was not associated with inattentiveness ($p=0.76$).

Conclusions: GST polymorphisms were not related to AD/HD. However, preliminary data suggest a strong relationship between MTHFR polymorphisms and inattentive type of attention disorder in survivors of childhood ALL. Further validation in a larger patient population is needed.

Correspondence: *Kevin R. Krull, Ph.D., Child Psychology, Baylor College of Medicine, 6621 Fannin, CC 1630, Houston, TX 77030-2399. E-mail: kkrull@bcm.tmc.edu*

R.G. MORRIS, E. PULLEN, J. BRAMHAM, S. KERR, R. BULLOCK & C.E. POLKEY. Exploration of Social Rule Violation in Patient with Focal Prefrontal Neurosurgical Lesions.

Objective: The object of the study was to explore whether virtual reality could be used to detect social cognitive impairment in patients with focal brain damage. The study investigated whether patients with focal frontal lesions could show appropriate proxemic rule adherence, following the social rules concerned with regulating personal distance.

Participants and Methods: Twenty two patients with focal prefrontal cortical lesions were compared to 22 matched control participants. A virtual reality task was administered in which the participants entered a bar and had to walk across to the bar counter and order drinks. In doing so, they had to avoid moving inappropriately between proximate groups of people. As a means of making the task more sensitive they were also tested for their prospective memory by asking them to make certain observations about the bar as they went to the bar counter.

Results: The results showed that patients with lesions impinging the orbitofrontal or mesiofrontal regions tended to make more proxemic errors than those with lesions impinging on the dorsolateral region or in comparison to normal controls. This impairment was not related to executive dysfunction the patients showed normal prospective memory.

Conclusions: The study shows that proxemic errors are specifically related to orbitofrontal or mesiofrontal brain lesions and implicate these regions in regulating social judgement concerning personal space. Virtual reality has been shown to provide a potential method for measuring social functioning other than questionnaire or behavioural observation methods.

Correspondence: *Robin G. Morris, MA (Oxon), Msc, Ph.D. (Cantab), PO Box 075 Psychology, Institute of Psychiatry, De Crespigny Park, London SE5 8AF, United Kingdom. E-mail: spjtrgm@iop.kcl.ac.uk*

A. PAPAZOGLU, T. KING, J. PARTRIDGE, R. MORRIS & N. KRAWIECKI. Behavior Problems as Predictors of Later Adaptive Functioning in Children with Brain Tumors.

Objective: Children with brain tumors are at risk of developing psychological and behavioral problems, which may influence long-term outcome. Attention problems have been especially well documented; however, few studies have examined the relationship between behavioral and adaptive functioning in this population. This study assessed the ability of scores on the Childhood Behavior Checklist (CBCL) and Composite IQ scores on the Stanford-Binet Intelligence Test, 4th edition (SB-IV) within three years of diagnosis to predict adaptive functioning on the Vineland Adaptive Behavior Scales (VABS) an average of 3.34 years (SD = .45) later.

Participants and Methods: Forty-two children with a mean age at diagnosis of 6.71 years (SD = 3.11) met the inclusion criteria. Age, socioeconomic status (SES), gender, and scores on the Neurological Predictors Scale also were explored as predictors of adaptive functioning.

Results: Attention problems were a significant predictor of the VABS Composite and the Daily Living Skills and Socialization domains. SES was a significant predictor of all domains. IQ was not found to be a significant predictor of later adaptive functioning. Our model accounted for 45.2% of the variance in overall adaptive functioning, and 51.5% in the Communication, 32.6% in the Daily Living Skills, and 29.8% in the Socialization domains.

Conclusions: This study highlights the importance of attention problems in predicting later adaptive functioning outcomes in children diagnosed and treated for brain tumors. Given the pervasive nature of attention impairments in this population, this finding underscores the importance of assessing, monitoring, and rehabilitating attention problems in order to maximize later adaptive outcome.

Correspondence: *Aimilia Papazoglou, M.A, Georgia State University, 140 Decatur Street, 7th Floor Room 772, Atlanta, GA, GA 30303. E-mail: apapazoglou1@student.gsu.edu*

Invited Symposium

9:00–10:30 a.m.

The Cognitive Neuroscience and Neuropsychology of Normal Aging and Alzheimer's Disease

Chair: **Betty Glisky**

Discussant: **Eric Reiman**

E. GLISKY. The Cognitive Neuroscience and Neuropsychology of Normal Aging and Alzheimer's Disease.

Symposium Description: In recent years, cognitive neuroscience and clinical neuropsychology have become increasingly interactive, each informing the other of new developments and concerns in ways that have

expanded the knowledge bases in both disciplines. In particular, the field of cognitive aging, both normal and pathological, has benefited from this merging of disciplines. In this symposium, we look at findings from cognitive neuroscience and neuropsychology, and from animal and human studies, to try to provide new insights into neurobiological and neuropsychological changes that occur in normal aging, in Alzheimer's disease (AD) and in those individuals at particular risk for Alzheimer's disease. We will discuss neurobiological and neuropsychological factors that may discriminate between normal and pathological aging, consider new neuroimaging methods that might provide early indicators of AD pathology, report on the potential effectiveness of aspirin and non-steroidal anti-inflammatory drugs for reducing AD risk, and consider new ways of assessing and interpreting neuropsychological test performance of individuals with, or at risk for AD.

Correspondence: *Elizabeth L. Glisky, Ph.D., Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ, 85721, E-mail: glisky@u.arizona.edu*

C.A. BARNES. Cognitive Changes in Normal Aging: What Does the Hippocampus Contribute?

Objective: Aging is associated with specific impairments of learning and memory, some of which are similar to those caused by hippocampal damage. Studies of the effects of aging on hippocampal anatomy, physiology, plasticity and network properties in rats suggest a high degree of specificity in such age-related changes in the different subregions of this structure. Experiments will be reviewed that link changes in cognition to selective deficits in plasticity mechanisms, altered hippocampal network dynamics and network activity pattern reactivation in old rats. Recent electrophysiological data collected in primate hippocampus will be presented that indicate neural states similar to those observed in the rodent that are associated with memory consolidation. Finally, experiments will be described that point to the dentate gyrus in rats and monkeys, as being particularly vulnerable to changes in normal aging, which is quite distinct from the pattern observed in Alzheimer's disease.

Correspondence: *Elizabeth L. Glisky, Ph.D., Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ, 85721, E-mail: glisky@u.arizona.edu*

E.L. GLISKY. Neuropsychological Changes with Age: What is Normal?

Objective: Increasing age is associated with increased variability in cognitive function: Some older adults remain active and high functioning well into their 80s while others are struggling to keep going at 65. A challenge for psychologists and neuroscientists has been to try to account for this variability and to identify what is "normal" and what may be pathologic. This presentation will illustrate this variability in two cognitive domains that appear most affected by age—memory and executive function—in a large cohort of "normal" older adults aged 65-92. Specifically, longitudinal data will be presented showing that neuropsychological composite measures of medial temporal/memory function and frontal/executive function, decline independently over time. Further, although there is considerable inter-individual variability in the change trajectories, it still may be possible to identify a subset of individuals who are aging pathologically and a subset of individuals who are aging supernormally in one or both of these neurocognitive functions.

Correspondence: *Elizabeth L. Glisky, Ph.D., Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ, 85721, E-mail: glisky@u.arizona.edu*

L. RYAN. Assessing risk for Alzheimer's disease using diffusion-weighted MRI.

Objective: Accurate diagnosis of Alzheimer's disease (AD) in its earliest stages, prior to the onset of cognitive symptoms, remains an impor-

tant challenge for researchers. I will describe an ongoing project that is designed to assess the utility of diffusion-weighted MRI in identifying early neuropathological markers of AD. Recent evidence suggests that inflammation may be an early contributor to the development of AD pathology. Diffusion MRI is sensitive to the presence of inflammation in the brain, and may be particularly useful as a marker of early AD. In this project, we compare regional diffusion MRI measures in cognitively normal older adults with no known risk for AD to older adults with one or more known risk factor for AD, including genetic susceptibility and mild cognitive impairment. Other factors may actually decrease risk for AD, such as taking a daily aspirin, or long term non-steroidal anti-inflammatory (NSAID) use in chronic arthritis patients. Results to date show that genetic risk for AD is associated with a pattern of diffusion consistent with the presence of inflammation, particularly within medial temporal lobe regions. In other regions, genetic risk is associated with more pronounced age-related changes in diffusion. Importantly, both aspirin and long-term NSAID use appear to have a beneficial effect on brain function measured by diffusion MRI and these effects can outweigh the negative impact of genetic risk. The results suggest that diffusion MRI may provide a sensitive marker of early inflammation associated with AD pathology, and that anti-inflammatory drugs may have ameliorative effects on brain function.

Correspondence: *Elizabeth L. Glisky, Ph.D., Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ, 85721, E-mail: glisky@u.arizona.edu*

A.W. KASZNIAK. Connecting Cognitive Neuroscience and Neuropsychological Assessment in Alzheimer's Disease.

Objective: Over the past several years, developments in cognitive neuroscience have led to both new interpretations of traditional clinical neuropsychological test performance of persons with Alzheimer's disease (AD) and to the development of new assessment approaches. This presentation will review these developments, with a particular emphasis on the assessment of memory, metamemory, and executive functioning. The presentation will also examine present gaps in the neuropsychological assessment knowledge base concerning persons with, or at risk for AD, and possibilities for basic cognitive neuroscience to help close these gaps.

Correspondence: *Elizabeth L. Glisky, Ph.D., Department of Psychology, University of Arizona, PO Box 210068, Tucson, AZ, 85721, E-mail: glisky@u.arizona.edu*

Symposium 1

9:00–10:30 a.m.

Functional Neuroimaging and Sport-Related Concussion: A 5-Year Study

Chair: Jamie Pardini

Discussant: Jeff Barth

M. LOVELL, J. BARTH, J. PARDINI, J.T. BECKER, D. PARDINI & W. EDDY. Functional Neuroimaging and Sport-Related Concussion: A 5-Year Study.

Symposium Description: This symposium presents original data from the largest functional neuroimaging study of sport-related concussion.

Findings are derived from data acquired on over 200 injured athletes and controls. Primary objectives for the symposium include: 1) provide background information on functional neuroimaging research as applied to sport-related concussion, 2) describe the study methodology, participant characteristics, procedures, and future directions of the project, and 3) examine between- and within-group differences in functional, neuropsychological, and symptom data associated with concussion. Presenters will detail data from the concussed and recovered phases of the study for injured athletes, as well as examine the stability of data across two time points for control athletes. Further, preliminary magnetoencephalography (MEG) data, acquired in a subsample of the study, will be presented. Relevance of findings to the clinical practice of concussion assessment and management will be discussed, as will future directions for the study of concussion using neuroimaging methodology. Presenter's Roles:

Mark Lovell, PhD, ABPN, will be the chair of the symposium and is the Principal Investigator of the grant. He will present background literature, study methodology, and description of the sample.

Jamie Pardini, PhD, will review neuropsychological and behavioral data. James Becker, PhD, will review fMRI findings related to between-group differences.

Dustin Pardini, PhD, will review fMRI findings related to within-group differences.

William Eddy, PhD, will present preliminary MEG data.

Jeff Barth, PhD will serve as the discussant.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

M. LOVELL. Functional Neuroimaging and Sport-Related Concussion: An Overview.

Objective: Contact sports provides an excellent opportunity to study the physiological recovery process that occur following mild traumatic brain injury (concussion). To date, we have studied over 200 athletes through a five-year NIH-funded grant titled "functional MRI and sport-related concussion". This presentation will review the scientific literature that formed the foundation for this study and will explore fMRI as a research tool. The relationship between fMRI, neuropsychological and self-report data will be discussed as this information relates to making return to sport decisions.

Participants and Methods: Concussed athletes underwent evaluation within one week of injury. All athletes in the concussed group were symptomatic and demonstrated impairment on neurocognitive testing at the time of their first fMRI study. Data collected included structural and functional MRI (fMRI), neuropsychological test data and self-report symptom data. fMRI data were acquired while participants completed two tasks "in scanner": 1) an n-back test, designed to detect changes in neurometabolic activity during a task of increasing working memory load, and 2) a task designed to assess response inhibition. Concussed athletes received fMRI scans while concussed and when determined to be recovered based on current international concussion management guidelines. An age-matched non-injured athlete control group also received functional fMRI scans and ImPACT testing at two time points, corresponding to the assessment periods of concussed group.

Results: Although currently a research tool, fMRI is likely to be increasingly utilized as a clinical tool in the management of sports-related MTBI.

Conclusions: Our current 5 year study of recovery from concussion in high school and college age athletes suggests that this technology can provide useful information regarding the recovery process. Furthermore, fMRI technology is likely to prove useful in developing establishing future guidelines for return to sport following concussion.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

J. PARDINI. Neuropsychological and Neurobehavioral Sequelae of Concussion.

Objective: Current international guidelines for the management of sport-related concussion suggest that an athlete be withheld from contact sport until he or she is asymptomatic at rest, asymptomatic with graded exertion, and within expected levels (or back to baseline) on neurocognitive testing. This presentation reviews the relation between neuropsychological data, symptom data, and concussion recovery in the largest functional MRI study of concussed athletes to date.

Participants and Methods: For the overall study, data were gathered from 155 concussed and 50 control student athletes (mean age = 17.25). Neurocognitive data was acquired through post-injury testing on the ImPACT computerized test battery, and symptom data was acquired through the Post-Concussion Symptom Scale. Athletes were evaluated, on average, 3.93 days after injury. Participants were re-evaluated at regular intervals until recovered.

Results: Across all four ImPACT composites (verbal memory, visual memory, visual motor speed, and reaction time), concussed subjects demonstrated significantly lower scores and significantly higher symptom scores than did non-injured controls ($p < .05$). In addition, athletes demonstrated impairment relative to their own baselines ($p < .05$). Once recovered, athletes' test scores were equivalent to those of their own baselines and controls. Control subjects demonstrated stability across two assessment periods for neuropsychological testing and symptom scores. **Conclusions:** The current sample demonstrated typical concussion-related cognitive deficits on neuropsychological testing, as well as increased symptom scores. Upon recovery, their scores were equivalent to scores of control athletes and their own baselines. Therefore, fMRI and MEG findings from this sample should be generalizable to concussed high school and collegiate athletes.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

J.T. BECKER, K.A. BERRYMAN, J. PARDINI, J. WELLING, W. EDDY & M. LOVELL. MRI Correlates of Sports-Related Concussion.

Objective: The purpose of this study was to examine alterations in brain structure and function following a sports-related concussion.

Participants and Methods: Subjects were concussed patients and age-matched controls (Age=16.6, SD=2.4; education=10.4 years, SD=2.2). Concussed athletes were evaluated after initial injury, and again after recovery. Control athletes were tested on the same schedule.

All subjects were scanned in a GE 3.0T system. Following acquisition of an anatomical MRI image (SPGR), subjects were scanned using reverse spiral sequences while they performed one of three types of N-back task conditions: 0, 1, and 2-back. Each condition was run four times, for a total of 12 "sessions" per subject.

Results: A Principal Components Analysis of eight identified activation foci from the N-back task revealed three significant networks corresponding to 1) middle and inferior frontal cortex; 2) medial frontal and superior temporal areas, and; 3) posterior parietal cortex, bilaterally. The circuit involving the posterior parietal cortex was significantly correlated with both cognitive ($r = -.49$) and somatic (e.g., blurred vision, headache, photophobia) ($r = -.46$) symptomatology. Recovery time was significantly associated with the activity of the second principal component (specifically midline BA6) ($B=1.44$, 95% CI = 1.16 - 2.45, $p=.019$) - those concussed athletes in the highest third of the distribution of activity had the longest time to recovery (57.5 + 46 days, $t(17)=2.50$, $p=.024$) compared to the remaining athletes (22.1 + 17.4 days).

Conclusions: This is the first study to link neurophysiological and neuropsychological functioning in a group of acutely head-injured subjects

and suggests that the mild residual post-concussive complaints are linked to regional changes in brain metabolism. Although this study has obvious implications for the understanding of recovery from mild traumatic brain injury in general, the findings are particularly relevant to the issue of return-to-play in high school age athletes.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

D. PARDINI. Examining Heterogeneity in Concussed Athletes Using Functional Neuroimaging.

Objective: Sport-related concussion is now recognized as a complex injury which affects injured individuals differently. Current international concussion management strategies created by the Concussion in Sport group advocate individualized concussion management that involves symptom assessment, neuropsychological testing, and graduated return to sport. Data derived from the current study provides further evidence of differences among concussed athletes.

Participants and Methods: Participants were concussed athletes seen within seven days of injury. Analyses examined functional activation during a working memory task and a variety of injury characteristics including: 1) total symptom severity, 2) symptom factors, 3) neuropsychological test performance, and 4) on-field markers of injury (e.g., loss of consciousness, retrograde amnesia, and anterograde amnesia).

Results: Concussed athletes who reported more severe symptoms exhibit increased activation on a working memory task in three distinct regions: right posterior cingulate, left cingulate gyrus, right inferior parietal lobule, and right cingulate (all $ps < .01$).

Conclusions: Data from this large study provides evidence of significant within-group differences among concussed athletes. These findings are consistent with previous neuropsychological research demonstrating the individualized nature of concussion.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

B. EDDY. Magnetoencephalography: Exploring the Electrophysiological Consequences of Concussion.

Objective: Magnetoencephalography (MEG) is a non-invasive procedure that allows for the measurement and localization of electrical activity in the brain. This presentation will introduce attendees to the technology and common procedures of MEG, then will review findings from a preliminary sub-study of concussed and control athletes from the larger fMRI study.

Participants and Methods: Healthy control subjects and concussed athletes were evaluated in a parallel imaging procedure, where they underwent both fMRI and MEG procedures. In both devices the subjects completed the "N-back" test of visual-verbal attention and memory. Task parameters were kept as similar as possible to permit comparison of the locus and extent of task specific responses.

Results: Purpose specific software was written to measure signal change (time locked to the stimulus presentation) in the fMRI and MEG experiments. Head movement (within and between test runs), muscle movement (e.g., tongue position), and eye movement artifacts were successfully removed from the MEG data stream. Signal change was reliably elicited from frontal regions in the MEG, in areas spatially contiguous with those identified for the same subjects in fMRI.

Conclusions: MEG-identified activation during a visual-verbal memory task can be described in terms of localization, amplitude, and time-lag, as they relate to behavioral data (e.g., accuracy, reaction time). Altered signal, especially delays in signal change, are a sensitive marker of mild cognitive dysfunction.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: pardinij@upmc.edu*

Poster Session 2: Imaging/Assessment

9:00–10:30 a.m.

Assessment/Psychometrics

F.S. AHMED, L. MILLER & L. ABNER. Assessment of Theory of Mind: Variance among Measures.

Objective: Theory of Mind (ToM) refers to the ability to comprehend the mental state of another and has been linked to Executive Functioning in previous studies. This study examined the variance among three tests of ToM, each of which measures a different aspect of ToM. It is hypothesized that there will be a moderate correlation among these tests.

Participants and Methods: Twenty students from the University of Georgia participated in this study. Participants were administered The Reading the Mind in the Eyes Test, The Strange Stories Test, and The Faux Pas Test. These tests assess different components of ToM. The Reading the Mind in the Eyes Test measures emotion recognition (a fundamental ability in ToM) by presenting pictures of actors' eyes, each expressing a different emotion. The Strange Stories Test assesses the general ability to infer another person's mental state through the use of vignettes. The Faux Pas Test measures the most complex form of ToM (the faux pas) also through the use of vignettes.

Results: Correlational analyses were conducted on the obtained scores of the three tests. Surprisingly, no significant correlations were found.

Conclusions: It was hypothesized that although the tests measure different aspects of ToM, there should be a moderate correlation among them, representing the fundamental domain of ToM. However, the lack of association suggests that the ToM tests may actually represent independent domains. As each of these tests is widely used in the literature for ToM assessment, sometimes in isolation, further study into the variance among these tests is needed.

Correspondence: *Fayeza S. Ahmed, B.S. Psychology, Psychology, University of Georgia, 125 Jennings Mill Pkwy, Apt 7303, Athens, GA 30606. E-mail: ahmedfs@gmail.com*

E.J. ANDERSON, M.M. RYBA & M.D. HORNER. Use of Standard Neuropsychological Measures as Indicators of Insufficient Effort.

Objective: The utility of multiple, standard neuropsychological measures as indicators of effort was evaluated in a heterogeneous clinical sample. Reliable Digit Span and Digit Span were predicted to be sensitive indicators of effort.

Participants and Methods: Data were reviewed from 339 patients referred for neuropsychological evaluation at a VA medical center. Patients were classified as providing suspected good (GE) or suspected insufficient effort (IE) based on performances on Test of Memory Malingering (TOMM) or Portland Digit Recognition Test (PDRT), using cutoffs described in each test's manual. Twenty-one patients were excluded from analyses due to uncertainty about their classification (e.g., discrepant findings between PDRT and TOMM, and other less reliable effort tests such as the Rey 15-Item Test).

Performances on WAIS-III Digit Span, WMS-III Mental Control, Reliable Digit Span, Trails A and B, Wisconsin Card Sort, COWA, and Rey-Osterrieth Complex Figure Test) were compared between GE ($n=241$) and IE ($n=77$) groups. Receiver Operating Curve (ROC) analyses were used to determine best-fitting cut-offs, sensitivity, specificity, PPV, and NPV estimates.

Results: The GE and IE groups significantly differed on all measures except WCST variables. Mental Control, Digit Span, and Reliable Digit Span were the best indicators of effort with sensitivity ranging from 47-59%, and specificity ranging from 83-86% [PPV 51-55%; NPV 84-87%]. Other tests examined did not reliably discriminate between GE and IE.

Conclusions: Reliable Digit Span, Mental Control, and Digit Span were the best indicators of effort. In the context of other data (e.g., SVT's, behavioral observations), these measures may be useful in determining effort.

Correspondence: *Emily J. Anderson, Ph.D., Psychiatry, Beth Israel Deaconess Medical Center, Massachusetts Mental Health Center, Harvard Medical School, 401 Broadway, Providence, RI 02909. E-mail: emilyjoanderson@yahoo.com*

L. ASHENDORF, M.K. O'CONNOR, R.C. GREEN, A.L. JEFFERSON & R.A. STERN. Older Adult Normative Data for Trail Making Test Errors.

Objective: The Trail Making Test (TMT) regularly ranks among the most commonly-used neuropsychological measures, and it has been used with a variety of patient populations. Interpretation of the TMT has traditionally been limited to examination of the time to completion of the test. The error rates on both parts of the TMT (A and B) are often considered qualitatively, but have limited empirical support, particularly in older adult populations. The aim of the present study was to describe TMT error frequencies in a sample of healthy, older adults.

Participants and Methods: All participants were enrolled through the Boston University Alzheimer's Disease Core Center (BU-ADCC) patient/control registry. A sample of 218 healthy, older adults between the ages of 55 and 98 ($M = 72.6$, $SD = 8.7$) were identified by a multidisciplinary diagnostic review team consisting of specialists in neurology and neuropsychology. Exclusion criteria for the present study included a consensus diagnosis of dementia or mild cognitive impairment, a history of major psychiatric illness, other neurological illness, or head injury with loss of consciousness.

Results: Error rates on both TMT-A and TMT-B are reported in cumulative percentages. For TMT-B, data are reported by age (55-69 and 70-98) and education (<16 years and 16+ years).

Conclusions: This study reports normative data for TMT error rates. As the commission of errors can be elevated in clinical populations (e.g., Mahurin et al., 2006), these data add useful information to aid in the clinical interpretation of TMT performance.

Supported by NIH grants P30-AG13846 and M01-RR00533

Correspondence: *Lee Ashendorf, Ph.D., Psychology, Edith Nourse Rogers Memorial Veterans Hospital, 200 Springs Road, 116B, Bedford, MA 01730. E-mail: lash@bu.edu*

R. ENGLER, T. ATCHISON & A. CALENS. Factor Analysis of the Ward 7 Subtest Short Form of the WAIS-III.

Objective: Ward developed a 7 subtest short form for the WAIS-R that has proven reliable (Ward, 1990). This form has also provided reliable Verbal, Performance and Full scale estimates of the WAIS-III (Ryan & Ward, 1999). However, no study has explored the factor structure of this form. This study performed a factor analysis of a sample of individuals that had been given the Ward short form in a previous study.

Participants and Methods: Participants ($N = 146$) were solicited from introductory psychology classes. Average age was 19.91 ($SD = 3.15$), 64% female and FSIQ was 103.59 ($SD = 10.51$). They were administered the Ward form of the WAIS-III and Matrix Reasoning given under varying instructions.

Results: A PCA extraction with a varimax rotation was performed. Two factors emerged with Eigenvalues above one, Factor1 = 2.854 and Factor2 = 1.178. Factor loadings indicated a Verbal and Performance Factor would be the best solution. Similarities, Arithmetic, and Information all loaded above .7 on the First Factor. Picture Completion Digit Symbol loaded above .65 on the second factor. Block Design loaded highest on the Second factor .548 but had a second loading on the first factor of .517.

Conclusions: The study tends to confirm that the Ward 7 subtest short form does contain two factors best described as Verbal and Performance. The verbal factor appears to be the stronger factor but likely contains elements of general IQ. This is seen in that Block Design tends to load on both factors significantly but does load higher on the second factor. Correspondence: *Timothy Atchison, Ph.D., Psychology, West Texas A&M University, P.O. Box 60867, Canyon, TX 79016. E-mail: tatchison@mail.wtamu.edu*

T.M. ATKINSON & S.J. RYAN. Age Differences in the Switching Component of Phonemic Fluency in the Written Version of COWA.

Objective: Recent literature has established that the Controlled Oral Word Association (COWA) test yields two components of phonemic fluency: clustering (i.e., the production of words within subcategories) and switching (i.e., the ability to shift between clusters). The purpose of the present study was to investigate the factor structure of the written version of the COWA and performance differences on these components across age and gender groups.

Participants and Methods: A total of 197 male ($n = 100$) and female ($n = 97$) high school and college students aged 13-26 ($M = 17.9$) were administered the written version of the COWA in groups of 25-30 as part of a baseline measurement of neuropsychological function. This version of the COWA permits three minutes each for the participant to write down as many words as they can recall that begin with the letters "F", "A", and "S," respectively.

Results: Confirmatory factor analysis techniques yielded a two factor structure (i.e., switching and clustering) as the best fit for the data. Factorial invariance was demonstrated across gender and age groups. A latent means analysis demonstrated that high school students engaged in more switching than did college students.

Conclusions: In comparison to previous findings, the written version of the COWA represents the same theoretical constructs as the original COWA, with age dependent differences appearing at an even younger age. Fewer instances of switching among high school students indicate developmental differences in cognitive flexibility and should be considered by clinicians when measuring phonemic fluency in adolescents.

Correspondence: *Thomas M. Atkinson, MA, Curry School of Education, University of Virginia, 2021 Ivy Rd. Apt. D-4, Charlottesville, VA 22903. E-mail: tma9j@virginia.edu*

J.P. RYAN, T.M. ATKINSON, K. BUCK, A. LENT, R. CODER, H. SCHAFFER, H. SWEET, G. YOUNG, A. WALLIS & T. POWERS. The Use of Alternate Forms of the Trail Making Test to Facilitate Serial Neuropsychological Assessment.

Objective: While the Trail Making Test (TMT) is one of the most commonly used neuropsychological assessment instruments, it is susceptible to significant practice effects when administered repeatedly to monitor recovery from neurocognitive impairment. With the advent of several alternate versions of the TMT, it was proposed that the use of these alternate forms in serial assessment would assist in minimizing practice effects. To accomplish this, structural analyses were performed to investigate the construct validity of the TMT, Planned Connections (PC) from the Cognitive Assessment System, and the Connections Task (CT), as well as determine whether these measures could be used interchangeably with minimal practice effects.

Participants and Methods: Over a three week period the tests were individually administered to 133 undergraduate psychology students in six possible orders. Using confirmatory factor analysis, a two factor model (sequencing-switching) was identified as the best fitting model for the data as an alternative to a one factor or three factor (sequencing-switching-scanning) model.

Results: As demonstrated by the structural analyses, the two factor model was invariant across groups. A latent mean analysis showed no differences between the factor means for each of the groups, indicating the absence of order effects.

Conclusions: The results indicated that the TMT, PC, and CT share the same underlying factors of sequencing and switching. Structural analyses provided evidence that these measures can be used interchangeably in serial assessment without discernable practice effects. These results can assist clinicians in making meaningful interpretations of the post-traumatic recovery of sequencing and shifting abilities.

Correspondence: *Thomas M. Atkinson, MA, Curry School of Education, University of Virginia, 2021 Ivy Rd. Apt. D-4, Charlottesville, VA 22903. E-mail: tma9j@virginia.edu*

G.P. RYAN, J.P. BAERWALD & B.A. DAVIS. Reported Depressive Symptomatology and Verbal-Performance Differences.

Objective: To examine the relationship between reported depressive symptoms and VIQ-PIQ discrepancy.

Participants and Methods: Participants (n=9) were volunteers at a private liberal arts college. At the time of the study all participants denied psychological or academic difficulties.

Participants were administered the Wechsler Adult Intelligence Scale-3rd Edition and the Minnesota Multiphasic Personality Inventory-2. Participants' responses were compared on the discrepancy between verbal and performance scales and the depression subscales of the MMPI-2 (i.e., subjective depression, psychomotor retardation, physical malfunctioning, mental dullness and brooding).

Results: Results indicated a significant correlation between VIQ-PIQ difference and mental dullness in the depression subscales.

Conclusions: Results show that even in a "healthy" student population, whom deny psychological difficulties, affective features of depression have an effect on verbal-performance abilities.

Correspondence: *Gregory P. Ryan, Psy.D., Psychology, Loyola College, 4505 Brightwater Court, Apartment F, Owings Mills, MD 21117. E-mail: gryan@loyola.edu*

S. BOWDEN. Interpreting clinical dissociations: Why does test theory matter?

Objective: Double dissociations, as one class of clinical evidence, have attracted much attention in single case methods for identifying independent cognitive processes. Even low correlations between scores in clinical samples are sometimes accorded the status of dissociation evidence. Recently, studies have described operational definitions of dissociations and innovative statistical tests for identifying dissociations. However psychological test theory shows that these kinds of evidence are ambiguous.

Participants and Methods: Simple bivariate scatter plots (scores on Test X plotted against scores on Test Y) of samples of real clinical data, drawn from the authors archive, will be used to show that as the observed correlation between two scores decreases, the base rate of "dissociated" scores increases. Single cases satisfying the criteria for double dissociations can also be identified in these scatter plots.

Results: A correlation between two scores may be low because the two scores measure different psychological constructs (or latent variables). A correlation may also be low because two scores measure the same construct but one or both scores are unreliable. The construct or latent variable composition of scores cannot be determined from single case studies.

Conclusions: Unless we know the reliability of a test score and the psychological construct or latent variable composition of that score, in the relevant clinical population, we cannot interpret dissociations. But

if we know this information, then the purpose of seeking dissociations becomes redundant. These considerations suggest that clinicians should adopt a conservative approach to inferences of clinical "dissociation." Clinicians should be particularly wary of claimed dissociations when the scores in question are of low or unknown reliability.

Correspondence: *Stephen C. Bowden, Psychology, University of Melbourne, Redmond Barry Building, Parkville, VIC 3010, Australia. E-mail: sbowden@unimelb.edu.au*

F.W. BYLSMA & T.N. SCHIRMER. Cuing Effects on Boston Naming Test (BNT) Performance.

Objective: The BNT is the most widely used confrontational naming test in neuropsychological practice. Administration can be lengthy, taking up to 60 sec/item [20 sec to respond spontaneously; 20 sec to respond after a semantic cue (SEM); 20 sec after an optional phonemic cue (PHO)] for a potential total 40-60 minute administration time. Correct responses after a SEM – but not PHO – cue are counted in the total score. The clinical utility of SEM cues has been questioned, with research on the BNT & other naming instruments suggesting little effect; PHO cues are more helpful. The effect of SEM & PHO cuing on BNT performance was assessed in a group of geriatric patients to determine if cuing results in clinically significant improvement over spontaneous BNT naming performance alone.

Participants and Methods: The BNT was administered to groups of Alzheimer type (n=13), vascular (n=22), and mixed/other (n=11) dementia patients according to standard administration rules. Groups were equal in age, education, and estimated premorbid IQ.

Results: Spontaneous naming scores were equal across groups (about 40 items), and the groups benefitted equally from cues (about 1.5 additional items after SEM; about 5 items after PHO). Only 7 of 46 patients (15%) improved in naming deficit severity classification (Severe, Moderate, Mild, Average range) when correct responses after SEM cues were added, but 21 patients (46%) did when correct responses after PHO cues were added, and 22 (48%) did when both were added. The majority of those improved by only 1 classification category. Only 1 person (vascular dementia) improved more with SEM than PHO cues.

Conclusions: The effect of semantic cuing on BNT performance is small, and of clinical significance in a only small minority of patients. Phonemic cuing resulted in greater improvement than did semantic cuing and may be more clinically relevant. These findings are consistent with previous research on the effects of semantic and phonemic cueing across a variety of naming instruments.

Correspondence: *Frederick W. Bylsma, Ph.D., Neuropsychological Services, PC, 180 North Michigan Avenue, Suite 2210, Chicago, IL 60601. E-mail: nps_pc@sbcglobal.net*

T. CAROTHERS, M. DANIEL & K. BROCKWOOD. Ecological Validity of Neuropsychological Tests for Predicting Navigational Ability After Unilateral Brain Damage.

Objective: There is limited empirical evidence regarding how accurately neuropsychological tests predict real-world abilities. Basic daily activities such as navigational ability have been researched; however, previous studies generally have not taken into consideration laterality of brain damage. The present study examined the potential of neuropsychological test performance to discriminate patients with right and left-hemisphere damage that can and cannot navigate in their environment.

Participants and Methods: Participants were 126 inpatients in an acute physical rehabilitation unit: 76 participants had right-hemisphere damage and 50 had left-hemisphere damage. The patients were assessed using a variety of neuropsychological measures and their ability to independently navigate a standard route was determined.

Results: Logistical regression analyses were conducted. Rey-Osterreith Complex Figure copy was the only significant predictor of navigational ability for patients with right-hemisphere damage; the regression equa-

tion accurately predicted 88.9% of the right hemisphere patients who could navigate and 63.2% who could not. None of the neuropsychological measures entered the regression equation as predictors of navigational ability for the patients with left-hemisphere damage and this likely was due to the low number of patients with left-hemisphere damage who were unable to navigate ($n = 6$).

Conclusions: Based on neuropsychological test performance, the likelihood of predicting that a patient with right-hemisphere damage is able to navigate their environment when in fact they cannot is relatively low. Few left hemisphere patients have problems navigating a rehearsed route and neuropsychological test performance does not reliably identify those few who do.

Correspondence: *Tracy Carothers, MS, Pacific University, 20756 SW Kinnaman Rd, Aloha, OR 97007. E-mail: tcarothers@pacificu.edu*

R.T. CARROLL, B.D. STEH, S.J. MOTIVALA, C. NUNEZ, B. CELAYA, L.E. HOLT & J. SCHAEFFER. The Relationship Between MMPI-2 Depression Scores and Cognitive Functioning in a Heterogeneous Neuropsychiatric Sample.

Objective: The MMPI-2 is widely used in neuropsychological evaluations and a common assumption is that elevated depression scores are associated with cognitive weaknesses. The purpose of the current study was to determine whether Scale 2 (Depression) of the MMPI-2 is associated with reduced cognitive functioning in the areas of attention, processing speed, memory, and executive/frontal systems.

Participants and Methods: Sixty-seven participants were seen as part of a comprehensive neuropsychological evaluation in a large university-based hospital setting. Of our sample, 43% were women and 21% were inpatients. Ages ranged from 17-72 years of age ($M=40$, $SD=14$). Participants had 15 ± 3 years of education. Data for the study were derived from an archival database that included a clinical interview, MMPI-2, WAIS-III, WMS-III, Trail Making, RAVLT, verbal fluency, and WCST. **Results:** Multiple regression analyses were used to determine whether Scale 2 scores were associated with cognitive functioning measures. For scaled scores, education level and gender were included as covariates. For raw scores, age was also included. Age was a significant covariate for Trails B and WCST-Total Errors ($p<.05$); education was a significant covariate for RAVLT-Total Recall and both education and gender were significant covariates for RAVLT-Long Delay ($p's<.05$). Results indicated that Scale 2 scores were not significantly associated with any of the proposed cognitive measures ($p's>.05$).

Conclusions: In the current study, depression scores were not associated with neuropsychological functioning in the expected domains. These findings suggest that depressive symptoms are not linearly associated with cognitive functioning in a heterogeneous sample of neuropsychiatric patients. Thus, clinicians should exercise caution when interpreting MMPI-2 depression scores as potential evidence of mood-related cognitive dysfunction.

Correspondence: *Bill D. Steh, Ph.D., Semel Institute/Resnick Neuropsychiatric Hospital, UCLA, 760 Westwood Plaza, Room CS-734, Los Angeles, CA 90095. E-mail: bsteh@mednet.ucla.edu*

D. COBIA, J.D. WRIGHT & J.D. GFELLER. Investigating the Extended Complex Figure Test and Motor Independent Version in Individuals with Traumatic Brain Injury.

Objective: The Extended Complex Figure Test (ECFT; Fastenau, 2003) is a variation of the original Rey-Osterrieth Complex Figure Test (CFT). The ECFT includes a motor independent administration (MI-ECFT) which is ideal for individuals with upper extremity motor impairments. The primary goal of this research was to examine the utility of the full ECFT administration and the MI-ECFT version in individuals with traumatic brain injury (TBI) and upper extremity motor dysfunction. A review of current TBI literature reveals the ECFT has yet to be specifically examined in this population, and thus invites inquiry.

Participants and Methods: Individuals with TBI of varying severity ($n=19$) were administered the full ECFT as part of a neuropsychological battery. In addition, individuals with TBI and upper extremity motor impairment ($n=20$) were administered the MI-ECFT. The groups did not differ on age, gender, race, or injury severity (e.g., GCS).

Results: Means and standard deviations of recognition scores were generated for comparison purpose. A t-test on the recognition trial between full and MI-ECFT groups showed no significant differences [$t(36) = 1.26$, $p > .20$].

Conclusions: Consistent with findings from Keller and Fastenau (2000) in a neurologically intact population, motor encoding does not appear to enhance memory beyond visual encoding in individuals with TBI. These results support the use of the MI-ECFT in individuals who have sustained a TBI and have limited motor ability.

Correspondence: *Derin J. Cobia, Psychology, Saint Louis University, 3511 Laclede Ave., Shannon Hall 211, Saint Louis, MO 63103. E-mail: cobiadj@slu.edu*

J.R. CROMER, P. MARUFF & P.J. SNYDER. Internet-Based Games as Measures of Cognition: An Untapped Resource.

Objective: Computer-based tests of cognition delivered and/or administered via the Internet may be perceived as "game-like" and enjoyable to complete, and may also provide sensitive, valid, and reliable measurements of performance. Many programmers and web designers have created vast numbers of Internet-based games that might also provide useful neuropsychological data, despite this not being the intent of the programs.

Participants and Methods: Twenty subjects participated in this within-subjects, single-blind, cross-over design study. On the experimental day, each was given 250ml beverages containing 40% alcohol and 60% orange juice until they reached a blood alcohol concentration (BAC) of 0.10%. On another day they received a placebo. Across multiple time-points, each day, subjects used the mouse to rapidly and continuously correct the balance of a cartoon character who was, "staggering forward while drunk." A measure of the within-subjects effect size (Dunlap's d) differences were calculated for the ethanol and placebo conditions, separated by order of administration.

Results: This game demonstrated small to moderate effects of ethanol on cognition at around peak blood alcohol concentration (BAC). A MANOVA indicates a significant order of administration effect ($p<0.05$) for trials 1-4. **Conclusions:** This Internet-based game, originally developed solely for amusement, provided a sensitive gauge of ethanol's adverse effects on sustained attention and rapid visuomotor speed. This small study was intended as an exploration of whether Internet-based games, if retooled and administered under standard conditions, may provide neuropsychologically meaningful results.

Correspondence: *Jennifer R. Cromer, M.A., Psychology, University of Connecticut, 12S Green Road, Manchester, CT 06042. E-mail: jennifer.learner@uconn.edu*

S. DEVINE, W. RINN, H. DENISON, M. O'CONNOR, R. AU, P. WOLF & E. KAPLAN. The Framingham Heart Study Clock Scoring Protocol: An Introduction.

Objective: The objective is to introduce a new 25 point scoring protocol for the clock drawing test (CDT) to increase effectiveness in early detection of cognitive dysfunction. The CDT enjoys widespread use in both clinical and research settings, mainly because of the ease of administration and sensitivity in detecting impairments in clinical populations, particularly individuals with neurodegenerative disorders such as Alzheimer's disease (AD). Although various scoring systems have been developed to increase efficacy of the CDT, results have been mixed. With current emphasis on identifying prodromal stages of AD, the CDT scoring protocol warrants revisiting with the goal of extending its capacity to include ascertainment of pre-clinical symptoms.

Participants and Methods: The Framingham Heart Study has collected longitudinal clock drawings from individuals who were identified as being at risk for dementia. The CDT has been administered as part of a larger study on brain MRI and cognitive function of the Offspring cohort, most of whom are asymptomatic for neurologic disease.

Results: The CDT, comprised of a copy and command condition, is scored for qualitative features in four categories: the manner in which the participant 1) draws the outline; 2) places the numerals; 3) sets the time (ten after eleven); and 4) locates the center. The total score ranges from 0 to 25 points (normal to severe impairment).

Conclusions: Using the highly regarded Boston Process approach to measuring cognitive performance, the current Framingham CDT scoring protocol provides quantitative measures of qualitative behaviors. The newly developed scoring protocol is useful in single case as well as large scale applications.

Correspondence: *Sherral Devine, Ph.D., The Framingham Heart Study, Boston University, 73 Mount Wayte Avenue, Framingham, MA 01702. E-mail: sdevine@bu.edu*

L. EL-MESSIDI, L. GRANDE, R. MCGLINCHEY, C. BARBER & W. MILBERG. Assessment of Memory and Executive Function Awareness in Older Individuals.

Objective: Little is known about patients' awareness of and ability to report deficits within the broad domain referred to as "Executive Functions." The current study compared participants' self-report of memory and executive function difficulties to actual objective test performance within these domains using the Neuropsychological Impairment Scale (NIS).

Participants and Methods: Designed to elicit relevant diagnostic information that may be missed during an interview, the NIS contains seven cognitive impairment subscales assessing the areas of cognitive efficiency (cog), attention (att), memory (mem), frustration tolerance (fru), learning-verbal (l-v), and academic skills (acd). The pattern of responding on these subscales was compared to performance on a brief neuropsychological battery in a sample of 195 participants (148 cardiovascular patients, 47 healthy controls). Memory performance was assessed with the Hopkins Verbal Learning Test-Revised (HVLTR); executive functioning was assessed using phonemic fluency, semantic fluency, Trail Making A & B, and a clock drawing test. The NIS cognitive efficiency subscale differed between the participant groups, with impaired participants endorsing significantly more items associated with cognitive problems. Additionally, impaired participants endorsed significantly more memory, attention, and frustration items.

Results: Comparisons between participant groups on measures of executive functioning were non-significant, with a similar pattern of responding observed across the impaired and non-impaired participants.

Conclusions: This finding may be related to the cognitive deficits associated with executive function, as patients with executive dysfunction often experience poor insight into their behavior. As a result, they may be less likely to endorse NIS items reflecting cognitive problems.

Correspondence: *Lyla El-Messidi, BA, GRECC, Harvard Medical School/Boston VA, 150 South Huntington, Boston, MA 02130. E-mail: Lyla@heartbrain.com*

E. FLETCHER-JANZEN. The Influence of Socioeconomic Status on the Measurement of Cognitive Abilities: A Lurian Context.

Objective: This study sought to evaluate two modern cognitive ability batteries based on the psychometric abilities model, the KABC-II (Lurian neuropsychological theory-based) and the WISC-IV, with respect to their sensitivity to SES in several ethnic groups that vary considerably in SES and level of acculturation.

Participants and Methods: The six groups included in this study were African American (Virginia), Hispanic (Virginia and California samples), Hmong (California), Native American (Lakota Sioux), and Native Hawaiian. A total of 174 children and adolescents were administered the two instruments in counterbalanced order.

Results: The influence of SES, indexed by mother's level of education, on test scores and on the pattern of group mean scores was analyzed. In the total sample of 174 examinees, SES level correlated .39 with the WISC-IV FSIQ and .25 with the KABC-II FCI; the difference between these correlations is statistically significant ($p < .01$). High-SES examinees in the study tended to score higher on the WISC-IV than the KABC-II, whereas the reverse was true for low-SES examinees. It was noteworthy that the two groups showing substantially higher mean scores on the KABC-II than the WISC-IV were the two samples with extremely low distributions of SES.

Conclusions: Studies of ethnic group differences in cognitive abilities may be affected by the degree to which the measuring instrument is influenced by SES or acculturation, and how the theoretical design of the instrument is aligned with neuropsychological principles. Similar results have been found in studies of neuropsychological assessment instruments.

Correspondence: *Elaine Fletcher-Janzen, Ed.D., Psychology, University of Colorado, Colorado Springs, 445 Struthers Loop, Colorado Springs, CO 80921. E-mail: efj445@aol.com*

D.J. HARVEY & C. GOLDEN. Relationship of Demographic Variables to Derived Trail Making Test Indices Among Normal Older Adults.

Objective: Previous research supported the Trail Making Test (TMT) B/A derived index as an improved screening mechanism for cognitive impairment versus traditional scores due to its insensitivity to age effects. The present study examined the relationship between key demographic variables and an expanded range of TMT derived indices among older adults.

Participants and Methods: Participants were 120 neuropsychologically normal older adults. Mean age of the sample was 70.7 ($SD=9.2$) with mean education of 13.9 years ($SD=2.8$). The sample was 67% female. 76% were Caucasian, 16% Hispanic, and 6% African-American. 89% were right-handed. Participants were administered the TMT and all derived indices were calculated.

Results: A series of Pearson product-moment correlations was run to examine the relationship between demographic variables and TMT basic and derived-index scores. All TMT scores were significantly correlated with education ($p < .001$; r ranges -.35 to -.59) with B/A showing the least effects ($r = -.35$). Age was significantly correlated with all TMT scores ($p < .001$; r ranges .39-.57) except for B/A ($p = .437$; $r = .07$). No significant effects were found for gender. 82% of the sample was correctly classified as non-impaired using a B/A ratio cutoff of 3.0 versus 49% and 56% using standard time cutoffs.

Conclusions: All TMT basic and derived index scores were susceptible to the effects of age except for B/A. The B/A ratio also correctly classified a higher percentage of the sample as normal compared to commonly used time cutoff scores. The B/A ratio was recommended for use as an improved screening measure for older adults.

Correspondence: *Daniel J. Harvey, M.S., Psychology Service, Louis Stokes Cleveland Department of Veteran Affairs Medical Center, 1278 W 9th Street, Suite 633, Cleveland, OH 44113. E-mail: dan-harvey@sbcglobal.net*

V. HUGHITT, R.J. SPENCER, S. RICE, P.P. GIGGEY, S.L. SELIGER, L.I. KATZEL & S.R. WALDSTEIN. Time Estimation Predicts Performance on Neuropsychological Tests: Preliminary Findings.

Objective: Time estimation, a quickly administered task, has received scant attention as a neuropsychological instrument.

Participants and Methods: In the present study, we examined the correlation between performance on a retrospective time estimation task and established measures of neurocognitive function in a sample of 58 community-dwelling volunteers (mean age = 68.3 years, education = 15.4 years) participating in either a study of hypertension or chronic kidney disease. We recorded the time taken for participants to engage in several tasks and then asked them to estimate the length of time elapsed since the initial test in the series. Time estimation performance was recorded as the difference between estimated and actual time elapsed to the nearest minute ($M=4.3$, $SD=2.3$). We compared these scores with age, education, and performance on 15 established neurocognitive measures, including tests of memory, verbal fluency, psychomotor speed, and executive function. Time estimation did not correlate significantly with age or education.

Results: Correlational analyses revealed significant Pearson coefficients with nine of the 15 tasks (Logical Memory Immediate = $-.29$, Trails-A = $.29$, Trails-B = $.32$, Stroop Color-Word Test = $-.40$, Judgment of Line Orientation = $-.26$, Verbal-Fluency = $-.40$, Digit-Span Forward = $-.37$, and Semantic Fluency Animals = $-.34$ & Supermarket items = $-.49$). Notably, time estimation performance correlated with each of the 15 neurocognitive tasks in the expected direction, with more accurate estimation predicting superior cognitive performance.

Conclusions: These results provide evidence that retrospective time estimation is sensitive to cognitive ability, and has potential as a stand-alone assessment instrument.

Correspondence: Robert J. Spencer, M.S., Psychology; UMBC, 1000 Hilltop Circle, Baltimore, MD 21250. E-mail: rspencer@umbc.edu

R.A. JENKINS, J.S. CAROSELLI & R.O. TEMPLE. Anatomy of the Token Test: Which Items Best Predict Language and Executive Function Abilities?

Objective: The MAE Token Test, a verbal comprehension measure, consists of relatively simple items (Part A) and items involving more complex relational concepts (Part B). The relative association of Part A and Part B items to other language and executive function abilities has not been well-examined. With Parts A and B analyzed together, it was hypothesized that Part B would have unique variance associated with other language abilities and executive skills. Part B's hypothesized relationships were attributed to its semantic complexity added by relational operators (i.e., with, on, except) not found in Part A.

Participants and Methods: The MAE Token Test was given to 205 inpatients upon admission to a post-acute brain injury rehabilitation program. Separate multiple regression analyses were conducted with COWA (language) and WCST categories completed (executive) serving as the criterion variables and Part A and Part B items as the predictors. Additional analyses examined whether Part B items, grouped by relational operator, differentially related to language and executive functioning.

Results: For COWA, 17% of its variance was accounted for by Part A and Part B results, with only Part B being significant ($p < .05$). For WCST categories completed, 6% of its variance was accounted for by Part A and Part B results, with again only Part B being significant ($p < .05$). Furthermore, when investigating the relationship of Part B's various operators with language and executive function abilities, significant differential results were found.

Conclusions: In this study, Part B of the Token Test appears to have predictive utility over and above Part A with respect to its relative unique relationship to other language and executive function abilities. Furthermore, the various operators used in Part B have a further differential relationship with these other constructs.

Correspondence: Russell A. Jenkins, M.A., Psychology, University of Houston, 126 Heyne Building, Houston, TX 77204-5022. E-mail: rajenkins@uh.edu

A.E. KANE, A. MALKINA, D.P. SALMON & D. GALASKO. Evaluation of the 7 Minute Screen in Elderly Primary Care Patients with Memory Complaints.

Objective: The 7 Minute Screen (7MS) uses measures of orientation, free and cued recall, animal fluency, and clock-drawing in a regression based formula to classify an individual as having low, moderate, or high probability of dementia. The purpose of this study is to examine the sensitivity of the 7MS in relation to rigorous tests of memory and executive function in elderly primary care patients.

Participants and Methods: The MMSE, 7MS, WMS-R Logical Memory (LM) Test, and Trail Making Test, Part B (TMT) were administered to 110 elderly patients with memory complaints in a memory screening clinic. Patients were subsequently diagnosed with MCI or dementia within 1-year of testing.

Results: Seventy-five percent (82/110) of patients performed within normal limits on the MMSE. Thirty-five percent (38/110) were classified as having low, 3% (3/111) moderate, or 63% (69/110) high, probability of dementia on the 7MS. Impaired performance (i.e., below the 25th percentile using age-corrected norms) on LM delayed recall was exhibited by 63% (24/38) of patients with low, 67% (2/3) with moderate, and 97% (67/69) with high probability of dementia. Impaired TMT performance was exhibited by 49% (18/37), 67% (2/3), and 86% (51/59) of patients with low, moderate, and high probability of dementia on the 7MS.

Conclusions: These results suggest that memory impairment is quite prevalent in elderly primary care patients, even when they perform normally on brief screening measures such as the MMSE and 7MS. Rigorous memory and executive function measures are necessary to effectively evaluate potential memory impairment associated with aging, MCI, or early dementia in the primary care setting.

Correspondence: Amy E. Kane, B.A., Clinical Psychology; SDSU/UCSD Joint Doctoral Program, 9500 Gilman Dr. 094S, La Jolla, CA 92093-094S. E-mail: aekane@ucsd.edu

J. KATZENSTEIN, B. LEJEUNE & K. JOHNSON. Validity of Parent Report in Assessing Language Among Internationally Adopted Children.

Objective: International Adoptees (IAs) commonly demonstrate language delays due to pre-adoption deprivation, loss of native language, and immersion in a novel language. Monitoring language development is key to providing timely intervention. In typical development, parent report is a valid, necessary component of language assessment. The present study evaluated the validity of these measures in the IA population, given that parents have spent less time with their child when reporting language.

Participants and Methods: Participants were 47 IA children (77% female) ages 12 to 34 months ($M=21.83$, $SD=5.69$), who initially were tested 6-12 months after adoption, and 12 months later. At baseline, parents completed the MacArthur-Bates Communicative Development Inventory (CDI) and the Mullen Scales of Early Learning (MSEL; including expressive language subscale) was administered. At follow-up, parents completed the Language Development Survey (LDS) of the Child Behavior Checklist, and the MSEL was repeated.

Results: There was a modest correlation between baseline CDI vocabulary production and MSEL Expressive Language scores ($r = 0.35$; $p < 0.05$). After 12 months, the correlation between the LDS and MSEL Expressive Language was 0.62 ($p < 0.01$).

Conclusions: This is the first study to compare direct and indirect measures of language development among IAs at two time points. The findings at 12 months might reflect parents' increased sensitivity to their child's expressive language capabilities and suggest that validity of parent report increases with the amount of time since adoption. Although findings do not provide definitive insight regarding validity, they do support an approach that utilizes both objective and subjective measures of expressive language.

Correspondence: Jennifer Katzenstein, MS, Indiana University Purdue University Indianapolis, 402 N. Blackford Street, LD 124, Indianapolis, IN 46202. E-mail: jkatzens@iupui.edu

T.M. MARTIELLI, L. BENNETT BLACKBURN & J.D. GFELLER. Boston Naming Test Norms for 15 through 18 year old Adolescents.

Objective: The Boston Naming Test (BNT), a component of the Boston Diagnostic Aphasia Examination, is often used by neuropsychologists to assess the integrity of the language system associated with confrontation naming. While the naming of an object requires several cognitive processes to work in concert, the BNT is most often associated with dominant left temporal lobe functioning. Research indicates that performance on the BNT is impacted by a variety of factors including age, measured intelligence, educational attainment, ethnicity and gender. However, descriptive data are scarce for neurologically intact adolescents. In this investigation, we explored normative performance on the BNT in 15 through 18 year old adolescents.

Participants and Methods: Our sample included 200 participants (100 male, 100 female) who were thoroughly screened to exclude individuals with neurological, psychiatric or academic difficulties. The BNT-2 (Kaplan et al., 2000) was administered using instructions provided in the stimulus manual. The sample had a mean estimated IQ of 103 based on Wechsler Test of Adult Reading performance.

Results: There were no significant differences in BNT scores based on gender, age, or grade. Normative means and standard deviations, collapsed across age and gender, were calculated and will be provided.

Conclusions: The relationship of the current data to existing child and adult norms, as well as the utility of the multiple choice condition on the BNT-2 in this sample will be addressed.

Correspondence: Tammy M. Martielli, M.S., Psychology, Saint Louis University, 221 N. Grand Blvd., Shannon Hall Rm 210, St. Louis, MO 63103. E-mail: martielli@gmail.com

C. POLANCE, M. DANIEL, J.B. LANE & K. BROCKWOOD. Depression, Anxiety, and Validity of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) in Adult Attention-Deficit/Hyperactivity Disorder (ADHD).

Objective: To determine if there are significant MMPI-2 scale score differences for individuals with mixed emotional distress, ADHD, and comorbid ADHD/mixed distress.

Participants and Methods: Archival data was gathered from an outpatient university doctoral psychology training and research clinic. Subjects were divided into three groups: ADHD only (n=19), mixed distress only (n=95), and ADHD comorbid with mixed distress (n=14). Mixed distress was defined as any mood, anxiety, or adjustment disorder based on DSM-IV-TR criteria. Raw and K-corrected T-scores were analyzed for the traditional 3 validity and 9 clinical scales.

Results: All of the mean MMPI-2 scale scores for the ADHD only group were within the normal range; however, 79% of the ADHD only group had a score > 65 T on at least one MMPI-2 clinical scale. The ADHD-comorbid group endorsed significantly more items on the Pa scale than the group with ADHD only; the ADHD-comorbid group had mean scores > 65 T on scales F, D, Pd, Pa, Pt, and Sc. The mixed distress group had mean scores > 65 T on scales D, Pd, and Pt.

Conclusions: When group data is considered, ADHD symptom endorsement does not appear to diminish the clinical validity of MMPI-2 profile interpretation. Mixed emotional distress and comorbid ADHD incrementally increase the number of MMPI-2 scale elevations. However, some individuals with ADHD and no other evidence of psychopathology may show elevations on MMPI-2 scales.

Correspondence: Cynthia Polance, M.S., School of Professional Psychology, Pacific University, 12604 NW Barnes Rd #1, Portland, OR 97229. E-mail: pola7655@pacificu.edu

S. RANE, M.D. DICKINSON, J.S. CAROSELLI, S. DUVAL, I. GRAUR & M. HISCOCK. Development of a Non-Manual Trail Making Test: Convergent and Discriminant Validity.

Objective: A computerized non-manual Trail Making Test (NMTMT) is being developed for use with manually impaired patients. Preliminary data indicated that, although NMTMT and TMT scores are not strongly correlated, scores from both tests show similar patterns of correlation with other test scores. In this report, we describe additional characteristics of the NMTMT. We place special emphasis on determining the degree to which it is independent of verbal memory, cognitive ability, and motor speed.

Participants and Methods: Eighty university students (50 females, 30 males) completed the NMTMT, the standard paper-and-pencil TMT, the Rey Auditory-Verbal Learning Test (AVLT), Raven's Progressive Matrices (RPM) and a finger-tapping test (FT). Tests were administered in counterbalanced orders.

Results: Both Parts A and B of the NMTMT required about 30 s longer to complete than did the corresponding parts of the TMT, $p < .0001$. There were no significant gender differences on either test. Correlations between NMTMT and TMT scores were .28 for Part A and .53 for Part B. Correlations between Parts A and B were .72 for the NMTMT and .52 for the TMT. Regression analyses indicated that finger-tapping speed contributed significantly to the prediction of scores from Part A of the TMT, $p < .001$. However, none of the test scores (AVLT, RPM, or FT) contributed significantly to the prediction of NMTMT scores.

Conclusions: The NMTMT appears to be more difficult than the standard TMT. NMTMT scores are correlated significantly with TMT scores but the associations are not strong. Whereas performance on Part A of the TMT is related to motor speed as indexed by finger-tapping speed, performance on the NMTMT is independent of verbal memory, cognitive ability and motor speed. On the basis of the present results, as well as previous data, we conclude that the TMT and NMTMT have similar patterns of association and non-association with other neuropsychological measures.

Correspondence: Merrill Hiscock, Ph.D., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu

H. RAU, Y. SUCHY, W.J. WHITTAKER, A. EASTVOLD & D. STRASSBERG. Emotional Processing Deficits May Predict Poor Reading Comprehension in Male Sex Offenders.

Objective: Clinical neuropsychological assessments rarely include measures of affective processing. However, for certain populations, deficits in affect and prosody recognition may influence performance on various cognitive tasks, as some cognitive measures inadvertently contain affective stimuli (e.g., depictions of situations corresponding with written statements on reading comprehension tasks). This study sought to examine the effect of emotional processing on reading comprehension in male sex offenders.

Participants and Methods: A sample of 74 men (age 18-45) from a larger study on sex offenders was administered the Reading Comprehension subtest from the Peabody Individual Achievement Test (PIAT), along with the Shipley Institute of Living Scale (SILS), facial affect recognition task, and prosody recognition task.

Results: Data were analyzed using linear regression. After controlling for age, education, and IQ estimate (based on SILS), facial affect and prosody recognition tasks together accounted for an additional 14.8% ($p < .001$) of the variance in Reading Comprehension scores. Age and education accounted for only 2% ($p = .527$) and IQ accounted for 35.5% ($p < .001$).

Conclusions: These results support the notion that deficits in emotional processing may influence performance on some cognitive measures. Specifically, while IQ is a strong predictor of Reading Comprehension (as would be expected), perception of affect accounts for nearly an additional 15% of variance. These findings suggest that clinicians should consider the possibility that deficits in affective processing may be responsible for reading comprehension problems in some patients.

Correspondence: *Holly K. Rau, B.S. Psychology; Psychology; University of Utah, 380 South 1530 East, Room 520, Salt Lake City, UT 84112-0251. E-mail: holly.rau@psych.utah.edu*

S. RICE, V. HUGHITT, R.J. SPENCER, P.P. GIGGEY, S.L. SELIGER, L.I. KATZEL & S.R. WALDSTEIN. A Comparison of Four Clock-Drawing Scoring Systems: Preliminary Results.

Objective: Although scoring systems exist for free-hand clock-drawing tests (CDT), clinicians often forgo quantitative scores in lieu of general clinical impressions of performance.

Participants and Methods: We evaluated four CDT scoring systems (see Mendez, Ala, & Underwood, 1992; Rouleau, Salmon, & Butters, 1996; Royall, Cordes, & Polk, 1998; Sunderland et al., 1989) in predicting performance on a neuropsychological test battery. Participants were 48 well-educated ($M=15.5$ years) older adults ($M=69$ years) enrolled in studies assessing the effects of hypertension or chronic kidney disease on the brain. Participants were free from major neurologic illness. Two independent raters assessed CDT performance using each scoring system; their average was used for analyses.

Results: Inter-rater reliability was good for CLOX1 (Royall et al.; $r=.83$) but ranged from .54 to .60 for the three remaining systems. Correlational analyses further suggested that the scoring systems may not be used interchangeably. The Royall, Rouleau, and Sunderland systems predicted age, education, and a greater range of cognitive abilities than the Mendez system. Respectively, they demonstrated consistent association with Visual Reproductions-Immediate Recall ($r=.37, .32, .49$), Visual Reproductions-Delayed Recall ($r=.32, .34, .42$), Grooved Pegboard ($r=-.46, -.55, -.66$), Trails A ($r=-.26, -.33, -.42$), Trails B ($r=-.33, -.37, -.44$), and Semantic Fluency ($r=.34, .41, .40$). CLOX1 uniquely predicted Judgment of Line Orientation performance ($r=.38$), while the Sunderland system uniquely predicted performance on Stroop Interference Trial ($r=.38$) and Letter Fluency ($r=.38$).

Conclusions: These findings suggest the need for greater awareness regarding the specific predictive utility of different CDT scoring systems, especially in comparison with qualitative clinical judgment.

Correspondence: *Robert J. Spencer, M.S., Psychology; UMBC, 1000 Hilltop Circle, Baltimore, MD 21250. E-mail: rspencer@umbc.edu*

M.L. DREXLER, T. RIZZO, E.S. SUTHERLAND, F. YUGER & E. CHENG. A Preliminary Study of the Incremental Validity of Quantified Process-Related Features from the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to Diagnostic Classification of Cognitive Disorder in a Geriatric Sample.

Objective: The RBANS is commonly used, particularly in geriatric practice. Classification rates for cognitive disorders have been found acceptable. Corrections exist for age and education. However, many authors note the utility of process-related features (PRF's) in assessment. The current study compares diagnostic classification rates using age- and education-corrected indices (AECI's) with classification rates when PRF's are also examined in a geriatric sample with mixed cognitive disorder (MCD) vs. non-cognitive psychiatric disorder (NCPD).

Participants and Methods: Of 71 cases examined, 32 were excluded due to incomplete data, age under 60 years, or advanced education. Two independent raters based diagnoses on available medical information without reference to neuropsychological testing. There were 35 cases with MCD and 4 cases with NCPD. Average age was 77.97 years ($SD = 6.6$), and average education was approximately 12 years ($SD = 3.9$). PRF's included paraphasic errors on naming tasks, rotated drawing features, and other error types. Diagnostic classification rates were compared using AECI's alone versus also considering PRF's.

Results: Using AECI's alone led to an 84.6% rate of correct classification. Frequency of PRF's was somewhat low, but led to improved discrimination in those cases where such phenomena were observed. Examination of cases misclassified using AECI's alone revealed that additional impaired cases could be identified when PRF's were considered.

Conclusions: Difference in classification rates was small, but of potential significance to clinical practice. We encourage clinicians using the RBANS to be aware of PRF's. Demographic factors for those initially reclassified are considered. Limitations in sample size and suggestions for future research are discussed.

Correspondence: *Theresa L. Rizzo, MA, San Francisco VA Medical Center, 116B, 4150 Clement Street, San Francisco, CA 94121. E-mail: Theresa.Rizzo@va.gov*

G.P. RYAN, J.P. BAERWALD & G. HIGGINS. Verbal-Performance Discrepancy and Social Introversion: A Pilot Study Comparing College Students Performance on the WAIS-III and MMPI-2.

Objective: The objective of this pilot study was to examine the relationship between VIQ-PIQ discrepancies and social introversion in a college student sample.

Participants and Methods: Participants consisted of volunteers from a local liberal arts college. A total of nine participants volunteered for the study. Subjects were mostly female ($n=7$) and denied any significant academic or psychological difficulties.

Subjects met with the examiner for one four-hour testing session. Subjects were administered the Wechsler Adult Intelligence Scale-3rd Edition (WAIS-III), the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) and the Rorschach Inkblot Test.

Results: Subjects' VIQ-PIQ discrepancies were compared to the three subscales (i.e., shyness/self-consciousness, social avoidance, alienation—self and others) found in the Social Introversion Subscales (Ben-Po-rath, Hostetler, Butcher & Graham) in the MMPI-2.

Results found a significant correlation ($p > .05$) between VIQ-PIQ discrepancy and one of the three subscales, Alienation—Self and Others.

Conclusions: Affective disorders have been considered to play a role in cognitive performance. Although the current study has a small sample, results suggest that alienation of oneself may play a role in an affective-spectrum disorder and thereby affecting performance.

Correspondence: *Gregory P. Ryan, Psy.D., Psychology; Loyola College, 4505 Brightwater Court, Apartment F, Owings Mills, MD 21117. E-mail: gryan@loyola.edu*

N. SESTITO & T. SWIRSKY-SACCHETTI. WAIS-III Matrix Reasoning and WCST: The Same Cognitive Domain?

Objective: The Wisconsin Card Sorting Task (WCST) and, more recently, the Matrix Reasoning subtest of the WAIS-III (MRT) are both commonly administered to patients as part of a comprehensive neuropsychological evaluation. Both tests have been shown to measure abstract reasoning, cognitive flexibility, and divergent thinking. However, these tests can be time consuming and can cause fatigue and frustration in patients. This study hypothesized that both tests are correlated and may not contribute a significant amount of unique clinical information to warrant the time and energy demands required. This study examined the relationship between performance on the MRT and WCST in a brain injured population.

Participants and Methods: Both tests were administered to 110 patients diagnosed with mild TBI.

Results: Regression analyses showed that performance on MRT significantly predicted WCST perseverative errors (WCST-PE) [$b = .770, p = .038$] and number of categories completed (WCST-CC) [$b = .57, p < .001$]. Contrary to our prediction, the working memory index of the

WAIS-III (WMI) did not significantly add to the predictive power of matrix reasoning on WCST-CC ($b = -.005, p = .452$), but did on WCST-PE ($b = -.074, p = .02$). In addition, WMI alone significantly predicted MR ($b = .094, p < .001$) and WCST-PE ($b = .57, p < .001$), but did not significantly predict WCST-CC ($b = .173, p = .076$).

Conclusions: These results suggest that the WCST and MRT measure very similar cognitive domains in mild TBI, and therefore, one of these tests may be eliminated when time, fatigue, or patient frustration is of concern.

Correspondence: *Nicole Sestito, BA, Psychology, Drexel University, 1214 Daly Street, Philadelphia, PA 19148. E-mail: ns325@drexel.edu*

F.W. UNVERZAGT, P.O. MONAHAN, L.R. MOSER, Q. ZHAO, J.S. CARPENTER, G.W. SLEDGE & V.L. CHAMPION. The Indiana University Telephone-Based Assessment of Neuropsychological Status (IU-TBANS): A new method for large scale neuropsychological assessment.

Objective: Treatment-related cognitive dysfunction has been reported among breast cancer survivors (BCS). Our purpose was to adapt sensitive measures of neuropsychological function to a telephone administration format for use in a large survey of quality of life in BCS.

Participants and Methods: BCS were recruited from research registries, support groups, nominations of enrolled S's, and via advertisement. Healthy controls (HC) were individually matched to BCS on age (± 5 yrs) and education (± 3 yrs). S's were administered the same neuropsychological test battery on two occasions separated by 1 week. S's were randomly assigned to one of four conditions, stratified by diagnosis (BCS vs. HC), as follows: 1) in-person, telephone [P-T]; 2) T-P; 3) T-T; and 4) P-P. The battery consisted of four cognitive tests (Rey AVLT, Controlled Oral Word Association, Digit Span, Symbol Digit) and two self-report measures (Squire Memory Self-Report Scale, Center for Epidemiological Studies Depression Scale).

Results: A total of 113 S's were screened and 79 S's were randomized (42 BCS and 37 HC). BCS and HC did not differ in age, education, ethnicity, or marital status (all $p > .35$); nor were there any demographic differences by administration condition (collapsed across first visit, all $p > .19$). None of the group mean cognitive test scores differed significantly as a function of administration format. Raw score differences were generally a fraction of a point. The intraclass test-retest correlations within the T-T condition were high and significant (r 's ranged from .64 - .88, all $p < .05$) and comparable to those from the P-P condition and to published values. Standard errors of measurement were smaller (better) for 3/5 of the cognitive indices and 2/2 of the self-report scores in the telephone versus the in-person format.

Conclusions: This study shows that memory, attention, information processing speed, verbal fluency, and self-report of mood and memory can be reliably and precisely measured over the telephone.

Correspondence: *Frederick W. Unverzagt, PhD, Psychiatry, Indiana University School of Medicine, 1111 W. 10th Street, Suite PB 215A, Indianapolis, IN 46202. E-mail: funverza@iupui.edu*

Electrophysiology/EEG/ERP

T.E. BAKER & C.B. HOLROYD. Which way do I go? Neural activation in response to feedback processing and decision making in a virtual T-Maze.

Objective: The feedback error-related negativity (fERN) is a component of the event-related brain potential (ERP) associated with feedback processing. The reinforcement learning theory of the ERN (RL-ERN) proposes that the fERN reflects the impact of a reward prediction

error signal carried by the midbrain dopamine system on the anterior cingulate cortex (ACC) for the adaptive modification of behaviour. This theory predicts that when negative feedback is predicted by a preceding cue, the fERN should be elicited by the predictive cue and not by the negative feedback.

Participants and Methods: We tested this prediction in sequence of two ERP experiments that involved a novel virtual T-Maze task. In experiment one, participants choose between a right and a left alley and received either a reward or no reward at the end of each. In experiment two, a predictive cue (i.e. reward, no-reward, neutral) was presented immediately prior to feedback onset.

Results: Consistent with previous research, we found that a fERN was elicited by negative feedback. Surprisingly, we discovered differential activity between the feedback cues at 180 msec in the medial temporal lobe (MTL). In experiment two, we found the fERN was elicited by the no-reward predictive cue, but not by the reward predictive cue. Further, the fERN was elicited by negative feedback following the neutral predictive cue, and was not elicited by other feedback.

Conclusions: These findings support the RL-ERN theory, and suggest a possible interaction between two cognitive systems of feedback processing: an early recognition system (MTL), and a later control system (ACC). Correspondence: *Travis E. Baker, BA, MSc., Psychology, University of Victoria, 550 Beach Drive, Victoria, BC V8S 2M5, Canada. E-mail: teb@uvic.ca*

R. CANNON & J. LUBAR. Loreta Neurofeedback: A Cortical – Subcortical Comparison.

Objective: This study examines the efficacy of LORETA neurofeedback training (LNFB) in three regions of interest: a 7 voxel cluster of neurons in the cognitive division of the anterior cingulate gyrus (AC), a three-voxel cluster of neurons in the left dorsolateral prefrontal cortex (LPFC) and a four-voxel cluster of neurons in the right dorsolateral prefrontal cortex (RPFC). We trained participants to increase 14-18 Hz activity in each of the ROIs over twenty sessions.

Participants and Methods: This study was conducted with fourteen non-clinical students with a mean age of 22. We utilized electrophysiological measurements and subtests of the WAIS-III for pre and post measures to assess the influence of this training protocol.

Results: We compared sessions 1, 5, 10, 15 and 20. We also compared pre and post eyes-closed and eyes-opened baselines. The data indicate significant differences in activation patterns within these regions and throughout the cortex. More specifically the data indicate that the AC shares a significant association with the RPFC, while the LPFC shows significantly different activation patterns from both the RPFC and AC.

Conclusions: The AC and RPFC appear to influence a specific frontal circuit in the trained frequency as compared to the LPFC. The AC initiates regions that do not appear to be influenced by either of the other ROIs. There are significant differences that occur relative to ROI within areas of the medial, ventral and orbital-frontal cortices during this training. The data offer further support to the theory of moderation of the central executive by the dorsolateral prefrontal cortex, particularly in the right hemisphere and AC. There are significant improvements in both working memory (WMI) and processing speed index (PSI) scores. Correspondence: *Rex Cannon, BA, Psychology, University of Tennessee, Austin Peay Bldg, Knoxville, TN 37996. E-mail: rcannon2@utk.edu*

M.A. CATO JACKSON & H.S. ABRAM. Electroclinical Features, Neuroimaging, and Neuropsychological Findings in Childhood Atypical Absence Epilepsy.

Objective: 1) Evaluate use of a neurobehavioral test battery during continuous video EEG (vEEG) monitoring in patients with frequent gen-

eralized spike wave (GSW) activity with no obvious clinical correlates. 2) Relate electroclinical findings to neuroimaging and comprehensive neuropsychological findings. It is hypothesized that neurobehavioral testing will provide additional valuable clinical information relative to EEG, MRI and formal neuropsychological testing.

Participants and Methods: Two drug-naive patients (ages 7 and 9) with similar EEG findings of generalized spike wave activity during prolonged vEEG were examined. Prior to testing, neither patient displayed obvious signs of behavioral arrest during frequent (occurring every 1-5 minutes), intermittent periods of brief (lasting 5-20 sec) GSW activity. EEG findings were suggestive of atypical absence epilepsy in both cases. Results of neurobehavioral testing during vEEG are presented along with comprehensive neuropsychological findings and magnetic resonance (MR) neuroimaging findings.

Results: In both cases, neurobehavioral testing during vEEG demonstrated behavioral arrest during periods of GSW activity on some but not all tasks. Single-handed finger tapping and spatial span confined to one hemisphere elicited behavioral arrest in both cases. Outpatient neuropsychological testing revealed general attentional, language fluency, and academic difficulties in both patients. Brain MRIs were normal.

Conclusions: Subtle neurobehavioral deficits during GSW activity of atypical absence seizures are revealed with a combination of vEEG and bedside neurobehavioral testing. These results provide unique and clinically useful information beyond EEG, MR neuroimaging and formal neuropsychological data. Future directions include standardization of the neurobehavioral battery during vEEG for application in both focal and generalized epilepsy.

Correspondence: *Margaret A. Cato Jackson, PhD, Neurology Division, Nemours Children's Clinic, 507 Children's Way, Jacksonville, FL 32207. E-mail: acato@nemours.org*

K. HIGGINS-STRICKLAND, M. SEMRUD-CLIKEMAN, M. LIOTTI & S. PLIZSKA. Early Orthographic Specific Visual ERPs During Word Recognition in Developmental Dyslexia.

Objective: Event-Related Potential (ERP) studies with adults indicate a visual system specialization for orthographic information, hypothesized to develop during childhood with increased exposure to text. However, few developmental ERP studies in children have focused on early orthographic specific visual processes in normally developing readers. ERPs during word recognition were examined in children with and without dyslexia to further understanding of normal development of brain systems in reading and the role of basic visual processes in dyslexia. The relationship between ERP activity and reading and language skills was also examined.

Participants and Methods: ERP data were obtained from children aged 9-15 in a group of children with dyslexia ($n = 12$) and a group of normally developing readers ($n = 11$) during an implicit word recognition task: ERPs elicited by orthographic (words, pseudowords, consonant strings) and visual (false fonts, symbol strings) word-type stimuli were recorded at sites over the posterior scalp. Participants completed measures of phonological, orthographic, and naming processes to examine the relationship between ERP activity and reading related language processes.

Results: Both normal and dyslexic readers showed a negative going component between 170-270ms, peaking around 230ms for all word-type stimuli. ANOVA results found the N230 amplitude significantly larger for orthographic than visual control stimuli in the control but not the dyslexic group. Regression revealed behavioral measures of phonological, not orthographic, processes to significantly predict variance in ERP amplitude

Conclusions: These results provide support for the developmental hypothesis that visual word expertise increases with age and reading exposure and the N1 as an index of reading related visual specialization. Correspondence: *Kellie Higgins-Strickland, PhD, UT at Austin, 11919 Rotherham Dr, Austin, TX 78753. E-mail: higginsk@austin.rr.com*

M.S. MENNEMEIER, K.C. CHELETTE, A.J. WOODS, J. HUDSON, E. DEWI, P.A. TAYLOR-COOKE, T. WALLACE, R.D. SKINNER & E. GARCIA-RILL. The P50 ERP is Sensitive to Arousal States in Both Neglect and Normal Subjects.

Objective: The P50 potential is an auditory evoked response at 50 ms latency after a "click" stimulus with average amplitude of 1.5 μ V and a range of 0.5 to 3.7 μ V. The P50 potential is generated in part by reticulo-thalamic processes related to arousal. Unilateral neglect is associated with decreased arousal. Accordingly, P50 potential amplitude was markedly diminished in one stroke patient with chronic neglect but "normalized" (increased amplitude), and neglect resolved temporarily, after cold pressor stimulation (CPS: immersing the foot in iced water for 50 seconds to increase arousal).

Participants and Methods: The present study examined how CPS alters P50 potential amplitude in 10 male and 4 female normal subjects (age range = 20-28 yrs). The P50 potential was recorded before, immediately following and 20 minutes after CPS. Subjects were grouped based on whether baseline P50 potential amplitude decreased ($n=9$) or increased ($n=5$) immediately following CPS.

Results: Whereas one subgroup had relatively high baseline amplitudes (mean = 2.4 μ V) and the other had lower amplitudes (mean = 1.2 μ V); both groups exhibited the same mean P50 potential amplitude (1.6 μ V) immediately following CPS. Amplitudes showed a return to a biphasic baseline distribution 20 minutes after CPS.

Conclusions: In both normal subjects and a patient with neglect, increasing arousal with CPS had the effect of "optimizing" P50 potential amplitude, regardless of its initial starting point. These data validate the role of arousal processes in P50 potential generation, which may be a good biological marker of arousal state. Supported by NS39348 and RR020146

Correspondence: *Patricia A. Taylor-Cooke, M.A., Department of Psychology, University of Alabama at Birmingham, 11500 Pleasant Ridge Rd, Apt 376, Little Rock, AR 72223. E-mail: pataylor@uab.edu*

G.A. MOLLET, D.W. HARRISON & K. HOLLAND. Hostility and Pain: Increased Cerebral Activation to Cold Pressor Pain in Heightened Hostility.

Objective: Recent research has indicated that emotional traits may substantially alter the experience of pain. Heightened levels of hostility and anger are noted to increase pain sensitivity (Janssen, Spinhoven, & Brosschot, 2001). A majority of the research in this area has focused on increased cardiovascular reactivity in individuals with increased hostility or anger as a possible mechanism for increased pain report. However, differential cerebral activation to pain in heightened hostility and anger may provide an additional explanation for increased pain.

Participants and Methods: In order to examine the neurological aspect of pain processing in hostility, the current experiment recorded quantitative electroencephalography (QEEG) before and after exposure to a cold pressor in high ($N=13$) and low hostile ($N=13$) men.

Results: A group x pain interaction ($F(1, 24) = 3.86, p < .007$) indicated increased reactivity to the cold pressor in high hostiles. Further, a pain x hemisphere x location interaction ($F(1, 12) = 5.86, p < .03$) within the hostile group indicated that the primary site of activation to the cold pressor was at the left temporal lobe. A group main effect ($F(1, 24) = 5.25, p < .03$) indicated that high hostile men reported experiencing significantly more pain ($M = 5.54, SD = 1.05$) relative to low hostile men ($M = 4.46, SD = 1.33$).

Conclusions: The experiment may be indicative of differential reactivity to pain and lateralization of pain processing in high and low hostile men. Further, the results indicate that increased cerebral activation to pain may play an important role in subsequent self-reported level of pain. Correspondence: *Gina A. Mollet, Ph.D., Psychology, Adams State College, 205 Edgemont Blvd., Alamosa, CO 81101. E-mail: gmollet@adams.edu*

A.E. MOLNAR, M.C. WAGNER, J.L. BESWICK, V.J. MOLFESE & D.L. MOLFESE. Alphabetic Letter-Knowledge and Speech Sound Discrimination: A Preliminary Study using Electrophysiology in a Preschool Sample.

Objective: The present investigation studied the specific relations between preschool children's letter knowledge and brain processing speech-sound characteristics. It was hypothesized that children who could accurately identify more letters would also process speech sounds more efficiently compared to children who knew fewer alphabetic letters.

Participants and Methods: Six males and six females were tested. Participants were given the Leiter-R, WRAT-3, and listened to a series of speech sounds while ERP data were being collected which included 40 randomized repetitions of /ba/, /pa/, /da/, and /ga/.

Two groups were created based on letter knowledge scores. The High group identified 10-15 letters/15 total (mean age = 53 months) and the Low group identified 0-4 letters/15 total (mean age = 52.5 months). Data were analyzed in a 4 (sounds) x 5 (electrode sites) x 2 (hemispheres) x 2 (sex) x 2 (high/low group) ANOVA design.

Results: Principal Component Analysis (PCA) identified 3 factors to account for 79.7% of the total variance: Factor 1 (35.6% of variance; peak at 220ms), Factor 2 (27.3% of variance; peak at 668ms), and Factor 3 (16.8% of variance; peak at 84ms). Analyses revealed a significant group x electrode effect ($p < .003$; power = .92) occurring in the temporal region across all speech sounds. A main effect was found for letter knowledge group in factor 2 ($p < .005$; power = .90).

Conclusions: Children in the High and Low letter knowledge groups processed simple speech-sounds differently suggesting that children use letter-name knowledge as a tool for learning grapheme-phoneme relations.

Correspondence: *Andrew E. Molnar, Center for Research in Early Childhood, University of Louisville, 1061 E Park St., Apt #35, Carbondale, IL 62901. E-mail: molnar@siu.edu*

P. LUU, N.L. PRATT, D. TUCKER & M. SHANE. Frontal Negativity Assesses Feedback in Associative Learning.

Objective: This study examined neural activity for processing positive and negative feedback throughout a code learning task.

Participants and Methods: Eleven subjects were required to learn, through trial and error, stimulus-response contingencies. Subjects associated a specific button response to numerical stimuli. After the participant's response, correct or incorrect feedback was provided. A learning threshold was defined after four consecutive correct responses to a particular target.

Results: N100 amplitude in the occipitotemporal region was significantly more negative to error compared to correct feedback after learning. A large negativity localized within the left inferior frontal region was larger for pre-learning compared to post-learning trials. In addition, a medial frontal negativity (MFN) varied according to both feedback type and learning. The MFN was particularly elevated upon presentation of error feedback after learning. The P300 in the parietal region showed an increase in amplitude for error compared to correct feedback. Analysis of means demonstrates a learning effect with correct feedback producing the smallest amplitude after learning was consolidated.

Conclusions: Updating memory was uncovered temporally in the brain during learning. The N100 effect suggests more attention was allocated to error. Consistent with the MFN reflecting feedback monitoring, the MFN showed the greatest change in amplitude when subjects were required to learn a response. The left inferior frontal negativity showed pronounced activity prior to learning. This suggests that anterior frontal regions may attribute to updating memory. Such findings indicate deactivation in the frontal lobe updates information associated with learning. The finding is corroborated with the P300 amplitude. The P300 increased according to the most informative feedback. That is, both prior to and after learning, error feedback showed greater amplitudes than correct feedback. Thus, the P300 reflects the process of updating memory.

Correspondence: *Nikki L. Pratt, Master of Arts, Psychological and Brain Sciences, University of Louisville, 8715 Park Laureate Drive, Apt 111, Louisville, KY 40220. E-mail: nikki.pratt@louisville.edu*

J. PRICE, A.E. MOLNAR, C. SNOWDY, P.J. MOLFESE, V.J. MOLFESE & D.L. MOLFESE. Hemispheric and Sex Differences in Speech Perception in 4-year olds.

Objective: Voice onset time (VOT), an important speech cue, denotes the time delay between consonant release and laryngeal pulsing. Adults identify bilabial stop consonants with VOTs of 0- and 20-ms as voiced and discriminate them from 40- and 60-ms VOTs which are identified as voiceless. In a neuroelectrical study of speech perception, Molfese & Hess (1978) noted that the first large negative peak (N1) of the event-related potential (ERP) discriminated between VOT values similarly to behavioral studies while a second negative peak (N2) discriminated voiced vs. voiceless consonants only over the right hemisphere. The present study extended these earlier findings based on 2 electrodes to newer methods using 128-electrodes that also allow identification of brain structures involved in VOT discrimination.

Participants and Methods: ERPs were recorded from 16 four-year olds (8 males) using a 128-channel electrode net while children listened to consonant-vowel syllables that varied in VOT.

Results: Principal Component Analysis of ERPs identified 5 temporal regions accounting for 91% of total variance. ANOVA with Greenhouse-Geisser correction identified a Condition x Hemisphere interaction, $F(15)=3.52$, $p=.029$, observed power=.70, for ERPs from 8 to 184 ms following stimulus onset. ERPs discriminated VOT over the left hemisphere frontal site $t(15)=2.541$, $p=.023$, left hemisphere temporal site $t(15)=2.268$, $p=.039$, and right hemisphere central site $t(15)=-5.500$, $p=.0001$. A main effect for Gender, $F(15)=12.788$, $p=.003$, observed power=.9, indicated that male ERPs between 392 ms and 699 ms differed from females. Source analyses provided converging evidence, localizing to temporal regions of both hemispheres.

Conclusions: Similar to Molfese & Hess (1978), results from 128-electrodes noted that the initial large negative peak over both hemispheres discriminated the 0- and 20-ms sounds from the 40- and 60-ms sounds. Also, males processed VOT stimuli differently in each hemisphere while females did not.

Correspondence: *Dennis L. Molfese, Ph.D., Birth Defects Center, University of Louisville, Health Sciences Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

G. STEFANATOS, A. OSMAN, Y. IEUJI & W. JOE. Mapping Neural Responses to Rapid Frequency Modulations (FM) in Sound.

Objective: Frequency modulations (FM) are a ubiquitous acoustic feature of speech and serve as fundamental cues to the phonemic identification. Clinical studies have suggested that the left hemisphere may play a preferential role in the temporal analysis of rapid FM. However, reports of cerebral asymmetries in neuromagnetic source imaging and fMRI studies of normal listeners have been inconsistent. Here, we describe the results of an analysis of steady-state auditory evoked responses to rapid pulsed FM using low resolution electroencephalographic tomography (LORETA).

Participants and Methods: We examined steady-state auditory responses to rapid (50 and 100 ms) pulsed FM of a continuous tone in 12 normal hearing adults. Responses were recorded from 21 active electrodes referred to the arithmetic mean of left and right mastoids.

Results: The surface topography demonstrated a relatively broad distribution with maximal amplitude over frontocentral electrode sites. The phase of responses to 50 ms pulses lagged behind the phase of responses to 100 ms FM pulses, indicating that these steady-state responses were sensitive to temporal parameters of frequency change present in pulsed-modulations. Mapping responses using low resolution electroen-

cephalographic tomography (LORETA) revealed peaks in current density in posterior regions of temporal cortex, suggesting that the sources for these responses are located in or near primary and secondary auditory cortex. A cerebral asymmetry was evident with larger activation in left posterior temporal cortex.

Conclusions: The results of this study are consistent with functional specialization of the left hemisphere in rapid FM analysis. The strengths and weaknesses of this procedure for studying auditory temporal processing by large scale neuronal circuits in the human brain are discussed. Correspondence: *Gerry Stefanatos, D.Phil., Moss Rehab Research Institute, Albert Einstein Medical Center, Korman Research Pavillion, 1200 W. Tabor Rd, Philadelphia, PA 19141. E-mail: stefanag@einstein.edu*

D.A. STIGGE-KAUFMAN, M.J. LARSON & W.M. PERLSTEIN. Cognitive Modulation of Event-Related Potentials to Emotional Faces.

Objective: Event-related potential (ERP) research on facial expressions has improved our knowledge of facial affect processing. Emotional faces elicit early positive frontocentral ERPs and sustained positivity that is more broadly distributed. Perceptual discrimination tasks have shown that the later stages of emotional face processing are guided by attention and can be compromised when conflicting attentional demands are high. This study examined whether the active maintenance of non-facial working memory (WM) representations alters the electrophysiological processing of emotional faces.

Participants and Methods: High-density ERPs were acquired while thirteen healthy controls performed low and high “load” conditions of a delayed matching-to-sample task that presented emotional and neutral faces during the delay period. Within-subject ANOVAs were used to evaluate the roles of memory load and facial expression on WM task performance and ERP reflections of facial processing.

Results: WM task performance was differentially affected by WM load, but not by facial expression valence. Emotional faces presented during the WM delay did not evoke an early positive frontocentral ERP component. Fearful face ERPs had significantly larger sustained positivity when presented during the low WM load trials compared to trials involving the maintenance of a more demanding, high WM load. These WM load-related effects were not present for happy or neutral faces, suggesting that both high and low WM load representations compromise the later stages of face processing for non-fearful faces.

Conclusions: Fearful faces appeared to receive preferential processing when low load WM representations were maintained. This enhanced sustained ERP processing suggests that fearful faces are more resistant to cognitive modulation than other expressions and may be mediated by distinct cortico-limbic circuitry that is preferentially engaged by fear signals.

Correspondence: *David Stigge-Kaufman, University of Florida, P.O. Box 100165, Gainesville, FL 32610. E-mail: dstigge@phhp.ufl.edu*

Executive Abilities/Frontal System

N.C. MCLAUGHLIN, D. WIEBE, C. FULWILER & D.A. GANSLER. Working Memory and the Prefrontal Cortex: A Structural Analysis.

Objective: Researchers analyzing the frontal lobes have shown structural and functional differences between sub-divisions of the prefrontal cortex (PFC). Specifically, in the field of working memory (WM), there has been a long-standing debate over the functional specialization of the PFC. Researchers such as Goldman-Rakic had posited the labeled-line model, which assumes the prefrontal cortex is organized in a modality specific fashion, and makes a differentiation between spatial and object WM in the dorsolateral (DLPFC) and ventrolateral prefrontal (VLPFC) cortices. More recently, Petrides and colleagues have developed the two-stage model of WM, stating that the PFC is divided into regions spe-

cialized into levels of function. Maintenance of WM has been localized to the VLPFC; manipulation of information has been localized primarily to the DLPFC. This study proposed an analysis of the relationship between the structures of the VLPFC, the DLPFC, and various measures of WM.

Participants and Methods: Adult participants were recruited from several psychiatry clinics. Participants completed neuropsychological testing, including assessment of WM, using both clinical and experimental tasks. Participants also received a protocol-driven brain MRI. Statistical analyses examined the relationship between the volume of the DLPFC and VLPFC and the WM tasks.

Results: Overall, there was partial support for the functional organization of the two-stage working memory theory. Specifically, there was a relationship between the DLPFC and one of the manipulation tasks. Maintenance of information bore a relationship with the VLPFC, as well as the DLPFC.

Conclusions: We found support for the higher level WM stage (manipulation) represented more specifically in the DLPFC, while the lower level WM stage (maintenance) is represented more diffusely in the PFC. Lower levels of WM, involved broadly in cognitive function could recruit cerebral cortex more broadly.

Correspondence: *Nicole C. McLaughlin, PhD, Brown University, 9 Hemlock Dr., West Warwick, RI 02893. E-mail: nicole_mclaughlin@brown.edu*

Imaging: Functional

M. BRINKMAN, S.A. LANGENECKER, L.J. RAPPORT, L.A. BIELLI-AUSKAS, B. GIORDANI, S.L. WRIGHT, M.N. STARKMAN & J. ZUBIETA. Using fMRI to Distinguish Complex Visual Processing from Emotion Processing.

Objective: Perception and discrimination of facial expressions of emotion is an important aspect of social communication. This descriptive study characterizes the role of the bilateral fusiform “face” area, bilateral limbic structures, and bilateral dorsolateral prefrontal cortex structures in facial emotion perception and discrimination.

Participants and Methods: 3T fMRI images and performance on the Facial Emotion Perception Test were examined among 20 healthy adults (13 women). Relationships between activation data and behavioral data were examined in order to strengthen and build upon prior research in this area. The Facial Emotion Perception Test includes counterbalanced blocks for processing posed expressions of emotion and animals.

Results: Subtraction of animal block activation data from face block activation data revealed significant signal changes in the right middle frontal gyrus, the right insula, the left anterior cingulate gyrus, and bilateral inferior frontal gyri, and posterior cingulate gyrus. Correlations between activation data and behavioral data (percent correct faces [PCF] and reaction time to facial stimuli) indicated a significant inverse relationship between PCF and activation in the right anterior cingulate and left medial frontal gyrus. PCF and activation were positively correlated in the right insula and right fusiform/cerebellum. Activation data and reaction time were unrelated, whereas a significant inverse relationship between reaction time and accuracy was observed.

Conclusions: These findings support the importance of right fusiform gyrus and insula to processing of emotion content specific to faces, consistent with prior lesion and imaging research. Correlation findings suggest that activation in medial prefrontal areas does not enhance performance in facial emotion perception and discrimination.

Correspondence: *Michael Brinkman, Psychiatry, University Of Michigan Health System, C-480 Med Inn, 1500 Medical Center Drive, Ann Arbor, MI 48109-0840. E-mail: mbrinx@med.umich.edu*

L. CARR, H. BARBER, M. CARRIERAS & A. HERNANDEZ. The Neural Correlates of Gender and Number Agreement in Spanish.

Objective: The current study aimed to explore the integration processes of gender and number morphological features in Spanish. It has been proposed that grammatical gender and number features might be linked to a different degree with the word stem in lexical representation. In this view, gender information is most likely retrieved directly from the word form, whereas number is considered a morphological marking that combines with the stem it modifies.

Participants and Methods: This study examined the effects of agreement violations in word pairs in which gender and number agreement between an article and a noun (e.g., el-piano [the-piano]), and between a noun and an adjective (e.g., faro-alto [lighthouse-high]) were manipulated. Participants made grammatical judgments on these word pairs while being scanned with fMRI. Participants consisted of 10 adult native Spanish speakers.

Results: Results showed that violations demonstrated increased activity in superior BA 44 in the left hemisphere, and the inferior bilateral portion of the occipito-temporal regions. Gender violations revealed increased activity in the right hippocampal region and the midline fusiform gyrus on the left. Number violations revealed increased activity in BA 10.

Conclusions: These findings are consistent with the view that violations involve additional visual word form and morphological processing than correct items in order to guide grammatical processing. Also, the presence of activity for areas involved in visual analysis and memory for gender violations and the increased frontal activity for number violations is consistent with the notion that number is a morphosyntactic feature generated by rules while gender is a lexical feature inseparable from the word stem.

Correspondence: *Lindsay Carr, University of Houston, 2222 Maroneal, Apt 1913, Houston, TX 7730. E-mail: LJCarr2@uh.edu*

S. CHEN, J.A. ASTON, H. SU, P. CHEN, C. LU, J. YU, M. LIOU & W.I. TSENG. Reproducibility of Activations for Two Standardized Chinese Language Tasks for Use in a Clinical fMRI Battery.

Objective: Conventional blocked design clinical fMRI studies produce thresholded maps averaged across all blocks. In cases where the patient had performance difficulty or scanner spikes occurred during one of the blocks, activations maps are still producible, but the decrease in overall activations may be erroneously attributed to the disease of the patient. In addition, there are individual differences of intensity and extent of activations seen for the same task, making it difficult to set a normative threshold for each individual subject. We attempted to overcome these difficulties by applying reproducibility analysis to each subject performing two Chinese language tasks, and also evaluated the reliability of Broca activation across subjects between the tasks.

Participants and Methods: 28 right-handed healthy young adults performed visually presented tasks of categorical word generation and phonological processing within a 3T MRI scanner. Data were preprocessed, and distributions of reproducibility of voxels across cycles and reliability maps were generated for each subject in addition to standard activation maps.

Results: The voxel reproducibility profiles across each cycle enabled evaluation of activation integrity and helped identify two subjects with problematic scans. Both language tasks showed reliable left-lateralized activations for each subject. However, the reliability of active voxels across tasks for each subject was more variable. At the group level, regions of interest analyses found significant activation in the Broca Area for both tasks, and the left DLPFC was also activated in the word generation task. This group result is consistent with findings in the English versions of the tasks.

Conclusions: The reproducibility analysis provided additional information beyond traditional thresholding methods at the single subject level. This method could help to determine the reliability of standardized tasks within a clinical fMRI battery, and help determine the reliability of activation maps seen for each patient.

Correspondence: *S.H. Annabel Chen, PhD, Psychology, National Taiwan University, 1, Sec 4, Roosevelt Road, Taipei 106, Taiwan. E-mail: shachen@ntu.edu.tw*

K. CHIOU, N. FITZPATRICK, J. WANG, J. VESEK, D. GOOD & F. HILLARY. An fMRI Investigation of Visual Working Memory Following Moderate and Severe TBI.

Objective: Working memory, defined as the ability to maintain and manipulate information over a short amount of time, is an important component of cognitive functioning making fundamental contributions to higher processes such as learning and executive functioning. Healthy controls demonstrate greater left dorsolateral prefrontal cortex (LDLPFC) involvement when engaged in verbally mediated tasks of working memory. As task load is increased, healthy controls show additional activation in the right dorsolateral prefrontal cortex (RDLPFC). Interestingly, populations with traumatic brain injury (TBI) also demonstrate an increase in right prefrontal activation that is negatively correlated with performance; however, these increases in RDLPFC involvement appear at baseline (or at lower thresholds). In order to investigate the nature of such right hemispheric recruitment during working memory tasks, this study examines neural networks associated with visual working memory using parametric manipulation.

Participants and Methods: Participants who had sustained moderate TBI defined with Glasgow Coma Scores 3-8 were recruited from a local area hospital. Functional data were collected using functional magnetic resonance imaging techniques. The visual working memory task was a block design requiring the participant to recognize the familiarity and location of neutral human faces on a screen.

Results: All participants demonstrated slower reaction times as task load was increased. The individuals with TBI showed greater involvement of RDLPFC and slower reaction times than healthy adults.

Conclusions: Right hemisphere recruitment and implications for compensation in working memory after TBI will be discussed.

Correspondence: *Kathy Chiou, BA, Psychology, The Pennsylvania State University, 610 Moore Building, University Park, PA 16802. E-mail: ksc167@psu.edu*

S.M. CLERKIN, K.P. SCHULZ, J.H. NEWCORN, J.M. HALPERIN & J. FAN. Simultaneous Measurement of Brain Activation Associated with Emotional Processing and Response Inhibition.

Objective: To examine brain activation associated with response inhibition and emotional processing during an emotional go/no-go task.

Participants and Methods: Nine adults were scanned with fMRI while performing an Emotional Go/No-Go task. The task consisted of six 252 second counterbalanced blocks of 96 trials of happy, sad, and/or neutral faces, with 75% Go trials, and 25% NoGo trials. All scans were acquired by means of gradient echo echoplanar images sensitive to BOLD contrast perpendicular to the AC-PC plane on a 3T Siemens Allegra MRI. Processing was conducted using SPM2. Event-related analyses were conducted with general linear modeling using the default SPM2 basis function. Linear contrasts were applied to the parameter estimates for the correct NOGO - correctGo (response inhibition), correct Happy Go - correct Neutral Go (happy faces), and correct Sad Go - correct Neutral Go (sad faces) contrasts. The three contrast maps for were entered into separate random effects models. Results are reported at an uncorrected height (intensity) threshold of $p < .01$ and an extent threshold of $k = 50$ voxels.

Results: Repeated measures ANOVA revealed no significant effect of emotion on reaction time, $F(2) = 1.60, p = .24, \eta^2 = .18$. Errors of commission (mean = 8.97 ± 9.47) and omission (mean = 5.56 ± 4.10) were relatively low. Response inhibition resulted in activation of superior, mid-

dle, and inferior frontal gyri, cingulate gyrus, thalamus, and motor cortex. The happy faces contrast resulted in activation of the lingual gyrus, middle temporal gyrus, middle frontal gyrus, and postcentral gyrus. The sad faces contrast yielded activations of thalamus, parahippocampal, orbitofrontal, and middle frontal gyri, and inferior parietal lobule.

Conclusions: The emotional go/no-go task elicits activation in brain areas associated with inhibitory control and/or emotional processing. This task may be useful in distinguishing affective disorders based on inhibitory deficits or to simultaneously test inhibition and emotional processing.

Correspondence: *Suzanne M. Clerkin, BA, Psychiatry, Mount Sinai School of Medicine, One Gustave L. Levy Place, Department of Psychiatry, box 1230, New York, NY 10029. E-mail: suzanne.locascio@mssm.edu*

C.C. FARACO, L.S. MILLER, N. YANASAK, J.S. BEDWELL & Y. KESSEL. Searching for Endophenotypic Markers of Schizophrenia: An fMRI Study Using the Stroop Task.

Objective: Patients with schizophrenia have consistently displayed impairment in executive functioning. Functional magnetic resonance imaging (fMRI) studies of patients with schizophrenia show differential activation in areas involved in control and attention while performing tasks that involve the use of working memory. More specifically, hypoactivity has been found to occur in such areas as the dorsolateral prefrontal cortex and the anterior cingulate cortex (Brodmann areas 9/46 & 24/32, respectively). Many studies examining the occurrence of schizophrenia within families have shown that the disease has a strong genetic link. The aim of the current study was to determine whether hypoactivity in the dorsolateral prefrontal cortex and the anterior cingulate cortex could be used as an endophenotypic marker for schizophrenia.

Participants and Methods: Functional imaging was performed on 9 non-affected first-degree relatives of persons with schizophrenia and 5 controls, using a 1.5 T magnetic resonance (MR) scanner, while they performed a block-design Stroop task. The Stroop task requires the use of specific components of executive function.

Results: Data were analyzed using Statistical Parametric Mapping software 2 (SPM2). Activation was examined within regions of interest (ROIs) containing Brodmann areas 9, 46, 24, and 32. Controls exhibited greater activity within the dorsolateral prefrontal cortex (Brodmann area 9; coordinates: -16, 58, 34; $t = 3.42$; $p < .005$) on incongruent trials compared to first-degree relatives. Activation was also found outside the ROIs, consistent with findings in other studies of patients with schizophrenia.

Conclusions: These findings are suggestive of an endophenotypic marker; however, future studies may need to incorporate a larger sample size.

Correspondence: *Carlos C. Faraco, B.A., Psychology, University of Georgia, 310 McDuffie Dr., Athens, GA 30605. E-mail: cfaraco@uga.edu*

E. GREEN, L. HAASE, A. JACOBSON, B. CERF-DUCASTEL, N. KEMMOTSU, M. YIDONNOY & C. MURPHY. Measure of Appetite Associated With Differences in Cortical Activation From Hungry to Satiated States.

Objective: Much is unknown about the brain mechanisms underlying individual differences in eating behavior or appetite. The present study focuses specifically on the relationship between appetite or the desire to ingest food, and cortical activation in response to pleasant stimuli.

Participants and Methods: Participants were divided into two groups based on their responses to the Council of Nutrition Appetite Questionnaire (CNAQ) and were classified as "low-scoring appetite" (group 1) or "high-scoring appetite" (group 2). Both groups were given .3ml of a sucrose solution 8 times during two separate runs; once after fasting for 12 hours (the hungry condition) and once after ingesting a nutritional preload (the satiated condition).

Results: T2*-weighted echo planar images were acquired using an event-related paradigm on a 3T GE scanner. Those in the high-scoring appetite group showed differences in activation of cortical areas of interest (Insula, BA 11, Hypothalamus and Amygdala) in response to the tastant between the hungry and satiated states whereas those in the low-scoring appetite group did not; there was no significant difference between activation in areas of interest from the hungry to satiated condition in this group.

Conclusions: Further investigation is warranted to further characterize how an individual's appetite may be related to sensory-specific satiety or other phenomena involved in ingestive behavior.

Supported by NIH Grant #1 RO1 AG04085 to C.M.

Correspondence: *Erin Green, Psychology, San Diego State University, 6363 Alvarado Rd, Suite 101, San Diego, CA 92120. E-mail: erin.r.green@gmail.com*

S. KENNEPOHL, V. SZIKLAS, K.E. GARVER, D.D. WAGNER & M. JONES-GOTMAN. Correlating fMRI activation in the medial temporal lobe with memory performance: discrimination or response bias?

Objective: To investigate the relationship between fMRI activation in subregions of the medial temporal lobe (MTL) and different behavioral indicators of recognition memory performance.

Participants and Methods: Sixteen neurologically-healthy subjects were asked to learn four types of material: abstract designs, drawings of real objects, pseudowords, and words. Subjects were scanned during two encoding trials, two recognition trials, and a 20-minute delayed recognition trial. We used multiple regression analyses to assess the relationship between mean percent signal change in BOLD response in subregions of MTL and various indicators of discrimination (A' , Pr) and response bias (B'' and Br) while controlling for the effect of other confounding variables (learning trial and material type).

Results: During encoding, we found that average BOLD response in anterior hippocampi, entorhinal and perirhinal cortices were correlated with positive response bias ("yea-saying") during later recognition trials, but not with accuracy.

During recognition, memory discrimination was correlated with target-specific BOLD activation (i.e., contrasting target blocks – foil blocks) in posterior hippocampi. Conversely, target-specific activation in perirhinal and parahippocampal cortices was correlated with response bias, not memory discrimination.

Conclusions: During memory tasks, fMRI activation in the MTL does not always correlate well with memory accuracy. Rather, we found that increased activation in MTL subregions may be associated with a more liberal response bias during a recognition memory task. These findings may have important implications in the interpretation of neuroimaging studies of memory.

Correspondence: *Stephan Kennepohl, Ph.D., Montreal Neurological Institute, 3801 University, Montreal, QC H3A 2B4, Canada. E-mail: kennepohl@sympatico.ca*

Y. KESSEL, N.E. YANASAK, P.J. MAHER & S. MILLER. Practice- and Fatigue-Related Changes in Neural Activity in an fMRI Scanning of a Spatial Working Memory Task.

Objective: The current approach to functional imaging that assumes low variability in neural activity over time may partially be accountable for the difficulty replicating results. This fMRI study investigated intra-run changes in neural activity due to practice and fatigue effects. This study predicted practice-related decreased activation in task non-specific areas, and fatigue-related increased activation.

Participants and Methods: Seventeen participants were randomly assigned to a Practice group that received intense practice, or to a Control group that received minimal practice. Functional data were collected during two runs of the spatial n-back task, and analyzed by contrasting time periods between and within runs to identify changes in activation over time. Behavioral measures of performance and fatigue were correlated with neural activity.

Results: During run 1, the Control group displayed greater decrease in neural activity in the frontal lobes. The Practice group demonstrated mildly decreased activity in the frontal lobes, and increased activity in parietal task-related areas. During run 2, this pattern emerged in the Control group, and continued at a lesser extent in the Practice group. The observed changes in neural activity generally did not correlate with behavioral measures.

Conclusions: These results demonstrate significant changes in neural activity across runs of a spatial working memory task. Increased practice, but not fatigue, had a significant effect on the observed neural activity pattern within 20 minutes. Strategy development (i.e., parietal activity) co-occurred with decreased general executive control (i.e., frontal activity). This study demonstrates how uncontrolled variables could decrease replicability in functional imaging studies, and discusses measures to improve their reliability.

Correspondence: *Yfat Kessel, M.S., Psychology, University of Georgia, Department of Psychology, University of Georgia, Athens, GA 30602. E-mail: y_kessel@yahoo.com*

N.S. KOVEN, R.M. ROTH, L. BOZZUTO, J. PENDERGRASS, L.A. FLASHMAN & A.J. SAYKIN. Neural Correlates of Reaction Time Variability during Working Memory Performance in Schizophrenia.

Objective: Working memory (WM) deficits and increased intra-individual variability during WM have been reported in schizophrenia, but the neural correlates of this behavioral inconsistency require clarification. We examined the relationship between reaction time (RT) variability and brain activation during auditory WM, postulating abnormality in frontoparietal circuitry.

Participants and Methods: 13 healthy adults [age = 32.1 (9.8) years; 9 women] and 12 patients [age = 36.2 (12.7) years; 4 women] completed a blocked auditory WM fMRI task using a 1.5T GE scanner. Data were analyzed using regression models in SPM2 ($p < .01$, $k \geq 3$) using the 3-back > 0-back contrast. Intra-individual RT variability was calculated using the coefficient of variation ($ICV = SD/RT$).

Results: Behaviorally, patients demonstrated greater ICV than controls during the 3-back condition. Analysis of main effects indicated bilateral frontoparietal activation in controls and relative hypoactivation of these areas in patients. Regression models revealed a negative correlation between ICV and right DLPFC activity in controls. In the patient group, ICV was inversely associated with bilateral parietal activity.

Conclusions: WM RT variability is associated with particular patterns of brain activity, with a frontoparietal dissociation emergent across groups suggesting frontal hypoactivity in controls and parietal hypoactivity in patients as variability increases. These results provide further evidence of involvement of frontoparietal circuitry in executive dysfunction in schizophrenia. Correspondence: *Nancy S. Koven, Ph.D., Psychology, Bates College, 365 Pettengill Hall, Lewiston, ME 04240. E-mail: nkoven@bates.edu*

L. KRIVITZKY, T. ROEBUCK-SPENCER, C.P. JOHNSON, G.A. GIOIA & R. ROTH. Initial Development of a Pediatric Working Memory and Inhibitory Control Task for fMRI.

Objective: Working memory (WM) and inhibitory control (IC) are two key areas of neuropsychological functioning in children. They serve as critical foundations for daily cognitive function yet can be difficult to parse on performance tasks. The aim of this study was to develop an fMRI task based on the n-back and go/nogo paradigms, with parametric manipulations to separate these functions.

Participants and Methods: The task includes three levels of working memory demand (0, 1, 2-back) fully crossed with 2 levels of inhibitory demand (no inhibit, inhibit). Participants press a non-target or target button, or no button with inhibitory cues for a series of picture stimuli. To test the feasibility of the task, two participants (non-concussed 14 yo boy, concussed 14 yo girl) were administered the TEC. A standard letter n-back was also administered to validate the combined task.

Results: TEC and n-back total activation area increased greatly for the concussed participant by the 1-back, but did not greatly increase in the control until the 2-back. Inhibitory conditions increased activation over non-inhibitory conditions at the same level of WM load. Performance differences were observed between subjects on both tasks.

Conclusions: The parametric manipulation of WM and IC may allow integrated, yet separable, examination of children's executive control and a concurrent pattern of activation in a functional imaging task. Specifically, we see that the neurocognitive disruption of concussion seems to force the recruitment of additional regions for a medium load (1-back) n-back task. The presence of an inhibitory condition also increases activation.

Correspondence: *Chad P. Johnson, BA, Neuropsychology, Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: cpjohnso@cnmc.org*

J. LENGENFELDER, G.T. VOELBEL, G. WYLIE, N. NADKANI, A. SMITH & J. DELUCA. A Functional Near Infrared Spectroscopy Study of Verbal Fluency.

Objective: To investigate the pattern of cerebral activation in the frontal lobes of healthy adults with functional Near Infrared Spectroscopy (fNIRS), during a verbal fluency task.

Participants and Methods: Participants were 9 right-handed, healthy adults (6 females, 3 males) between the ages of 20 and 51 without any history of neurological disease or psychiatric disorders. Participants were seated comfortably and 30 fNIRS source/detector optodes were placed on their foreheads. Following a 1 minute baseline period the verbal fluency task was administered. Participants produced words starting with the F, A, and S with a 1 minute time limit for each letter according to standardized administration.

Results: Across the 9 participants there was significantly elevated oxy-hemoglobin (OxyHb) detected in the left inferior frontal gyrus (Brodmann Areas 45 & 46), between the left dorsal and ventral lateral prefrontal cortex, during the FAS verbal fluency task when compared to the baseline period.

Conclusions: This study demonstrates that fNIRS, a new functional neuroimaging technique, can be used to detect changes in OxyHb within the frontal lobe during a verbal fluency task in healthy adults. The increase in the left inferior frontal gyrus is consistent with prior functional imaging studies of verbal fluency tasks. The findings will be discussed in the context of using NIRS to measure functional changes in cerebral oxygenation due to cognitive activity.

Correspondence: *Jean Lengenfelder, Neuroscience, Kessler Medical Rehabilitation Research & Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: jlengenfelder@kmrrec.org*

M.R. MADORE, J.B. ALLENDORFER, M. LAMY, J. ELIASSEN, P.K. SHEAR & S.M. STRAKOWSKI. Activation Patterns for Healthy Individuals for Emotional and Neutral Pictures.

Objective: Understanding healthy brain functioning provides a template to interpret cognitive impairments associated with emotional dysfunction. The present study examined neural functioning during processing of negative neutral emotions. It was hypothesized that negatively valenced stimuli would elicit longer response times and differential patterns of brain activation, compared to neutral stimuli.

Participants and Methods: Twenty healthy participants between the ages of 18 and 45 were included in the study. Participants were excluded

if they had an Axis I diagnosis, first-degree relatives with affective or psychotic disorder, history of drug or alcohol dependence, medical or neurological disorder that could influence fMRI results, or history of mental retardation or estimated IQ score <85. During an fMRI scan, participants performed a continuous performance task that required them to respond to geometric figures or emotional stimuli. Emotional stimuli were either negative or neutral images from the International Affective Pictures Set (IAPS).

Results: A paired sample t-test revealed that individuals reacted significantly more slowly to negative than to neutral stimuli. Comparison of the fMRI results for the two emotional conditions showed increased activation in visual areas (middle occipital gyrus, Brodman's areas 18 and 19) in response to negative emotional stimuli; neutral stimuli were associated with more activation in attentional areas (super temporal gyrus, insula, Brodman's areas 22 and 41).

Conclusions: These findings are consistent with other reports that negatively valenced emotional stimuli are associated in healthy individuals with increased reaction times and greater activation patterns in brain regions that mediate attentional abilities. They also provide a basis for further analysis to assess differences in activation patterns based on arousal.

Correspondence: *Michelle R. Madore, M.A., Psychology, University of Cincinnati, Dyer Hall, Mail Location 0376, Cincinnati, OH 45221-0376. E-mail: madore_michelle@yahoo.com*

T. MANI, L. MILLER, N. YANASAK & S. MACCIOCCHI. Application of fMRI to Evaluate Changes in Functional Activation among a Moderate to Severe TBI Group.

Objective: Relatively little research has documented functional recovery following traumatic brain injury using functional MRI. This study aimed to examine the effects of moderate to severe brain injury on brain functioning over time.

Participants and Methods: Eight moderate to severely brain-injured participants completed motor and visual tasks during functional MRI at two time points during the first year following injury. Changes in functional activation within ROIs and in dispersion of activation were evaluated across time points.

Results: Participants demonstrated significantly reduced activation intensity within the ROI over time for the motor task, but not the RPS task. Participants demonstrated a (non-significant) trend toward decreased functional dispersion over time. Most participants demonstrated greater activation within (versus outside of) the ROI for both tasks. Variability among participants, in terms of activation intensity and dispersion, was evident.

Conclusions: There is evidence of potential functional recovery over the first year post-injury, with fewer resources utilized during task completion over time. Additionally, variability in functional activation among a moderate to severely brain-injured group is likely, though activation in brain regions typically activated among controls is also anticipated. Lastly, simple motor and visual tasks appear to offer utility in documenting functional recovery.

Correspondence: *Tanja Mani, Ph.D., University of Georgia/Mississippi Methodist Rehabilitation Center, 101 Ashley Circle, Apt. 1, Athens, GA 30605. E-mail: tanja_mani@hotmail.com*

T. MANI, L. MILLER, N. YANASAK & S. MACCIOCCHI. Changes in Brain Functioning over Time among a Small TBI Group Performing a Stroop Task.

Objective: Research using fMRI with TBI groups typically involves small samples, & repeated measurement is scarce. This study evaluated the effects of moderate to severe brain injury on cognitive task performance and cortical activation.

Participants and Methods: Five participants who sustained a moderate to severe brain injury completed a Stroop task while undergoing functional MRI (fMRI) at two time points post-injury. Changes in functional activation within ROIs and in dispersion of activation were evaluated across time points.

Results: Participants were generally able to complete the Stroop task successfully. Results revealed activation within regions typically activated during a Stroop task (the ROI), though variability among participants was evident, both within and across time points. Regions outside of the ROI were activated among all participants, to a greater degree than was present within the ROIs.

Conclusions: Arguably, recruitment of outside regions was necessary for successful task completion at both time points, which may suggest functional plasticity in cognitive task completion. Further, these initial findings suggest that even among individuals who have sustained brain injuries of similar conventional severity, considerable neurocognitive variability could be anticipated.

Correspondence: *Tanja Mani, Ph.D., University of Georgia/Mississippi Methodist Rehabilitation Center, 101 Ashley Circle, Apt. 1, Athens, GA 30605. E-mail: tanja_mani@hotmail.com*

N.C. MCLAUGHLIN, R.H. PAUL, S.M. GRIEVE, L.M. WILLIAMS, D. LAIDLAW, M. DICARLO, C. CLARK, W. WHELIHAN, R.A. COHEN, T.J. WHITFORD & E. GORDON. Diffusion Tensor Imaging of the Corpus Callosum: A Cross-Sectional Study Across the Lifespan.

Objective: Previous studies have demonstrated strong developmental trends of white matter evident using in vivo neuroimaging. However, few studies have examined white matter using diffusion tensor imaging (DTI) across the lifespan.

Participants and Methods: In the present study we examined fractional anisotropy (FA) and volume in the corpus callosum in 4 groups (children, adolescents, young adults, and elderly).

Results: Results revealed a curvilinear relationship in the analysis of the FA values for these four groups, with FA values increasing in childhood and adolescence, reaching their peak in young adulthood, followed by a non-significant decline in the elderly. Volumetric analysis of corpus callosum regions revealed a similar pattern, with an increase in volume from childhood and adolescence through young adulthood, and a non-significant decrease in volume in the elderly group.

Conclusions: These results define the microstructural development of the white matter across the lifespan. Future studies are required to examine the neurobehavioral correlates of these neuroimaging indices.

Correspondence: *Nicole C. McLaughlin, PhD, Brown University, 9 Hemlock Dr., West Warwick, RI 02893. E-mail: nicole_mclaughlin@brown.edu*

C.A. MUNRO, M.E. MCCAUL, D.F. WONG, Y. ZHOU, J.R. BRASIC, H. KUWABARA, A. KUMAR, M. ALEXANDER, W. YE & G.S. WAND. Sex Difference in the Relation between Striatal Dopamine Release and Testosterone.

Objective: Sex differences in some aspects of cognitive functioning have been demonstrated; studies have implicated sex hormones in these differences. The mechanism by which sex hormones influence cognitive functioning, however, remains unclear. Findings of sex differences in the relation between striatal dopamine and cognition have led researchers to suggest gonadal hormone modulation of cerebral dopaminergic neurotransmission as a mechanism for these differences. The aim of this study was to determine the relation between sex hormones and dopamine release (DAR) in the caudate, putamen, and ventral striatum.

Participants and Methods: In 48 healthy individuals (mean age = 22 years, 30 men), two 90-minute positron emission tomography (PET)

scans were used to measure [¹¹C] raclopride binding potentials (BP), a placebo scan and a scan preceded by 0.3 mg/kg amphetamine. The percent change of BP from the placebo scan was defined as DAR. Using partial correlations controlling for race, we examined the relation between striatal DAR and estradiol, progesterone, and free testosterone.

Results: In women, none of the DAR measures was correlated with any of the sex hormones. In contrast, DAR in the caudate was correlated with free testosterone in men ($r = -.53$, $p = .004$). Neither estradiol nor progesterone was correlated with DAR in any region in the men.

Conclusions: In this study we found a correlation between DAR and testosterone in men but not women. This finding has implications for sex differences in the cognitive effects of testosterone. Although it has been suggested that testosterone's effects on cognition are related to increased cerebral perfusion, this explanation cannot account for sex differences in its cognitive effects. Our results support the notion that the mechanism by which testosterone influences cognitive test performance differentially in men and women could be via its relation to the striatal dopamine system.

Correspondence: *Cynthia A. Munro, Ph.D., Psychiatry and Behavioral Sciences, Johns Hopkins University, 600 N. Wolfe St., Meyer 21S, Baltimore, MD 21287-7218. E-mail: cmunro@jhmi.edu*

C.B. PADULA, A.D. SCHWEINSBURG & S.F. TAPERT. Spatial Working Memory Performance and fMRI Activation Interactions in Abstinent Adolescent Marijuana Users.

Objective: Previous studies have suggested neural disruption and reorganization in adult marijuana (MJ) users appears to dissipate after a month of abstinence. However, it remains unclear if the acute effects of marijuana persist in adolescents following abstinence. The aim of this study was to understand the relationship of brain response abnormalities to task performance since this remains unexplored in adolescents.

Participants and Methods: MJ-using ($n=17$) and control ($n=17$) adolescents aged 16 to 18 were recruited from local schools. Following 28 days of monitored abstinence; functional magnetic resonance imaging data and performance data were collected as participants performed a spatial working memory (SWM) task.

Results: Composite scores for reaction time and accuracy were calculated to provide a single, comprehensive performance measure. While groups scored similarly on task performance, interactions between brain response and performance were significant. Increased activation in the left temporal lobe ($F[3,30]=7.92$, $p<.0001$) and the left anterior cingulate cortex ($F[3,30]=6.33$, $p<.002$) was related to improved performance in the MJ users, but poorer performance in the controls. Conversely, increased activation in the right temporal lobe ($F[3,30]=4.97$, $p<.006$), left parahippocampal gyrus ($F[3,30]=5.5$, $p<.004$) and the right thalamus ($F[3,30]=4.37$, $p<.011$) predicted poorer performance in the MJ users, and better scores in the controls.

Conclusions: After 28 days of observed abstinence, adolescent MJ users demonstrated differences in brain response to a spatial working memory task compared to controls despite similar performance, suggesting that MJ users may utilize a different approach to the task via alternate neural pathways.

Correspondence: *Claudia B. Padula, BS in Psychology, University of California, San Diego, 8672 Via Mallorca #K, La Jolla, CA 92037. E-mail: cpadula@ucsd.edu*

J. PENDERGRASS, R.M. ROTH, N.S. KOVEN, L.A. FLASHMAN, H.S. PIXLEY & A.J. SAYKIN. Neural Correlates of Response Inhibition and Reaction Time Variability in Bipolar Disorder.

Objective: Patients with Bipolar I Disorder have demonstrated abnormal right frontal lobe activation during response inhibition. Right mid-

dle and inferior frontal neural activity has been associated with reaction time variability during go/no-go task performance in healthy adults. We evaluated the relationship between reaction time variability and neural correlates of response inhibition in healthy adults and patients with Bipolar I Disorder.

Participants and Methods: 19 healthy adults (age = 34 [12.3]) and 18 patients with Bipolar I Disorder (BPD) (age = 37 [12.6]) completed an event-related fMRI go/nogo task on a 1.5T GE scanner. Data were analyzed using SPM regression models ($p < .01$, $k > 3$) with nogo > go contrast. Intra-individual reaction time variability during go trials was calculated using the coefficient of variation ($ICV = SD/RT$).

Results: Controls exhibited a faster mean RT compared to patients, but differences in ICV were not observed. Regression models revealed negative correlations between ICV and right inferior frontal activity in controls, and between ICV and right parietal activity in patients, during successful response inhibition. Mean RT was negatively correlated with bilateral medial frontal and caudate activity in controls and right middle frontal and primary motor activity in patients.

Conclusions: The present study offers additional support for a relationship between consistency of responding and right frontal lobe activation during successful response inhibition in controls. In BPD, variability of responding had greater impact on parietal components of neural circuitry subserving response inhibition. Further investigation on the impact of ICV on executive control processes in normal and clinical populations is needed.

Correspondence: *Jo Cara Pendergrass, Ph. D., Psychiatry, DHMC/Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756. E-mail: jo.c.pendergrass@dartmouth.edu*

A. RAMATI, N.H. PLISKIN, J.L. REILLY, S. KEEDY, J.W. FINK, R.J. ERWIN, E. BODNAR, K. KELLEY, R.C. LEE, K.R. THULBORN & J.A. SWEENEY. Working Memory and Implicit Learning in Electrically Injured Patients: A Functional Neuroimaging Study.

Objective: Studies examining cognitive functioning in electrical injury patients consistently report neuropsychological deficits primarily in attention, learning and working memory domains. To date, it remains unclear whether the observed cognitive dysfunction is related to alterations in CNS functioning. The current study sought to examine whether electrical injury subjects demonstrate abnormal patterns of brain activation during working memory and implicit learning tasks.

Participants and Methods: Fourteen electrical injury subjects and fifteen demographically matched healthy control subjects performed two oculomotor cognitive activation tasks during functional magnetic resonance imaging studies. Behavioral data was also collected in an oculomotor neurophysiological laboratory using the same oculomotor paradigms.

Results: For the spatial working memory task, electrical injury subjects exhibited significantly more activation in and around all sensory-motor areas supporting working memory including the prefrontal cortex, posterior somatosensory cortices, cingulate cortex and striatum. An inverse pattern of between-group differences in activation was observed on the implicit learning task, with electrical injury subjects exhibiting significantly reduced activation in all brain regions activated in control subjects. Behavioral data indicates mostly comparable level of task performance in terms of accuracy, though significantly longer response latencies in the electrical injury group on the implicit learning task and a sensorimotor control task in which subjects made visually-guided saccades.

Conclusions: These results are the first to demonstrate system-level dysfunction of cortical and subcortical regions that support working memory and implicit learning in individuals who have experienced electrical injury.

Correspondence: *Alona Ramati, MS, Psychology, Rosalind Franklin University of Medicine and Science, 1010 N. Taylor Ave, Oak Park, IL 60302. E-mail: ramati_a@yahoo.com*

G.J. REY, B. BERNAL, C. DUNOYER, P. JAYAKAR, N. ALTMAN, G. GARAYCOA, T. RESNICK, G. MORRISON, J. RAGHEB & M. DUCHOWNY. Language Networks in Children with Intractable Epilepsy Due to Malformations of Cortical Development and Hippocampal Sclerosis.

Objective: To investigate language organization in children with intractable epilepsy utilizing fMRI and assess effect of histopathological substrates.

Participants and Methods: We studied 24 right handed children ages 9-17 years with intractable epilepsy that were being examined for epilepsy surgery candidacy. All subjects underwent fMR using listening to a story (LTS) and COWA paradigms. Studies were performed in a 1.5 Tesla magnet. Images were post-processed utilizing cluster-analysis with thresholds of $p < 0.01$. Findings were classified by two experts as: [1] No activation; [2] Expected activation of Brodmann's areas 21, 22, 40, 41, 42, 37, 44, 45, 8 and 9 over the left hemisphere, and [3] Reorganization where activations occurred elsewhere provided that they conformed to a cluster of 10 or more pixels. Subjects were classified by histopathology as: [1] Cortical dysplasia (CD) grade I (n=11), [2] CD Taylor type and DNET (n=6), and [3] Hippocampal sclerosis (n=7).

Results: LTS paradigm showed no activation [n=1], expected anatomic activation [n=14] and reorganization [n=8]. COWA paradigm showed no activation [n=1], expected activation [n=17] and reorganization [n=5]. Additionally, 6 of 10 subjects with left temporal lesions showed reorganization for the LTS task while 2 of 3 subjects with left frontal lesions showed reorganization for the COWA task. Type of histopathology did not significantly influence language organization.

Conclusions: Reorganization of language occurs in about 2/3 of children with dominant temporal and frontal pathology. The proximity of the pathology to eloquent cortex rather than the specific histopathology substrate is the crucial determinant of reorganization of language in this patient population.

Correspondence: *Gustavo J. Rey, Ph.D., Neuroscience, Miami Children's Hospital, 3100 SW 62nd Avenue, Miami, FL 33155. E-mail: gustavo.rey@mch.com*

E.C. ROSEMAN, J.M. WILLIAMS, J. KOUNIOS, S. PLATEK, S. FARO & F. MOHAMED. fMRI: Redefining the Rest State.

Objective: When analyzing block design fMRI data, the rest condition typically acts as a control for the active condition. However certain cognitive tasks, such as memory tasks, should not assume that the rest condition defines a default condition, as it is fraught with rehearsal and carry-over effects. Instead, memory tasks should be divided into three distinct conditions: a baseline default condition, an active condition, and a rest condition which is more reflective of rehearsal. The baseline condition occurs before any stimuli are presented, therefore not containing rehearsal or carry-over effects. This study compares the baseline and rest conditions to determine the cognitive activity specific to the rest condition.

Participants and Methods: This study included 11 healthy participants (7 female; 4 male) ranging from 26 - 37 years old. All participants performed four separate fMRI block design series with distinct categories of stimuli: neutral/emotional words, neutral pictures/ emotional pictures. Subjects were instructed to remember the stimuli and were tested following scanning. The design consisted of 20-second blocks of rest alternated with stimuli presentation.

Results: fMRI images were obtained using an EPI sequence on a Siemens 1.5 Tesla Vision scanner, and were analyzed using SPM2. Single sample t-tests and ROI analysis reveal significantly more ($p \geq .05$) activity in the rest condition for words in brain areas related to verbal and emotional processing. For pictures, significantly more activity was found in areas of visual processing.

Conclusions: Compared with the baseline condition, the rest condition shows clear evidence of rehearsal and carry-over effects. As such, contrasting the active and rest conditions results in the loss of crucial information specific to memory. These results suggest that a number of important positive results may be lost by using conventional rest conditions, signifying a need for an alternative control condition.

Correspondence: *Emily C. Roseman, Psychology, Drexel University, 4656 Mansion Street, Philadelphia, PA 19127. E-mail: ec732@drexel.edu*

T. TAKAHASHI, M. MIMURA, A.J. ISOMURA, B. YAMAGATA, H. TOMIOKA, H. KOBAYASHI, M. YANO & H. YOSHIMASU. Differential Patterns of Near Infrared Spectroscopy (NIRS) Response in Alzheimer's Disease and Late-Life Depression.

Objective: Differentiating early stage Alzheimer's disease (AD) and late life depression in elderly adults has been controversial in clinical settings. Previous studies using near infrared spectroscopy (NIRS) have consistently shown that individuals with major depressive disorder (MDD) exhibit decreased oxygenated hemoglobin (oxy-Hb) response in the prefrontal cortex while performing phonemic fluency tasks. The purpose of the present study was to explore whether NIRS is of diagnostic value differentiating between early stage AD and MDD.

Participants and Methods: Participants were 18 elderly individuals with MDD (mean age=72.6), 16 age matched individuals with AD, and 14 healthy controls (HC). By utilizing NIRS (ETG4000), oxy-Hb values were measured during control vocalization tasks and while performing phonemic (initial letter) or semantic (category) verbal fluency tasks

Results: In phonemic tasks MDD demonstrated a reduced oxy-Hb on broad areas of the medial to lateral prefrontal cortex. AD showed left lateral prefrontal areas. In semantic tasks decreased oxy-Hb were unremarkable in MDD. AD showed a reduced oxy-Hb in the left dorsolateral prefrontal to the temporal areas.

Conclusions: The present study demonstrated that oxy-Hb response patterns are dissociably compromised in MDD and MD while performing phonemic / semantic verbal fluency tasks. The results suggest that oxy-Hb patterns as easily measured by NIRS may differentiate between elderly MDD and AD

Correspondence: *Taro Takahashi, Showa University, kounann 3-6-21-2704, minato-ku Tokyo-to 1080075, Japan. E-mail: taro5150@sb3.so-net.ne.jp*

G. VOELBEL, J. LENGENFELDER, G. WYLIE, N. NADKANI, A. SMITH & J. DELUCA. Pattern of Activation within the Frontal Lobe during Auditory Working Memory: A functional Near Infrared Spectroscopy Study.

Objective: To investigate the pattern of cerebral activation in the frontal lobes of healthy adults with functional Near Infrared Spectroscopy (fNIRS), during a working memory task.

Participants and Methods: Participants were 9 right-handed, healthy adults (6 females) between the ages of 20 and 51 without any history of neurological disease or psychiatric disorders. Participants were seated comfortably and 30 fNIRS source/ detector optodes were placed on their foreheads. The fNIRS scan started with a 5 minute baseline period, followed by the auditory presentation of the N-Back test. The participants tapped the table with their right hand to respond to the target letters. The N-Back consisted of three randomly presented trials of the 0-, 1-, 2-, and 3- back conditions. In the N-Back test, the 0-back condition is a baseline condition, and the 1-, 2-, and 3- Back conditions place increasing demands on working memory systems.

Results: Across the 9 participants there was significantly elevated oxy-hemoglobin (OxyHb) detected in the right ventral lateral prefrontal cortex (VLPFC) when 0-Back (baseline) was subtracted from the 1-, 2-, and 3-Back conditions. A significant increase in OxyHb was also detected in right VLPFC when the 2-Back was subtracted from the 3-Back condition.

Conclusions: This study demonstrates that fNIRS, a new functional neuroimaging technique, can be used to detect changes in OxyHb within the frontal lobe during an auditory working memory task in healthy adults. Consistent with prior studies, increased right VLPFC activation was detected when the working memory load increased.

Correspondence: *Gerald Voelbel, Ph.D., KMRREC, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: gvoelbel@kmrrec.org*

D.J. WOOLSTON, G. ALLEN, K.C. SAINÉ, P.S. CARMACK, R.W. BRIGGS & M.C. CULLUM. fMRI Investigation of an Experimental Executive Function Measure: The Texas Card Sorting Test.

Objective: Utilization of functional magnetic resonance imaging (fMRI) to investigate the Texas Card Sorting Test (TCST, a unique, less structured nonverbal card sorting task) as a measure of prefrontal cortical activation.

Participants and Methods: 20 right-handed healthy volunteers between the ages of 21 and 40 were scanned on a Siemens Trio 3 Tesla MR system. Participants performed a computerized version of the TCST and a control task during a block design fMRI experiment. The TCST requires subjects to sort six visual stimuli that vary along multiple dimensions into two groups and to continue generating novel sorts for three minutes. Data were analyzed using Statistical Parametric Mapping software (SPM5).

Results: Statistically significant clusters ($q < .05$, using FDR thresholding, with cluster extent set to greater than 5 voxels) of activation were observed in the left orbital frontal lobe (BA 47) and in the left medial frontal gyrus (BA 8). Significant activation was also present in the right superior temporal gyrus (BA 38/41), right parietal lobe (BA 7), and bilaterally in the occipital/parietal lobes (BA 19).

Conclusions: The TCST overcomes some of the limitations of other available executive function measures (i.e. lengthy administration time, negative feedback, and reliance on English language abilities). These results demonstrate that the TCST activates orbitofrontal and medial frontal areas, thereby providing preliminary neurobiologic evidence of its potential utility as a measure of executive functioning.

Correspondence: *Dixie J. Woolston, Psychiatry, UTSWMC, 5841 E University Blvd #B, Dallas, TX 75206. E-mail: dixie_woolston@yahoo.com*

Imaging: Structural

A.M. BRICKMAN, C. HABECK, N. SCARMEAS & Y. STERN. Multivariate defined age-associated atrophy is associated with cognitive functioning.

Objective: Magnetic resonance imaging (MRI) can be used to investigate the neuromorphological consequences of normal aging and their impact on cognition. We previously used a multivariate statistical approach to identify covariance patterns of gray and white matter that distinguished older from younger healthy adults. Here, we examine the stability of this finding in an independent sample. We sought to determine the predictive utility of the expression of these patterns for cognitive functioning among older adults, and to what degree education mediates this relationship.

Participants and Methods: Forty-two younger (mean age=23) and 35 older (mean age=72) healthy participants underwent MRI scanning and were assessed with a 57-item modified Mini-Mental State (mMMS) examination. The previously derived covariance patterns were forward applied to the current sample to probe to what extent the pattern was manifest. In older adults, the degree to which gray and white matter patterns were expressed was compared to performance on the mMMS. Mediation analysis explored the impact of education on these findings.

Results: Covariance patterns distinguished the younger and older adults with .94 sensitivity and .98 specificity for gray matter and .55 sensitivity and .86 specificity for white matter. Greater expression of the gray matter pattern was significantly associated with poorer performance on the mMMS among older adults. Controlling for education, this association was reduced to non-significance.

Conclusions: The findings suggest that our previously derived age-associated covariance patterns for gray matter are generalizable. Although the derived white matter pattern also generalized, greater variability among older adults led to low sensitivity. Patterns of age-associated atrophy are related to cognitive abilities, and may be partially mediated by education.

Correspondence: *Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu*

J.F. BUCKMAN, G. LOCASCIO, C. ZAKRZEWSKI, M.E. BATES & R. HENDREN. Volumetric Differences of the Thalamus Associated with Childhood Psychopathology and Family History of Alcoholism.

Objective: The thalamus is central to information processing and transmission within the brain. Smaller thalamic volumes have been reported in autistic adult men compared to controls. Thalamic abnormalities are inconsistently noted in bipolar disorder (BD) samples. While the effect of a positive family history of alcoholism on thalamic volume is unclear, abnormalities in evoked potential of children of alcoholics suggests the possibility of altered corticothalamic circuitry. This study sought to assess whether thalamic volumes differed between control children and those with high functioning autism (HFA), Asperger's Syndrome (ASP), or BD, and whether a relationship existed between thalamic volume and density of familial alcoholism diagnoses.

Participants and Methods: 7 HFA, 18 ASP, 7 BD, and 14 control (with no history of psychiatric disorder) children were included. Clinical diagnoses were made with the Kiddie-Schedule of Affective Disorders & Schizophrenia, Autism Diagnostic Interview and DSM-IV criteria. From MRI scans, thalamus was traced following well-established protocols. Familial alcoholism data were gathered from participants' parents using the Family History Assessment Module. The density of alcohol use disorder diagnoses in first-, second- and third-degree relatives was derived.

Results: Controlling for total brain volume, the ASP group had significantly larger bilateral thalamic volumes than the controls. No differences were noted between groups in the density of familial alcoholism, nor was the density of alcohol use disorder diagnoses associated with thalamic volumes in any group.

Conclusions: Larger thalamic volumes observed in children with ASP may be related to alterations in behavioral features of the disorder. Further research is needed to clarify this relationship.

Correspondence: *Gianna Locascio, Psy.M., Center of Alcohol Studies/GSAPP, Rutgers University, 607 Allison Rd, Piscataway, NJ 08854. E-mail: locasciog@yahoo.com*

K. WATARI, V. ELDERKIN-THOMPSON & A. KUMAR. Cognitive Function and Prefrontal Volumes of Adults with Type 2 Diabetes and Major Depression.

Objective: Although the cerebrovascular complications of type 2 diabetes are well appreciated, the combined neuroanatomical and neuropsychological profiles of adult diabetic patients have not been examined. This study examined the prefrontal brain volumes of gray and white matter and the neuropsychological performance of healthy controls, diabetic patients and depressed diabetic patients.

Participants and Methods: A cross-sectional sample of 20 type 2 diabetic and depressed patients, 20 type 2 diabetic patients, and 34 non-

depressed, non-diabetic controls completed magnetic resonance imaging. Gray and white matter volumes of the anterior cingulate, gyri recta and orbitofrontal regions were individually estimated. Participants completed a standard battery of laboratory tests, a psychiatric evaluation and a comprehensive neuropsychological battery.

Results: Depressed diabetic patients had smaller total whole brain gray matter volumes than healthy controls. The nondepressed and depressed diabetic groups each had smaller gray matter volumes in the anterior cingulate and orbitofrontal regions than healthy controls. The depressed and nondepressed diabetic groups did not differ on any neuroimaging measure. Overall neuropsychological performance of the depressed diabetic group differed from the nondepressed volunteers. In the individual domains, depressed diabetics performed worse than diabetic controls in processing speed and worse than healthy controls in information processing speed and executive functioning. There was also a trend ($p=.06$) for diabetic controls to perform worse than healthy controls in executive functioning.

Conclusions: Patients with type 2 diabetes have smaller prefrontal gray matter volumes. Cognitive weakness among nondepressed diabetic patients was limited to executive functioning. If depression is comorbid with the diabetes, the patients show significantly poorer overall neuropsychological performance compared to healthy controls.

Correspondence: *Virginia Elderkin-Thompson, Ph.D., UCLA, 760 Westwood Plaza, Los Angeles, CA 90024-1759. E-mail: velderkin@mednet.ucla.edu*

N.R. HORNE, K.J. BANGEN, L. DELANO-WOOD & M.W. BONDI. Diffusion Tensor Imaging in Alzheimer's Disease: A Meta-Analysis.

Objective: The importance of white matter changes in the pathogenesis of Alzheimer's disease (AD) remains unresolved. One theory purports that changes in white matter follows an inverse pattern of myelogenesis (termed "retrogenesis"). To date, the results of studies applying DTI to AD have been inconsistent, with some indicating greater loss of white matter integrity in posterior than anterior regions, and others reporting an anterior-posterior gradient of degeneration. We conducted a quantitative review of DTI studies using meta-analytic methods to characterize the magnitude and pattern of microstructural white matter changes in AD.

Participants and Methods: Ten studies published between 2000 and 2006 met criteria for inclusion. Results from 147 patients with AD and 130 age-matched healthy older adults were included.

Results: Effect sizes (d) derived from various regions of interest revealed evidence of large differences in diffusion parameters between AD patients and healthy elderly across studies. Although effect sizes revealed an anterior-posterior gradient when comparing separate lobar white matter measures, large effects were also found in selected posterior regions (e.g., splenium, posterior cingulate bundle, superior longitudinal fasciculus).

Conclusions: The pattern of microstructural white matter changes in AD follows the retrogenesis model, and future DTI studies should predict differences in both anterior and posterior regions depending upon the vulnerability of the specific white matter fiber bundle vis-à-vis retrogenesis. Knowledge of the expected magnitude and pattern of microstructural white matter changes in AD will inform future investigations of at-risk groups (e.g., MCI, APOE $\epsilon 4$) and thus aid in the early detection of AD.

Correspondence: *Nikki R. Horne, MS, San Diego State University/University of California San Diego Joint Doctoral Program in Clinical Psychology, VASDHS (Bondi 116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: nhorne@ucsd.edu*

D.A. JOSEPH, M.F. WOOD, C.C. PRICE, I.M. SCHMALFUSS & T.H. MARECI. DTI Morphological Dilation Techniques and Relationships to Cognitive Functioning.

Objective: Diffusion Tensor Imaging (DTI) primarily focuses on quantification of fractional anisotropy (FA) and average diffusivity

(AD). The present study assessed the validity of two common voxel FA and AD region of interest (ROI) techniques. The first technique restricted the ROI dilation to intense regional voxels (restricted dilation) whereas the second technique relied on structure morphology (anatomical dilation).

Participants and Methods: Whole brain 3T MRI DTI scans were obtained on 24 non-demented older adults (mean age=71.4; mean Mini Mental State Exam=28.9) who also completed the Stroop Color Word Test (Golden, 2002), WAIS-III Digit Span subtest (Wechsler, 1997), and the Hopkins Verbal Learning Test-Revised (HVLT-R; Benedict, 1998). FA and AD values were obtained from the right and left anterior internal capsule.

Results: After correcting for Bonferroni, the anatomical dilation technique demonstrated a moderate negative correlation between AD of the left anterior internal capsule and Stroop Color Word performance ($r=-.54$, $p<.01$). Both dilation techniques demonstrated a trend for a moderate positive correlation between FA anterior left and right internal capsules and Stroop Color Word performance (e.g., $r=.42$, $p=.05$). No other relationships were observed (all $p >.05$).

Conclusions: Only the anatomically guided dilation ROI technique demonstrated that increasing diffusivity within the anterior internal capsule correlated with declining inhibition and self-monitoring. These results suggest that anatomical consideration rather than voxel intensity alone may be more appropriate for DTI ROI measurements.

Correspondence: *Dawn A. Joseph, clinical and health psychology, University of Florida, 701 SW 62nd Blvd D24, Gainesville, FL 32607. E-mail: dajoseph@phhp.ufl.edu*

J.D. KLAGES, J.D. FISK, D. KYDD & K. ROCKWOOD. Regional Hippocampal Atrophy in Persons with Mild Alzheimer's Disease and Vascular Cognitive Impairment.

Objective: The differential diagnosis of dementia in its early stages is critical for understanding prognosis and treatment options. It is challenging, due to the considerable overlap in the presenting complaints and cognitive deficits in dementia of various etiologies. Hippocampal atrophy has been considered characteristic of Alzheimer's disease (AD) but can also be seen in vascular cognitive impairment (VCI), presumably due to Wallerian degeneration or strategic ischemic infarction. Still, if hippocampal atrophy reflects different pathological processes, it should have visible regional differences in AD compared with VCI.

Participants and Methods: We examined the total and regional hippocampal volume of persons with mild AD ($n=10$), VCI ($n=11$) and matched controls ($n=8$). MRIs were conducted on a 1.5 Tesla GE Scanner and included a coronally acquired T1 SPGR (1.5 mm thickness, 0 skip) for hippocampal and whole brain analysis. 3D images were compiled in AFNI and traced using all three planes. Hippocampal volumes were analyzed both as a whole, correcting for total brain volume, and for each MRI slice in a rostral to caudal order. All participants completed a neuropsychological battery focused on memory and executive functions.

Results: Both AD and VCI patients demonstrated hippocampal atrophy relative to controls but there were no significant differences in total or regional hippocampal atrophy between the patient groups; this despite differences in their neuropsychological test results and ischemic lesion burden.

Conclusions: Mixed AD/VCI with shared pathological processes may be highly prevalent, even in the early stages of dementia. Studies of preventative and treatment strategies should take an inclusive approach to these disorders.

Correspondence: *Jennifer D. Klages, Ph.D., Hillside Centre, 311 Columbia St, Kamloops, BC V2C 2T1, Canada. E-mail: jennifer.klages@interiorhealth.ca*

P.J. LOCKHART, M. MAHONE, S. MOSTOFKY, B. HARRIS, G. RAYMOND, D. LANHAM & M. DENCKLA. Volumetric Analyses of the Corpus Callosum and Cerebellar Vermis of Children with Prenatal Alcohol Exposure without Fetal Alcohol Syndrome.

Objective: The neuroanatomic impact of prenatal alcohol exposure is not well understood when Fetal Alcohol Syndrome (FAS) is not present. The purpose of this study was to better understand the neurotoxic effects of prenatal alcohol exposure on two midline brain regions (the corpus callosum and cerebellar vermis) in individuals who have prenatal alcohol exposure but who do not meet full criteria for FAS.

Participants and Methods: MRI scans were acquired on 45 children, ages 6-16, with IQs greater than 65. Subjects were screened for the confirmed presence or absence of prenatal alcohol exposure and were placed in a non-alcohol exposed control group (n=22; 8 girls) and an alcohol exposed group without FAS (n=23; 8 girls). There was no history of severe brain injury or serious psychiatric diagnoses; and groups were matched on age. All subjects were evaluated by a dysmorphologist blind to the subject's alcohol exposure status. Vermal, corpus callosum and total intracranial areas were measured on midsagittal MRI images by raters blind to diagnosis.

Results: There were no differences between groups in corpus callosum size; however, subjects with non-FAS prenatal alcohol exposure had significant reductions (compared to non-alcohol exposed controls) in total intracranial volume ($p=.007$) and anterior cerebellar vermis ($p=.028$) size.

Conclusions: The findings suggest that midline brain abnormalities are associated with prenatal alcohol exposure, even without evidence for FAS; indicating the need for further exploration of the phenotype of children with prenatal alcohol exposure who do not have the dysmorphic features required for a diagnosis of FAS.

Correspondence: *Paula J. Lockhart, MD, Psychiatry, Kennedy Krieger Institute, 3901 Greenspring Ave, Baltimore, MD 21211. E-mail: Lockhart@kennedykrieger.org*

M.J. ROSENBLUM, S.A. SASSOON, A. O'REILLY, R. FAMA, E.V. SULLIVAN & A. PFEFFERBAUM. Frontal White Matter Fiber Bundle Integrity Predicts Digit Symbol Test Performance in Alcoholics: A Diffusion Tensor Imaging Study.

Objective: Alcoholics commonly show brain white matter abnormalities and deficits on the Digit Symbol (DS) subtest of the WAIS-R, a task involving sustained attention (frontal lobes), graphomotor skills (hemisphere opposite to writing hand), nonverbal processing (right hemisphere bias), and speeded movement. Coordination of these processes likely requires successful inter-hemispheric communication that depends on the integrity of fiber bundles of the corpus callosum (CC). We hypothesized that the integrity of callosal fibers of the genu rather than the splenium would predict DS performance in alcoholics.

Participants and Methods: Men and women meeting DSM-IV criteria for alcohol dependence (n=87) and age-matched controls (n=88) performed the DS test and underwent MR diffusion tensor imaging (DTI).

Results: Alcoholics performed significantly worse (-0.55 SD) than controls on both traditional DS test scores and time to complete the entire grid of 93 boxes. Quantitative white matter fiber tracking indicated deficits in fractional anisotropy (FA) in the alcoholics that were greater in the genu (0.90 SD) than splenium (0.50 SD). Bivariate followed by multiple regression analyses in the alcoholics indicated that genu FA significantly predicted both traditional scores and grid completion time after accounting for the contribution from splenium FA that was not significant. Selectivity of the genu-DS association was demonstrated by a failure of either genu or splenium fiber bundle FA to predict Fine Finger Movement, a non-cognitive, motor speed measure. No brain structure-function correlations were seen in the controls.

Conclusions: Alcohol-related compromise of white matter tracts integrating left and right frontal hemisphere information disrupts frontally-based processes required for DS performance.

Supported by AA12388, AA10723, and AA05965

Correspondence: *Margaret J. Rosenbloom, M.A., Psychiatry & Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Rd, Stanford, CA 94305-5721. E-mail: mrosenbloom@stanford.edu*

M. SEMRUD-CLIKEMAN & S. PLIZSKA. Frontal Lobe Volumes in Children with ADHD.

Objective: Children with ADHD have been found to show difficulty on measures of working memory and executive function; skills associated with frontal lobe difficulties. Previous research has indicated possible differences in volume in the frontal lobe particularly in the posterior frontal lobe area. This study evaluated the frontal lobe volume in children with ADHD with and without a history of stimulant medication and in controls.

Participants and Methods: The participants in this study were 18 boys in three groups: ADHD:combined type with a history of stimulant medication, ADHD:combined type who are treatment naïve (TN), and typically developing controls. No child diagnosed with ADHD had any comorbid diagnosis. All were right-handed and English speaking. Each child was screened for any learning problems or neurological difficulties. All children treated with stimulant medication were not on medication 24 hours prior to the acquisition of the MRI scan. Frontal lobe measures used a standard method for measurement using the DISPLAY software. Intra-rater reliability was found to be .93. The frontal lobe was divided into the posterior frontal lobe which extended from the beginning of the corpus callosum to the central sulcus. The prefrontal area was defined as between the front of the brain and the slice anterior to the corpus callosum. Brain size was normalized between the subjects to control for differing sizes.

Results: Significant differences were found bilaterally in the prefrontal cortex (left $p = .03$; right $p = .01$). There were no differences between the groups in the posterior frontal region (left $p = .74$; right $p = .65$). The ADHD groups did not differ from each other but both significantly differed from the control group.

Conclusions: These findings indicate that prefrontal differences are present in children with ADHD which are not sensitive to medication. Correspondence: *Margaret Semrud-Clikeman, Ph.D., Educational Psychology, University of Texas, 1 University Station, D 5800, Austin, TX 78712. E-mail: peg.semrud@mail.utexas.edu*

E. WILDE, M.A. RAMOS, R. YALLAMPALLI, Z. CHU, J.V. HUNTER, E.D. BIGLER, X. LI, G.R. HANTEN & H.S. LEVIN. The Relation Between Diffusion Tensor Imaging in the Frontal Lobes and Executive Functioning in Pediatric Traumatic Brain Injury.

Objective: Diffusion tensor imaging (DTI), a relatively new imaging modality, has recently been utilized to examine disruption of fiber integrity in white matter systems. In this study, we examined differences in fractional anisotropy (FA) using DTI in the frontal lobes of children with TBI and a comparison group of children with orthopedic injury (OI). We also wished to investigate the relation of frontal FA to the Emotional Control and Monitor scales of the Behavior Rating Inventory of Executive Function (BRIEF).

Participants and Methods: Seventeen children (3 female, 14 male) aged 9-16 with TBI years and 16 OI children of comparable age (3 female, 13 male) underwent DTI on a 1.5T Philips scanner at 3 months post-injury. Analysis of the frontal white matter was performed by three raters using PRIDE v4.1 fiber tracking software. Inter-rater and intra-rater reliability were excellent (intraclass correlational coefficients >0.9). Children were administered the BRIEF at the time of scanning.

Results: Analysis of variance revealed significant group differences on mean FA for the right frontal ($F(1,28)=6.67, p=0.015$) and left frontal ($F(1,28)=5.75, p=0.023$) regions. Additional analyses indicated significant group-by-region interaction effects for the right ($F(1,28)=5.93,$

$p=0.022$) and the left ($F(1,28)=6.90$, $p=0.014$) frontal areas whereby TBI children exhibited a significant relation between FA in the frontal areas and T-scores on the Monitor scale. Lower FA was related to a higher T-scale score (more symptoms). There was no significant relation with the Emotional Control scale.

Conclusions: DTI is promising tool to further elucidate brain-behavior relationships in disorders affecting white matter, such as pediatric TBI. Correspondence: *Elisabeth Wilde, PhD, Physical Medicine and Rehabilitation, Baylor College of Medicine, 1709 Dryden Rd, Suite 725, Houston, TX 77030. E-mail: ewilde@bcm.tmc.edu*

J.B. WILLIAMSON, D. NYENHUIS, G. STEBBINS & P. GORELICK. Relationships between Whole Brain and Regional Apparent White Matter Integrity and Neuropsychological Markers in Post-ischemic Stroke Patients.

Objective: Whole brain white matter diffusion tensor imaging-fractional anisotropy (FA) is sensitive to cognitive impairment in stroke patients. We now examine the relationships of both whole brain and regional FA and neuropsychological performance in a stroke population.

Participants and Methods: Subjects were 105 ischemic stroke patients, 3 to 6 months post stroke. Neuropsychological tests were grouped by cognitive domain (overall, working memory, basic attention, recall, recognition, language, spatial, psychomotor, and encoding) and standardized Principle Component (PC) scores were generated. Behavioral assessment included the Frontal Systems Behavioral Scale, Visual Analog Mood Scales, and Chicago Multiscale Depression Inventory.

DTI scans were performed on a 1.5T GE MRI with LX upgrade using a diffusion weighted single-shot spin-echo echo-planar sequence with two diffusion weights: $b = 0$ and $b = 800$ s/mm². FA was calculated for whole brain, frontal, and parietal ROI. Statistical analyses consisted of bivariate correlations and multivariate forward linear regression models that predicted neuropsychological scores while controlling for stroke volume.

Results: Whole brain FA correlated significantly with neuropsychological measures. Parietal lobe FA was the strongest predictor of visuospatial skills while frontal lobe FA was the strongest predictor of psychomotor speed, apathy, and depressed mood. Unexpectedly, parietal FA was also the strongest predictor of working memory, basic attention, and memory encoding.

Conclusions: This preliminary work reveals potential utility of DTI-FA ROI analyses in cerebrovascular disease as a predictor of brain-behavior relationships. Further analyses will examine temporal and occipital FA and lateralized effects. Results are discussed in the context of current regional DTI-FA literature.

Correspondence: *John B. Williamson, Ph.D., Neurology, University of Illinois at Chicago, Suite 400, 1645 West Jackson BLVD, Chicago, IL 60612. E-mail: juillia2@uic.edu*

M. WOOD, C.C. PRICE, J. NICOSIA, I. KELLISON, I.M. SCHMALFUSS & C.M. LEONARD. Volumetric Measurement of the Entorhinal Cortex: A Reliability and Validity Analysis.

Objective: The pathology of Alzheimer's disease (AD) first appears within the transentorhinal/entorhinal cortex. Measurement of this structure can be challenging depending on the technique employed. The purpose of this study was to identify the most robust technique based on intra-rater reliability and validity results of three entorhinal cortex volumetric measurement techniques.

Participants and Methods: Volumetric MRI scans (3.0T Siemens; MP Rage sequences) and a story memory task (Newcomer, 1999) were administered to 40 non-demented older adults (Age=71.25±6.61; MMSE=29.28±1.04). Using MEASURE (Barta et al., 1997) and after controlling for whole brain volume, entorhinal volumes were quantified based on three different techniques: the protocol of Insausti and colleagues (Insausti et al., 1998), Goncharova and colleagues (Goncharova et al., 2001), and an experimental Full method.

Results: Intra-rater reliability was high for each of the three techniques ($r=0.97-0.99$). Significant correlations between entorhinal size and memory ability were only found using Insausti and Goncharova protocols ($r=0.30$ and $r=0.30$, respectively). Of these two methods, the Goncharova protocol was qualitatively the easiest manual technique to employ.

Conclusions: High intra-rater reliability can be obtained for each of the three entorhinal measurement approaches. The Insausti and Goncharova technique correlated moderately with story memory ability suggesting that either of these two approaches is useful for memory investigations. Of these two techniques, however, Goncharova is recommended due to the ease and speed and of use.

Correspondence: *Mary Wood, B.S., College of Medicine, University of Florida, 1122-1 SW 6th Ave., Gainesville, FL 32601. E-mail: marister@ufl.edu*

R. YALLAMPALLI, E.A. WILDE, Z. CHU, D.M. TROTTER, J.V. HUNTER, X. LI, S.C. YUDOFISKY & H. KIM. The Relation Between Diffusion Tensor Imaging in the Cingulate and WCST Performance in Bipolar Disorder.

Objective: Neuroimaging studies help enhance our understanding of brain-behavior relationships in neuropsychiatric disorders, such as bipolar disorder (BPD). Diffusion tensor imaging (DTI), allows for determination of white matter fiber integrity in specific brain areas through fractional anisotropy (FA) measurement. The cingulate gyrus has been implicated in executive functioning, a common cognitive deficit in some BPD patients. This study examined the relationship between FA in the cingulate and performance in the Wisconsin Card Sorting Task (WCST) in patients with BPD and a comparison group.

Participants and Methods: Seven patients with BPD were paired with 7 healthy participants who were matched for age, sex, and SES with an average age of 46.79 ± 11.17 . Subjects underwent MRI on Philips 1.5T scanner and analysis of the cingulate was done using the Phillips PRIDE v.4.1 software. All subjects were administered the WCST at the time of scanning, and age and education corrected standard scores were used.

Results: Although there was no significant group difference in mean FA for the right or left cingulate, general linear model analyses revealed relations between WCST perseverative error score and FA in the right, $F(1,13)=5.3$, $p=0.041$, and left, $F(1,13)=7.97$, $p=0.017$. In addition, there was a relation between WCST total error score and the mean FA in the left cingulate, $F(1,13)=7.81$, $p=0.018$. There was a near significant relation between the WCST total error score and the mean FA in the right cingulate, $F(1,13)=3.54$, $p=0.087$. Higher FA was associated with a higher scaled score (fewer errors).

Conclusions: These results suggest that the cingulate may be affected by BPD. Correspondence: *Ragini Yallampalli, B.S. Neurobiology, Psychiatry, Baylor College of Medicine, 7315 Brompton St, Apt 272B, Houston, TX 77025. E-mail: yallampa@bcm.tmc.edu*

Poster Session 3: Adult Acquired CNS Injury

10:45 a.m.–12:15 p.m.

Hemispheric Asymmetry/Laterality/Callosal Studies

R.C. DELEON, M. HISCOCK, B.H. JANSEN, M. MCHENRY & G. ZOURIDAKIS. Why Do Certain Right-Handers Fail to Exhibit a Right-Ear Advantage? An Electrophysiological Study.

Objective: Whereas clinical findings indicate left-hemisphere language representation in approximately 95% of right-handers, only

about 80% of normal right-handed persons show a right-ear advantage (REA) for dichotically presented linguistic stimuli. This study tested the hypothesis that right-handers who fail to show an REA have better-developed ipsilateral than contralateral auditory pathways to the left hemisphere.

Participants and Methods: Right-handed undergraduates with normal hearing were divided into REA and non-REA (NREA) groups on the basis of the Halwes Fused Dichotic Word Test, after which event-related brain potentials (ERPs) in response to brief tone stimuli were recorded bilaterally from temporal, central, and frontal sites. There were 15 participants in the REA group and 16 in the NREA group. The research design for the ERP phase of the study was a 2 groups x 2 ears x 2 hemispheres ANOVA, and the dependent variables were ERP latency and amplitude. Post hoc comparisons were made to identify differences in the response of each hemisphere to ipsilateral and contralateral stimulation.

Results: The REA group showed more efficient conduction from each ear to the contralateral hemisphere. This pattern was obtained in 72% of amplitude comparisons and 67% of latency comparisons. The NREA group also showed a superiority of contralateral over ipsilateral pathways, but only when left-hemisphere responses were analyzed (89% of amplitude comparisons and 75% of latency comparisons). Participants in the NREA group showed no difference in right-hemisphere responses to stimuli from the ipsilateral and contralateral ears.

Conclusions: Although ERP patterns differentiated the two groups, the results do not confirm the hypothesis of better ipsilateral than contralateral conduction to the left hemisphere in persons who fail to show an REA. The results suggest the need for a more comprehensive model of ear asymmetry that can accommodate dynamic processes such as attention and information processing.

Correspondence: *Merrill Hiscock, Ph.D., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu*

K. HIATT & J.P. NEWMAN. Behavioral Assessment of Interhemispheric Communication Among Psychopathic Offenders.

Objective: Interhemispheric communication deficits appear to play a role in psychopathy (e.g., Hare, 1998; Hiatt & Newman, 2006; Kosson 1996, 1998; Raine et al., 2003) but there have been few direct empirical studies. We used well-established behavioral paradigms to investigate (1) the efficiency of simple information transfer across the corpus callosum, and (2) the efficiency of interhemispheric integration.

Participants and Methods: Participants were Caucasian male inmates with PCL-R scores in either the psychopathic (PCL-R score ≥ 30) or nonpsychopathic (PCL-R score ≤ 20) range. Study 1 (54 psychopathic (P), 36 control (C) participants) assessed interhemispheric transfer using a simple target-detection task based upon Poffenberger's (1912) methodology. Studies 2 (45 Ps, 46 Cs) and 3 (26 Ps, 33 Cs) examined interhemispheric integration efficiency using two different versions of Banich and colleagues' (e.g., Belger & Banich, 1998) letter-name identity task.

Results: Study 1 revealed a significantly prolonged interhemispheric transfer time (IHIT) among psychopathic offenders relative to nonpsychopathic offenders. Studies 2 and 3 revealed a normal bilateral processing advantage among psychopathic offenders, suggesting normal integration of information that is presented simultaneously to opposite hemispheres.

Conclusions: We found a somewhat surprising pattern of substantially delayed interhemispheric transfer but an apparently normal bilateral processing advantage among psychopathic offenders. Task limitations may have contributed to the failure to detect interhemispheric integration deficits. The overall pattern of findings is interpreted with respect to possible callosal transfer deficits among psychopathic offenders.

Correspondence: *Kristina Hiatt, Ph.D., Psychology, University of Oregon, Child and Family Center, 195 W. 12th St, Eugene, OR 97401. E-mail: kdhiatt@uoregon.edu*

A.K. HOLLAND, G.A. MOLLET, J.E. CARMONA, K. ADDISON & D.W. HARRISON. Differences in Cerebral Lateralization of Phoneme Detection as a Function of Hostility and Stress.

Objective: Differences in cerebral asymmetry were examined as a function of hostility in right-handed men through measurement of phoneme detection before and after stress. It was predicted that high hostile men would exhibit relative activation of the right brain, and a relative increase in left-ear phoneme detection after exposure to a recording of angry crying.

Participants and Methods: Six right-handed men were identified as high hostile and 11 as low hostile, as indicated by standardized scores on the Cook-Medley Hostility Scale. Right- and left-ear phoneme detection was tested by having participants identify 30 trials of phonemes presented to the left and right ear simultaneously. Participants then listened to a recording of infant vocalizations at 90 dB, followed by a second measure of phoneme identification.

Results: A condition x ear interaction ($F(1, 16) = 12.87, p < .005$) was found, indicating improved accuracy at the right ear in the post-stress condition in low and high hostile men. A second hostile x focus x ear interaction ($F(2, 30) = 3.33, p < .05$) was found, indicating a decline in asymmetry in high hostile but not low hostile men in the post stress condition.

Conclusions: We found augmentation of speech processes with mild to moderate levels of affective stress. High hostile males appear to be inflexible at allocating lateralized intentional resources. Contrary to our prediction, we found increased asymmetry as a function of the stressor with improved speech processing in the post-stress condition. It is possible that higher levels of affective stress may alter the ability to process speech.

Correspondence: *Alissa K. Holland, M.A., Psychology, Virginia Polytechnic Institute and State University, 109 Williams Hall, Blacksburg, VA 24061. E-mail: akhollan@vt.edu*

G.A. MOLLET, A.K. HOLLAND, J.E. CARMONA, K. ADDISON & D.W. HARRISON. Lateralized Differences in Systolic Blood Pressure Regulation as a Function of Hostility Level.

Objective: This research examined systolic blood pressure (SBP) regulation and allocation of hemispheric resources in low and high hostile men. A dual-task paradigm was created whereby participants directed attention to dichotic stimuli, and regulation of SBP was recorded. Increased SBP is associated with right hemisphere activation in high hostile men (Demaree & Harrison, 1997). It was predicted that during direction of right hemispheric resources (left focus condition) to dichotic stimuli, high hostile men would be unable to regulate SBP as effectively as low hostile men.

Participants and Methods: Participants (high hostile: $N = 4$; low hostile: $N = 4$) completed a 30 trial dichotic listening task before and after exposure to an auditory stressor. No focus, focus right, and focus left conditions were included. Systolic blood pressure was recorded before and after each exposure to the stressor.

Results: A main effect of focus ($F(2, 12) = 4.95, p < .05$) indicated increased SBP in the no focus condition regardless of hostility level. Further, a group x focus x condition ($F(2, 12) = 6.05, p < .05$) indicated increased SBP for high hostile men in the no focus and focus left conditions.

Conclusions: Results suggest reduced right hemispheric resources in high hostile men during a dual-task. High hostile men showed dysregulation of SBP when they were required to use right hemisphere resources on the dichotic listening task. Additionally, high hostile men showed increased reactivity to the stressor in the no focus condition, which may be suggestive of increased reactivity to stress in high hostile men.

Correspondence: *Alissa K. Holland, M.A., Psychology, Virginia Polytechnic Institute and State University, 109 Williams Hall, Blacksburg, VA 24061. E-mail: akhollan@vt.edu*

J. LEE & L. BUCHANAN. An Investigation of Sex Differences in Hemispheric Asymmetry using Auditory and Tactile Recognition Memory Tasks.

Objective: The present study examined sex differences in hemispheric asymmetry using a dichotic listening recognition memory task and a texture recognition memory task. To our knowledge, this is the first study to examine sex differences in laterality across these two modalities.

Participants and Methods: Participants included 22 female and 23 male right-handed adults. For the auditory evaluation of asymmetry, two different word lists were presented simultaneously to the right and left ears. The participants were asked to attend to and memorize only the information from one ear. Immediate and delayed recognition memory for the items on the list were tested. The memory test was followed by a second study list with attention to previously ignored ear and a second set of memory tests followed. For evaluation of tactile memory, participants were instructed to feel and memorize textures that were presented to one hand. Following the presentation, an immediate and a delayed recognition tests were given. The test was repeated using the other hand using a new set of stimuli.

Results: There was an advantage for immediate over delayed recognition and a right ear advantage for the dichotic listening test but there were no sex differences.

Conclusions: Despite documentation of sex differences in hemispheric asymmetry for the processing of linguistic information, the findings of the present study suggest an absence of sex differences in recognition memory for that information.

Correspondence: *Jin Lee, Psychology, University of Windsor, 15251 Maxwell, Plymouth, MI 48170. E-mail: lee12c@uwindsor.ca*

S.N. LEGARDY, W.S. BROWN, B. SCHIEFFER & L.K. PAUL. Deficits in Interpreting Inference and Irony Individuals with Agenesis of the Corpus Callosum.

Objective: Adults with agenesis of the corpus callosum (ACC) have deficits similar to those seen in individuals with right hemisphere brain damage in comprehension of nonliteral language, proverbs, affective prosody, and narrative humor. These findings in ACC are attributed to a more general limitation in the perception of second-order meaning in language. This study investigated the comprehension of inferential language and irony in individuals with ACC.

Participants and Methods: Seven adults with complete ACC were compared to 16 adult control participants (matched in age and IQ) on two 16-item tasks from the same Right Hemisphere Communication Battery developed by Brownell & Gardner (1986).

Results: On the inference measure, individuals with ACC were able to perceive correct inference and fact statements as well or better than controls. However, they were worse in their perception of incorrect inference and fact statements, tending to answer that statements were true when they were not ($p = .07$). For the irony measure, controls were better able to correctly answer factual statements compared to individuals with ACC ($p = .03$). In addition, for ironic statements, there was a trend of an interaction such that individuals with ACC were relatively better at comprehension of irony in friendly scenarios than they were at comprehension of ironic statements in hostile scenarios ($p = .14$).

Conclusions: Overall, this research suggests that, while individuals with ACC can make correct inferences and comprehend irony in general, limitations in comprehension may emerge when processing incorrect statements or expressions involving hostile emotions.

Correspondence: *Warren S. Brown, Ph.D., Fuller Graduate School of Psychology, Travis Research Institute, 180 N. Oakland Ave, Pasadena, CA 91101. E-mail: wsbrown@fuller.edu*

Q.R. MANO, E. PLAMBECK, L.A. KLEIN & D.C. OSMON. cAsE MiXiNg Reverses the Asymmetry of Orthographic Neighborhood Effects: A Lateralized Lexical Decision Experiment.

Objective: A lateralized visual lexical decision experiment was conducted to examine how cAsE MiXiNg interacts with orthographic neighborhood size (N) effects in the right visual field (RVF) and left visual field (LVF). Large orthographic neighborhoods (LN) have recently been shown to have the most facilitative effect in the LVF/right hemisphere.

Participants and Methods: To further examine the putative laterality of N effects, a 2(LVF vs. RVF) x 2(cAsE MiXiNg vs. non-cAsE mX-InG) x 3(large [LN] vs. small [SN] vs. pseudowords) factorial design was employed. Reaction time and error rates across all experimental conditions were collected from non-impaired college students ($n=50$).

Results: Two repeated-measures analyses of variance (ANOVA) were conducted separately for word and non-word stimuli. The first ANOVA with word stimuli revealed a 3-way interaction such that cAsE MiXiNg reversed the asymmetry of LN facilitative effects in the LVF to facilitative effects in the RVF [$F(1,49)=36.223, p<.001$]. Specifically regarding this interaction, cAsE MiXiNg appeared to differentially (1) disrupt LN lexical decisions in the LVF while (2) disrupting small N lexical decisions in the RVF. The second ANOVA with pseudowords showed that cAsE MiXiNg enhanced accuracy for pseudoword decisions in the LVF [$F(1,49)=56.193, p<.001$].

Conclusions: While the results could be explained within the interactive-activation model, they seem to fit better within the SERIOL model of visual word recognition. As such, results are discussed within the context of cerebral laterality of orthographic processes.

Correspondence: *Quintino R. Mano, M.S., Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford Ave., Garland Hall 224, Milwaukee, WI 53221. E-mail: qrmano@uwm.edu*

P. MOES, M.A. SCHEERES & B. KLASSEN. Interhemispheric Interaction of Emotional Processing in Relation to Social and Emotional Behavior.

Objective: Previous work in our laboratory found that females had a significantly greater interhemispheric interaction for judging emotional expressions than did males (Sheehan & Moes, 2002). This previous study assessed interhemispheric interaction using a visual half-field, emotion-matching task. Two faces, with either the same or different emotions (e.g., happy/angry) were presented tachistoscopically to the left, right or bilateral visual fields. A bilateral field advantage (BFA) score for reaction times (RT) was calculated by subtracting the bilateral RT's from the unilateral (left and right combined) RT's. Females had a significantly larger BFA than males, suggesting greater interhemispheric cooperation for females. The present study was designed to determine if the level of interhemispheric interaction for emotional judgments was related to other measures of social or emotional behaviors.

Participants and Methods: Participants completed the same face/emotion matching task as in the previous study, along with a test of emotional judgment accuracy (e.g., the "eye test"), one measure of "emotional intelligence" and two measures of need for affect ("need to approach" and "need to avoid").

Results: Results replicated the previously found gender difference for BFA score. In addition, correlations between the BFA and other measures of emotional judgment or motivation found significant positive relationship for BFA and the need-to-approach and the need-for-affect (total) measures, but not for BFA and the other paper and pencil measures.

Conclusions: The results indicate that individual differences in interhemispheric interaction may contribute to differences in everyday social/emotional abilities.

Correspondence: *Paul Moes, Ph.D., Psychology, Calvin College, 3201 Burton St. SE, Grand Rapids, MI 49506. E-mail: pmoes@calvin.edu*

S.E. PARLOW & C. HARRIS. Identifying Ambiguous Hand Preference in Autistic Children.

Objective: Autism is unique among the developmental disorders for its high rate of ambiguous handedness. A potentially important clinical marker, such children are believed to have poorer developmental outcomes. Unfortunately, there is no standard method of assessing handedness in this population. We contrasted three approaches, hypothesizing that the WatHand Box, which combines rigorous observation and a naturalistic approach, might be more sensitive than parent report and a more traditionally structured measure.

Participants and Methods: 50 children aged 3-12 years ($M = 8.1$ yr) were tested, including 25 autistic children and 25 healthy siblings. Severity of autism was assessed using the Autism Behaviour Checklist. The Hand Preference Demonstration Test (Soper et al., 1986) was administered four times across a two-week period, and the WatHand Box (Roy & Bryden, 2004) twice. Parents reported hand preference globally and for 14 individual tasks. A laterality quotient (LQ) was calculated for each measure. Scores of -49.0 to 49.0 were used to identify children with ambiguous handedness.

Results: As expected, there were more non-right-handers in the autistic group, regardless of the measure used. The rate of ambiguous handedness was higher for observational methods (20%) than parent report (8%). Parents were more likely to classify a non-right-handed autistic child as left-handed, while observational measures were more likely to classify the child as ambiguous. Test-retest reliability was higher for the HPDT than for the WatHand Box, but the hit rate for ambiguous handedness was higher for the WatHand Box. Contrary to expectation, autism severity was not associated with LQ scores in this relatively high functioning sample.

Conclusions: As expected, the number of autistic children identified with ambiguous handedness varied with the method used. The WatHand Box was the most sensitive and parent report the least sensitive measure. This study is the first to report on the use of the WatHand Box with an autistic sample.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

D. PULSIPHER, J. MORTON, J.B. PARRISH, C. DOW, L. GUIDOTTI, R. SHETH, M. SEIDENBERG & B. HERMANN. Line Bisection is Not a Measure of Gross Callosal Maturation in Healthy Children.

Objective: In recent years, several authors have hypothesized that line bisection performance in children may be a measure of corpus callosum (CC) maturation. Previous studies have shown that prepubescent children typically bisect lines to the right of true center with their right hand and to the left with their left hand (symmetrical bias). Children entering puberty typically bisect lines to the left with both the right and left hands (pseudoneglect). Because of substantial posterior CC growth during this period and its involvement in the transfer of attention-based visuospatial processes, it has been suggested that this leftward shift on the line bisection task may be a manifestation of callosal maturation. Despite reports discussing this issue, no study has directly examined this relationship in children.

Participants and Methods: 46 healthy children completed the line bisection test and underwent quantitative MRI. Subjects ranged in age from 8-18 years, with a mean age of 13 years. The CC was manually traced and divided into 7 Witelson regions using an automated process. Analyses were conducted by grouping the Witelson regions into anterior, posterior, and midbody.

Results: Subjects did not show the typical age associated pattern of symmetrical bias and pseudoneglect, but rather showed varying patterns of line bisection performance. Increased age was significantly associated with increased CC volume in the midbody and posterior section (p 's < .05). Correlations between the sections of the CC and line bisection performance did not yield any significant relationships.

Conclusions: Despite the presumed relationship between line bisection and CC, the line bisection task does not appear to be an adequate measure of gross callosal maturation. Microstructural changes may underlie previous associations reported in the literature.

Correspondence: *Dalin T. Pulsipher, B.S., Psychology, Rosalind Franklin University of Medicine & Science, 3333 Green Bay Road, North Chicago, IL 60064. E-mail: dalin.pulsipher@rfums.org*

T. SCHULTE, E.M. MULLER-OEHRING, A. PFEFFERBAUM & E.V. SULLIVAN. Stroop-Cue Match Performance In Alcohol Abuse, Hiv, And Combined Disorder: A Diffusion Tensor Imaging Study.

Objective: Diffusion tensor imaging (DTI) was used to study the combined effects of HIV infection and alcoholism (ALC) on corpus callosum microstructural integrity in relation to selective attention and conflict processing.

Participants and Methods: We devised a Stroop Match-to-Sample task requiring a decision based on a color cue directing attention to a color and priming color processing of Stroop stimuli. We previously observed that individuals with HIV performed comparably to controls, whereas ALC showed processing delays with exacerbation from the combined disorders (H+A). DTI was acquired in 18 ALC, 19 HIV, 20 H+A, and 19 controls (CTL).

Results: Fractional anisotropy (FA) in callosal genu, body, and splenium was significantly higher and mean diffusivity (MD) was lower in CTL than ALC and H+A but not HIV. All groups showed Stroop effects with longer reaction times to incongruent than congruent trials. In ALC but not the other groups, larger Stroop effects on cue-stimulus match but not non-match trials correlated with lower FA (genu $r = -.63$; body $r = -.55$; splenium $r = -.50$) and higher MD in callosal regions (genu $r = .51$; body $r = .54$; splenium $r = .45$). In H+A subjects, larger Stroop-cue match effects correlated with lower genu FA ($r = -.42$). To test whether the Stroop-cue match and FA relation was specific to alcoholics, we tested the slopes difference between ALC and CTL and found a significant alcohol-specific relation between Stroop performance and genu FA and trends for genu and body MD and body FA.

Conclusions: The pattern of callosal microstructure-function relations in ALC and H+A but not in HIV indicates that alcoholism-related microstructural degradation of the corpus callosum affects Stroop-induced interference and match processing. We speculate that alcohol-related selective degradation of the callosum attenuates selective attention and curtails the opportunity to engage in compensatory benefit from recruiting bilateral frontal control systems for conflict processing. Support: AA12999, AA12388, AA10723.

Correspondence: *Tilman Schulte, Ph.D., Neuroscience Program, SRI International, 333 Ravenswood Avenue, Menlo Park, CA 94025-3493. E-mail: til@stanford.edu*

T.E. SITZER, L. ZHENG, C. ZAROW, M.W. WEINER, H.V. VINTERS, W.G. ELLIS, J.H. KRAMER, D.M. MUNGAS, B.R. REED, W.J. JAGUST, W.J. MACK & H.C. CHUI. A Comparison of Hippocampal Asymmetry in Alzheimer Disease and Hippocampal Sclerosis.

Objective: After Alzheimer Disease (AD), hippocampal sclerosis (HS) is the second most common cause of amnesia in late life, although it is often not recognized until autopsy. The objective of this study was to compare neuropsychological profiles, focusing on verbal and nonverbal memory, and volumetric structural imaging in AD and HS.

Participants and Methods: Based on neuropathological criteria, the sample comprised 38 cases: 13 AD, 12 HS, and 13 cognitively normal (CN) controls (mean age = 79.6 ± 6.5 , mean education = 14.1 ± 3.4). Group comparisons were made between baseline measurements of 1) verbal and nonverbal memory, 2) psychometrically matched measures of memory (MEM) and executive functioning (EXEC), and 3) MRI-derived hippocampal volume of right and left hemispheres.

Results: Verbal memory was comparable to visual memory in CN (Diff=0.013±0.44) but was slightly weaker than visual memory in AD (Diff=-0.059±0.43) and stronger than visual memory in HS (Diff=0.243±0.40). The asymmetry between verbal and visual memory in AD and HS approached statistical significance ($p=0.09$). MEM, as compared to EXEC was stronger in CN (Diff=-7.6±20.3), and weaker in AD (Diff=14.2±16.3) and HS (Diff=7.6±10.9). Right hippocampal volume was significantly lower in HS (0.09%±0.03) compared to CN (0.18%±0.03; $p<.001$) and AD (0.12%±0.03; $p<0.05$). Right hippocampus tended to be larger than left in CN (Diff=0.013±0.02); no asymmetry was noted in AD (Diff=-0.002±0.02), and left was larger than right in HS (Diff=0.012±0.04).

Conclusions: Compared to AD, HS is associated with greater right hippocampal atrophy and poorer performance on visual than verbal memory. Additional studies are needed to further explore this differential vulnerability of right hemisphere structure and function in HS.

Correspondence: *Traci E. Sitzer, Ph.D., Neurology, University of Southern California, 1520 San Pablo St. Suite 4100, Los Angeles, CA 90033. E-mail: tsitzer@usc.edu*

B. PAV, P.S. FOSTER, V. DRAGO, C. MACKMAN, M.S. OKUN, H.H. FERNANDEZ, K.M. HEILMAN & F.M. SKIDMORE. Lateralization Effects of Conceptual Hypometria on Perception of Relatively Far Peripersonal Space in Idiopathic Parkinson's Disease.

Objective: Hypometria (e.g. micrographia) is often observed in individuals with Parkinson's disease (PD). We were interested in learning if individuals with PD have an altered perception of body-centered personal space. Attention-perception in far space has been shown to be primarily mediated by the right hemisphere, while the left hemisphere attends more readily to objects in near space. We posited that individuals with PD would display conceptual hypometria for actions, particularly for actions in far space. We hypothesized that individuals with onset of disease in the right hemisphere would have a greater conceptual action hypometria than individuals with left hemispheric onset.

Participants and Methods: 20 subjects with PD and 20 age-matched controls were given a questionnaire evaluating subjective perception of personal action space. The questionnaire asked individuals to rate distance from themselves of various actions, such as opening a door, on a scale of 0 (close) to 5 (far).

Results: Individuals with PD had a hypometric perception of actions occurring in far space ($M=3.1$) compared to controls ($M=3.66$). In a sub-analysis, we found only individuals with right hemispheric onset of PD had significant conceptual hypometria ($M=2.69$) compared to controls, while individuals with left hemispheric onset ($M=3.31$) were not significantly different from controls.

Conclusions: Perception of interpersonal space in PD is hemispherically lateralized. Individuals with onset of disease in the right hemisphere had hypometric subjective perception of far peri-personal space. This may have implications for capacity of individuals with PD to accurately judge distance in activities requiring conceptual mapping of space.

Correspondence: *Frank M. Skidmore, University of Florida, McKnight Brain Institute, 100 S Newell Drive, Rm L3-100, Gainesville, FL 32610. E-mail: frank.skidmore@neurology.ufl.edu*

R.D. WHITMAN & C. ABEARE. A Reciprocal, Dynamic, Hemispheric Model of Creativity.

Objective: It is proposed that the left and right hemispheres are biased, respectively, towards figural (narrow, exclusive) and holistic (broad, inclusive) processing of stimuli. A creative and adaptive perceptual style requires both processing styles operating in parallel as an interacting system modulated by frontal executive functions. This is tested in three studies.

Participants and Methods: Study one used a lateralized lexical decision task in Ss scoring high and low on the Torrance creativity battery. Study two studied the effect of nicotine on lateralized semantic priming. Study three studied lateralized semantic priming in a population of thought disordered and non-thought disordered schizophrenics.

Results: Study one demonstrated that subjects high in creativity show greater right hemisphere priming than do less creative subjects. Study two, showed that right hemispheric priming increases under nicotine arousal. Study three showed an uncontrolled increase and persistence in right hemisphere priming in thought disordered schizophrenics.

Conclusions: These studies provide support for the proposed model of creativity. There was a dynamic interaction between hemispheres and increased right hemisphere semantic priming in highly creative subjects and under nicotine arousal. And there was greater and more persistent right-hemisphere priming in thought-disordered schizophrenics. The right hemisphere is more involved in highly creative subjects, under conditions of increased cortical arousal, and in thought-disordered, frontal lobe impaired schizophrenic subjects. Creativity involves an interhemispheric interplay that permits a continuous reconsideration of meaning and allows for creative consideration of alternative meanings. Absence of this interplay decreases creativity and a loss of inhibition results in thought disorder.

Correspondence: *Russell D. Whitman, Ph.D., Psychology, Wayne State University, 5057 Woodward Avenue, 7th Floor, Detroit, MI 48202. E-mail: dwhitman@wayne.edu*

R.D. WHITMAN & J. MILLER. Lateralized Serial Semantic Priming.

Objective: Research suggests that the left hemisphere more narrowly activates words meaning than does the right. This study determined the effects of successive priming in selection of appropriate word meaning; specifically, whether excitation of one network can effectively inhibit an adjacent, conflicting network of association.

Participants and Methods: Eighty right-handed, English speaking adults participated in a lateralized, lexical priming task using two prime stimuli followed by a real or non-word target within a 150 or 450ms stimulus onset asynchrony (SOA). One (inconsistent: BANK-RIVER: MONEY) or both (consistent: BANK-RIVER: WATER) prime stimuli were semantically related to the real word targets.

Results: Consistent and inconsistent pairs primed in both hemispheres at the early SOA. The left hemisphere showed greater priming for consistent stimuli and the right hemisphere showed equivalent priming to both prime-types. By 450 ms, the right hemisphere showed an inhibition of response to consistent stimuli and the left hemisphere primed to both prime pairs but showed a reversal from the early SOA, with inconsistent stimuli now showing greater priming.

Conclusions: These results suggest that the left hemisphere's early response is narrow priming (150ms) followed by broader priming (450 ms). Further, the two hemispheres show maximum priming at different times. When two related networks are activated within the lexicon following word presentation, the contextual clues surrounding a word are utilized to reach a conclusive meaning. These results support our hypothesis in that once a meaning is decided upon, the dominant network (the chosen meaning) then inhibits the subordinate (unselected, adjacent networks) networks.

Correspondence: *Russell D. Whitman, Ph.D., Psychology, Wayne State University, 5057 Woodward Avenue, 7th Floor, Detroit, MI 48202. E-mail: dwhitman@wayne.edu*

Neglect

D. ANTONIELLO, P.S. FOSTER, B.M. KLUGER, V. DRAGO, D. FITZGERALD & K.M. HEILMAN. Task Specific Altitudinal Neglect.

Objective: Clinical observations on patients with spatial neglect suggest the brain's attentional mechanisms are organized along the horizontal, vertical and radial axes. Patients with spatial neglect often fail

to report and respond to stimuli presented in the neglected portion of space. In addition, on tasks that require spatial operations such as line bisection, they frequently demonstrate neglect by placing their mark to the side of the midline ipsilateral to the lesion. Previous reports of altitudinal (vertical) neglect have shown the direction of hemispace inattention to be consistent across various visual-spatial tasks. We now report a patient who demonstrates an altitudinal neglect in which the upper versus lower spatial distribution is task dependent.

Participants and Methods: A 63 year-old woman with Posterior Cortical Atrophy was examined for the ability to perform visual spatial operations in the horizontal, vertical, and radial axes.

Results: On tests of double simultaneous visual stimulation, the patient displayed altitudinal inattention by extinguishing the stimuli presented in the lower hemispace. On the letter cancellation task, the patient displayed altitudinal inattention by neglecting the letters in the lower hemispace. In contrast, on vertical and radial line bisection tasks, the patient displayed altitudinal inattention of the upper hemispace by consistently placing her mark well below the true midpoint.

Conclusions: Thus, the patient showed a task dependent inattention, neglecting the lower field during double simultaneous stimulation and letter cancellation while neglecting the upper field during line bisection. These results suggest this patient had a reduced attentional capacity and employed different attentional mechanisms along the vertical axis that were dependent on the task. Hence, line bisection might activate the more dorsal “where” system biasing attention downward while the extinction and letter cancellation paradigms might engage the ventral “what” system biasing attention upward.

Correspondence: *Daniel Antonello, MD, Neurology, University of Florida, L3-100 McKnight Brain Institute, Newell Drive, Gainesville, FL 32610. E-mail: daniel.antonello@neurology.ufl.edu*

B. BUTLER & G. ESKES. The Effect of Left Limb Movements on the Orienting of Attention after Right Hemisphere Stroke.

Objective: A deficit in disengaging attention from the ipsilesional (right) space in order to re-orient toward the contralesional (left) space has been related to the severity of visuospatial neglect after right-hemisphere stroke. Active and passive left limb movements in left hemispace improve performance on visual scanning and line bisection tasks in some individuals with neglect. In this study, it was hypothesized that left limb movements would reduce the disengage deficit during covert orienting of attention.

Participants and Methods: Orienting was assessed with vocal reaction times in a cued target-detection paradigm with no limb movement and after unilateral active and passive limb movements in a group of older healthy adults ($n=20$) and in right-hemisphere stroke patients with ($n=3$) and without ($n=13$) neglect.

Results: In one neglect participant, whose lesion affected the ventral orienting network and spared the superior parietal lobe and subcortical structures involved in right-hemisphere attention and motor pathways, left limb movement reduced the disengage deficit by decreasing response latencies to left targets after a right cue. Left limb movements however, had little effect on orienting in stroke or healthy control groups with no disengage deficit or in individual neglect participants with a spatial attention bias (i.e., slower overall target detection on the left).

Conclusions: The ability of contralesional limb activation to ameliorate orienting deficits in neglect may depend upon the severity of the disengage deficit and the availability of neural resources in attentional and motor pathways that facilitate activation in the orienting network and re-balancing of neural activity between the hemispheres.

Research supported by the Heart and Stroke Foundation of Nova Scotia
Correspondence: *Beverly Butler, PhD, QEII Health Sciences Centre, Room 3073, Abbie J. Lane Bldg., 5909 Veteran's Memorial Lane, Halifax, NS B3H 2E2, Canada. E-mail: Beverly.Butler@cdha.nshealth.ca*

B.H. LEE, E. KIM, K. CHOI, S. SEO, S. MOON & D.L. NA. Mini-Mental State Examination in Right Hemisphere stroke with or without hemispatial neglect.

Objective: Hemispatial neglect refers to a patient's failure to report or respond to stimuli presented in contralesional space. Little is known about cognitive differences between patients showing neglect and patients without neglect in their acute stroke stage. The aim of this study was to investigate how the patients with neglect (N+) differ from those without neglect (N-) in general cognitive function assessed by the Korean version of Mini-Mental State Examination (K-MMSE)

Participants and Methods: Patients consisted of 98 consecutive acute right hemisphere stroke patients. The patients underwent neglect test battery followed by MMSE in the same day or within one day. Hemispatial neglect and general cognitive dysfunction were defined on the basis of norms.

Results: Fifty eight of 98 (59.2%) patients were designated to be N+ group. Patients with N+ group were older, less educated, and had larger lesion volume. The mean MMSE score of 98 patients was 23.44 ± 4.88 (range: 9-30), and 57 (58.2%) of these patients scored below the age and education matched normal range. The frequency of general cognitive deficit in N+ group was 74.1% (43/58), which was significantly higher than that (35.0%, 14/40) of N- patients ($\chi^2 = 14.902, p < 0.001$). A regression analysis after controlling for lesion volume, age, and education variables revealed that the neglect was a significant predictor of low MMSE score ($\beta = -0.252, t = -2.591, p = 0.011$). Specifically, presence of neglect predicted low scores of MMSE subdomains such as time orientation, place orientation, visuospatial function.

Conclusions: The presence of neglect was a significant predictor of low MMSE score. The hemispatial neglect was related to disorientation and visuospatial dysfunction. These results suggest that hemispatial neglect syndrome significantly contributes to general cognitive dysfunction and that hemispatial neglect should be considered within the context of general cognitive dysfunction.

Correspondence: *Byung H. Lee, MA, Neurology, Samsung Medical Center, Sungkyunkwan University School of Medicine, 50 Ilwon-dong, Gangnam-gu, Seoul 135-710, South Korea. E-mail: byuryhan@hanmail.net*

E. MURRAY, B. CLARK & A.M. BARRETT. “Getting the Picture” of Spatial Neglect.

Objective: Chatterjee (1997) proposed that viewer- versus object-centered errors may predict participants' pattern of mis-centering photographs. We wished to learn if this behavior could be influenced by a primary perceptual-attentional (PA) versus motor-intentional (MI) spatial bias.

Participants and Methods: Patients with post-stroke left spatial neglect (2 right-lesion, 1 bilateral-lesion) photographed 6 objects and 6 lines in the viewfinder of a camera. We hypothesized that a primary PA bias might induce mis-positioning of the photograph subject to the non-neglected side while, a primary MI bias would impair movement of the camera toward the neglected field, inducing subject mis-positioning toward the neglected side.

Results: We observed three different patterns of performance. Patient 1, who met screening criteria for abnormal attention, but did not demonstrate horizontal line bisection errors, mis-centered photographed lines and objects rightward, suggestive of left spatial neglect. Patient 2, who on screening made omission errors in left greater than right space, made rightward line bisection errors consistent with a primary PA bias. This patient mis-centered lines rightward, but objects, leftward. Patient 3 did not meet screening criteria for spatial neglect yet, like Patient 2, exhibited a stimulus-specific pattern of mis-centering; objects were displaced rightward while lines were not asymmetrically displaced.

Conclusions: Our patients' photography bias cannot be explained by either an object/viewer reference frames or a PA/MI bias alone. Although the basis of this behavior is not known, we propose that an object processing or MI spatial system may be more activated by real objects than symbolic or coordinate stimuli (e.g. lines).

Correspondence: *Elizabeth Murray, MA, Stroke Research, Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: emurray@kmrrec.org*

Stroke

Y. HASHIMOTO, K. SAWADA, M. MARUISHI & T. TOSHIMA. Reversal Learning with Different Type of Stimuli in Patients with Unilateral Hemisphere Damage.

Objective: In recent years, discrimination shift learning paradigm has been used to investigate deficits of set shifting and to test hypotheses regarding the processes underlying set shifting. Although an extensive number of studies have employed ID/ED shift learning tasks in neurological patients, not as many studies have investigated reversal/non-reversal shift learning. Some reversal shift impairments have been shown in patients with subcortical lesion, patients with unilateral frontal lesions, patients with ventromedial frontal damage. In the present study employed reversal learning paradigm using several kinds of stimuli to assess the performance of patients with unilateral hemisphere damage and investigate the role of stimuli which could affect on discrimination shift learning.

Participants and Methods: Six patients with left hemisphere damage and 6 patients with right hemisphere damage completed reversal and non-reversal shift-learning tasks using different types of stimuli. We used two types of stimuli: geometric figure and colored line drawing. We compared their performance with that of normal adults.

Results: Many patients could not reach the task criterion regardless of the location of damage and the shift condition of the task. However, when we compared the performance in terms of type of stimuli, there was dissociation among the tasks. Color was easiest to attain comparing to other concept. We analyzed the result not only achievement score but also their learning process according with previous developmental findings of discrimination shift learning paradigm.

Conclusions: The findings are discussed in light of previous developmental and neuropsychological findings of discrimination shift learning paradigm and the proposed role of stimuli which affect on hemisphere specific dysfunction in discrimination shift learning tasks.

Correspondence: *Yukari Hashimoto, Ph.D, Psychology, Fukuyama University, 1-Sanzo, Gakuenmachi, Fukuyama-city 729-0292, Japan. E-mail: yukari@fuhc.fukuyama-u.ac.jp*

T.D. HERNÁNDEZ, K. MCFADDEN, A. SEGAL, B. IVANKOVICH, C. CAVITO & S. HUERTA. Effects of Jin Shin on Motor Function Following Stroke.

Objective: Stroke is the number one cause of adult disability in the U.S. Deficits related to motor function (e.g., physical activity levels, range of motion) often persist, despite traditional rehabilitation. Complementary and alternative medicine (CAM) is a frequently utilized option for stroke-associated deficits. In a pilot study of the CAM modality Jin Shin (e.g., acupressure), arm surface temperature asymmetry was reduced relative to placebo treatment in chronic stroke patients (Hernández et al., SAR, 2003). The functional relevance of this finding, however, is not known. Thus, the present study tested the hypothesis that Jin Shin treatment would improve motor function in comparison to Placebo, and it explored the relationship between functional improvement and arm surface temperature.

Participants and Methods: Seven individuals with chronic deficits at least 19 months post-stroke, were randomly assigned to receive 8 weeks of Jin Shin or Placebo treatments prior to cross-over into the opposite treatment using a single-blind design.

Results: The Jin Shin treatment effect was significant ($p=.04$, Cohen's $d=.52$) for increases in moderate physical activity levels (7-Day Physi-

cal Activity Recall) and suggested a trend towards increased range of elbow motion (goniometer assessment). The findings could not be accounted for by expectancy, treatment order or credibility. The relationship between functional improvement and treatment-associated changes in arm surface temperature was not uniform.

Conclusions: Jin Shin treatment had a positive effect on motor function in individuals at least 19 months post-stroke, compared to Placebo treatment. Based on these results, Jin Shin treatment warrants further study as a potential option for chronic stroke-associated deficits and disability.

Correspondence: *Theresa D. Hernández, Ph.D., Psychology, University of Colorado, UCB 345, Boulder, CO 80309. E-mail: tdh@psych.colorado.edu*

S.B. LEE. Rehabilitative Couple Therapy Approach for the Stroke Patients and Caregivers.

Objective: To investigate rehabilitative couple therapy techniques as an aid in improving the stroke patients' and caregivers' life satisfaction and self-esteem as well as in reducing their loneliness rate.

Participants and Methods: 15 male Korean aged stroke patients (mean age=72.5) and 15 female caregivers (wives) (mean age=67.2) were selected for rehabilitative couple therapy interventions. 15 female stroke patients out of 39 stroke patients were screened, by the Halstead-Reitan Neuropsychological Test Battery, as not having greater impairments, and they have wives as primary caregivers at home. The male stroke patients and their wives were arranged to receive total 16 sessions of rehabilitative couple therapy during and 6 month after inpatient hospitalization. The patients were referred for rehabilitative couple therapy from major stroke rehabilitation hospitals. Pretreatment and posttreatment assessments of life satisfaction, loneliness, and self-esteem were administered for both the stroke patients and the caregivers.

Results: Between pretreatment and posttreatment, there was significant improvement in the participants' assessments of life satisfaction (male: $p<0.01$ and female: $p<0.01$) and self-esteem (male: $p<0.01$ and female: 0.05) as well as a significant reduction in their loneliness scale (male: 0.001 and female: 0.01). After the rehabilitative couple therapy, the stroke patients show more improved self-esteem scores and less loneliness scales than those of their wives.

Conclusions: The results demonstrate the efficacy of rehabilitative couple therapy as a complementary and alternative therapy approach for the stroke couple's improved psychological well-being and emotional support during the stroke patient's rehabilitation.

Correspondence: *Sang B. Lee, PhD, Pastoral Counseling, Kangnam University, San 6-2, Gugal-Dong, Giheung-Gu, Yongin City 446-702, South Korea. E-mail: sanglee@kangnam.ac.kr*

L. NAKHUTINA, J.C. BOROD, Y. STERN, A. KLUGER, K.T. KREITER, S. PEERY, M. SCHMIDT & S.A. MAYER. The Effect of Educational Attainment on Cognitive Performance and Recovery in Patients with Subarachnoid Hemorrhage (SAH).

Objective: The effect of educational attainment on cognitive outcome after subarachnoid hemorrhage (SAH) has been largely unexplored. The current study examined the effect of education on cognition at 3 months after SAH and on recovery of cognitive functioning from 3 to 12 months after SAH.

Participants and Methods: Data were collected from SAH patients ($N=113$; education: 0 to 20 years) prospectively enrolled in the Columbia University SAH Outcome Project. Seven cognitive domains were examined: attention, language, verbal memory, visuospatial skills, visual memory, psychomotor speed, and executive functions.

Results: After controlling for the influence of age, gender, SAH severity and complications, education emerged as a significant predictor of outcome in all cognitive domains at 3 months post SAH (education R^2 :

0.352–0.058; $p \leq 0.003$). Education also moderated the relationship between SAH severity and language scores, such that in participants with low education (7 years), the presence of severe SAH was significantly associated with lower language scores ($\beta = -0.266$; $p = 0.016$). Conversely, in participants with high education (16 years), there was no significant association between SAH severity and language scores ($\beta = 0.050$; $p = 0.626$). When the impact of educational attainment on recovery of cognitive functioning from 3 to 12 months after SAH was examined in 82 patients who were reevaluated, results indicated that higher education was strongly associated with better recovery rates for all domains (education $R^2: 0.165$ – 0.035 ; $p < 0.05$), except for executive functioning ($R^2 = 0.24$; $p = 0.094$).

Conclusions: These findings suggest that higher educational attainment mitigates the severity of SAH-related cognitive decrements and are consistent with the cognitive reserve theory.

Correspondence: *Luba Nakhutina, Ph.D., Psychology, CUNY Graduate Center, 1380 Riverside Dr., Apt. 5G, New York, NY 10033. E-mail: luba_ny@hotmail.com*

M. ONO, A.P. HALEY, K.F. HOTH, A. POPPAS, J. GUNSTAD, L. SWEET & R.A. COHEN. Cognitive Decline among Patients with Coronary Artery Disease.

Objective: Studies have shown greatest impairments of attention, executive, and psychomotor functioning in cardiovascular disease (CVD). As coronary artery disease (CAD) is the most common form of CVD, the aim of the study was to examine the impact of CAD on the core cognitive domains.

Participants and Methods: A group of 114 patients with and without CAD (atherosclerosis, coronary artery bypass surgery, myocardial infarction, angina, angioplasty/stent placement) with no prior neurological history were examined. They underwent a two-hour comprehensive neuropsychological assessment at baseline and at the 12-month follow-up. Regression analyses to predict change were conducted to assess change in cognitive functioning within core cognitive domains between baseline and 12-month follow-up.

Results: Independent of age, gender, education, and depression, CAD was associated with declines in memory performance. ($R = .54$; $F(4, 109) = 8.32$, $p = .0001$). However, CAD was not associated with significant declines in other cognitive domains. More specifically, declines in memory were primarily evident with respect to learning but did not decline significantly in memory storage, recall, or recognition.

Conclusions: Declines in memory performance over 12 months among the CAD patients were significant but changes in other domains were not significant. The decline in memory could be attributed to reduced learning capacity over time, which may be a more sensitive indicator of brain changes associated with CAD. Since the memory decline is associated with an organizational aspect of memory, it is likely that the performance declines are secondary to attention, executive, and psychomotor deficits.

Correspondence: *Makoto Ono, Ph.D., Brown University, 103 Taber Avenue, Providence, RI 02906. E-mail: makotomoono@yahoo.com*

S. YEH, T.D. PARSONS, M. MCLAUGHLIN & A.A. RIZZO. Virtual Reality Upper Extremity Motor Training for Post-Stroke Rehabilitation.

Objective: Upper extremity motor impairment is a common consequence of stroke and often produces significant challenges for patients as they engage in everyday instrumental activities of daily living. Virtual reality enhanced motor training is an emerging therapeutic modality that can serve to deliver upper extremity motor training tasks within consistent, yet modifiable simulated functional environments that mimic real world challenges.

Participants and Methods: A three-month clinical experiment (performed at the USC Keck School of Medicine) using a Virtual Reality Upper Extremity Motor task (VRUEM) was conducted on five partici-

pants with stroke. Case study results from 12 two-hour training sessions are reported herein. The VRUEM made use of a “Reaching Task” that required participant to reach for multiple virtual targets in 3D peripersonal space with synchronized forearm and hand movement on paretic side. Target positions in 3D space were positioned in a semi-sphere zone that was calibrated to participant’s then current range of motion. Specific to the Reaching Task, three kinematic metrics were derived: movement efficiency (ME), movement speed (MS) and performance time (PT), based on continuous capture of the hands 3D position across all trials.

Results: The case study revealed the patient’s current status of hand arm movement with respect to motion range composed of pitch, yaw and arm length. Progression (rehabilitation) appeared primarily in zones with lower performance. Physical assessment results comported well with results from VR training.

Conclusions: The VRUEM task (static reaching) for post-stroke rehabilitation on upper-extremity’s functional deficit was found to be effective in this case study. The two main features of this VR system are its adaptability and capacity for capturing kinetic performance in an accurate way.

Correspondence: *Thomas D. Parsons, PhD, Centers for Creative Technologies, University of Southern California, 13274 Fiji Way., Office 301, Marina del Rey, CA 90292-4019. E-mail: tparsons@usc.edu*

B.K. RUSH, T.G. BROTT, D. BUTLER, A. RICHIE, L.D. CASE & J.F. MESCHIA. Persistent Cognitive and Functional Effects of First-Ever Ischemic Stroke.

Objective: Examine persistent effects of first-ever ischemic stroke.

Participants and Methods: Eighteen cases of first-ever ischemic stroke and 27 stroke-free controls participated in the Ischemic Stroke Genetics Study (ISGS) and were reevaluated to assess cognitive and functional status. The NIH Stroke Scale (NIHSS), Oxford Handicap Scale (OHS), and Glasgow Outcome Scale (GOS) were given to cases; both groups completed the Barthel Index (BI), Mini Mental Status Exam (MMSE), Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), Trail Making Test A & B, and Controlled Oral Word Association Test (COWAT). Collaterals completed the Functional Activities Questionnaire (FAQ) to index instrumental activities of daily living.

Results: Twenty-one of 45 participants were men. Median age was 74 yrs; 42/45 graduated high school. There were no significant group differences in age or education. For cases, median time from stroke onset was 662 days; 17/18 were greater than 90 days out from stroke. Median NIHSS within 30 days of stroke was 2.0. Median NIHSS at evaluation was 1.5. Median Trails A for cases vs controls was 41 s vs. 36 s ($p = .11$); Trails B was 91 s vs. 83 s ($p = .12$). Mean MMSE for cases vs. controls was 27 vs. 28 ($p = .08$). BI was 98 vs. 96 ($p = .36$). COWAT was 26 vs. 40 ($p < .001$). RBANS was 183 vs. 209 ($p < .01$). FAQ was 3 vs. 0 ($p < .001$).

Conclusions: There appear to be persistent cognitive and functional effects of mild first-ever ischemic stroke that are undetected by global screenings of outcome.

Correspondence: *Beth K. Rush, Ph.D., Psychiatry & Psychology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32224. E-mail: rush.beth@mayo.edu*

C.A. SCOTT, L.J. RAPPORT, J.A. GRIFFEN, R. COLEMAN BRYER, C. MCKAY, R.A. HANKS & R. WHITMAN. Self-Assessment of Driving Ability and the Decision to Resume Driving Following Stroke.

Objective: Research on healthy adults indicates a positive bias in self-ratings of driving ability that is highly resistant to change. This phe-

nomenon of the entrenched “driving self” has not been examined among persons with acquired brain injury, whose impairments may substantially affect fitness to drive. Additionally, prior research obtained ratings compared to an “average” driver instead of a specific criterion known to the rater.

Participants and Methods: Forty-seven pairs of stroke survivors and a significant other (N = 94) provided ratings of driving ability from three perspectives: Self versus the “average driver”, self versus their survey companion, and companion versus the “average driver”. Participants also rated considerations related to whether survivors resumed driving.

Results: Mixed-model ANOVA indicated a main effect of positive self-bias and a group x criterion interaction: Mean self-rating for both groups was “better than average”; however, significant others showed stability for comparisons of self to the average driver and to their survey companion, whereas survivors showed a significant drop in self-ratings when comparing themselves to their companion. Significant others’ ratings of self and companion correlated as expected; survivors’ self-ratings versus the average driver were unrelated to other ratings, whereas self-versus-companion and companion-versus-average showed stronger within- and between-group convergence. Significant others rated professional advice, physical and cognitive deficits as the most important considerations for survivors’ driving status, whereas survivors rated only convenience as more than “somewhat” important.

Conclusions: Use of a specific criterion can facilitate more accurate self-ratings of driving ability among survivors; however, actual decisions regarding driving status may be unrelated to self-view.

Correspondence: *Carolyn A. Scott, Psychology, Wayne State University, 5057 Woodward Ave, 7th Floor, Detroit, MI 48202. E-mail: c.scott@wayne.edu*

M.C. WILDE. Correlates of Motor Impersistence in Acute Stroke.

Objective: Investigate the Correlates of Motor Impersistence acute stroke.

Participants and Methods: Seventy two ischemic and hemorrhagic stroke patients served as subjects for this study. None of the patients had a preexisting neurologic, psychiatric or substance abuse disorder. The Motor Impersistence Test was administered along with the Mini Mental Status Examination (MMSE), the Line Bisection test and the Repeatable Battery of Neuropsychological Status (RBANS). Bivariate correlations were used examine the association between the number of Motor Impersistence Test items failed and clinical as well as background variables.

Results: Thirty nine percent of the sample had motor impersistence. Of that, 56% had moderate and 44% had marked motor impersistence. Amongst the background variables, there was a significant association between years of education attained and motor impersistence ($r = -.28$, $p = .016$). There were no significant associations between motor impersistence test performance and age ($r = .15$, $p > .05$) or stroke severity (National Institutes of Health Stroke Scale) ($r = .01$, $p > .05$). Amongst the cognitive variables, there was a significant inverse association between motor impersistence test performance and the MMSE ($r = -.40$, $p < .001$) and the RBANS Visuospatial/Construction ($r = -.51$, $p < .001$), Language ($r = -.49$, $p < .001$), Attention ($r = -.29$, $p = .01$) and Total Index scores ($r = -.41$, $p < .001$). There was a significant association between the presence of neglect and motor impersistence ($r = .65$, $p < .000$). There was no significant association between motor impersistence and the RBANS Immediate ($r = -.15$) or Delayed Memory ($r = -.18$) index scores.

Conclusions: A significant number of stroke patients were impersistent, the majority of whom had moderate impersistence. The significance of these findings will be discussed within the context of stroke and cognitive impairment.

Correspondence: *Mark C. Wilde, Psy.D., Physical Medicine and Rehabilitation, UT Medical School Houston, 6411 Fannin 4 East Jones Pavilion, Houston, TX 77030. E-mail: mark.c.wilde@uth.tmc.edu*

S. ZINN, P. DRURY & S. GRAMBOW. Factor Analysis of Executive Functioning in Cerebrovascular Disease.

Objective: Executive functioning is emerging as a hallmark of cognitive decline associated with cerebrovascular disease. As this decline can exist prior to the occurrence of cerebrovascular accident, it is important to identify other etiologies for these cognitive decrements. We hypothesized that changes in subcortical tissues due to microvascular disease would lead to executive function deficits.

Participants and Methods: To examine this, we conducted neuropsychological testing and rated structural MRIs in a sample of 55 patients admitted with symptoms of cerebrovascular disease. Our neuropsychological battery included tests of memory, attention, fluency and cognitive flexibility. We factor analyzed 15 scores from this battery and examined the relation of the factors to measures of white and subcortical gray matter hyperintensities, stroke severity, activities of daily living (both physical and instrumental), age and education. The factor analysis was conducted in SAS using a varimax orthogonal rotation.

Results: Three factors were retained. The first factor best represented a generalized information processing capacity, the second factor represented psychomotor speed, and the third factor represented selective attention. Pearson correlations revealed that the information processing factor was significantly related to age ($r = -0.62$), education ($r = 0.40$) and deep white matter changes ($r = -0.42$). The second factor showed a trend toward relationship with physical functions of daily living, and the third attentional factor was related to subcortical gray matter changes ($r = -0.40$).

Conclusions: These data suggest a gradual decrease in information processing capacity with aging that is likely exacerbated by microvascular disease and lack of cognitive reserve. Microvascular disease of subcortical gray matter contributes to declines in attention.

Correspondence: *Sandra Zinn, Research & Development (151), Durham VA Medical Center, 508 Fulton St, Durham, NC 27705-3875. E-mail: sandra.zinn@duke.edu*

Traumatic Brain Injury

B.W. ABLITZ, R. NAIDOO & R.B. PERNA. Neurorehabilitation Associated Gains Following Long Standing Traumatic Brain Injury.

Objective: Current consensus supported by empirical research indicates that the greatest gain in neurorehabilitation occur within the first 24 months following TBI. There is limited empirical research addressing the efficacy of neurorehabilitation for those who enrolled after this period. Increasing functional independence in vocational status and independent living are important treatment goals for these individuals. In this study, the functional gains following enrollment in a neurorehabilitation program after 24 months post injury are examined.

Participants and Methods: Changes in the total MPAI-4 (Malec and Lezak, 2003), independent living and vocational status of 46 individuals (male=29, female=17; mean age = 36.74; mean education =11.55 years; mean time since injury=12.09 years), first enrolled in a multidisciplinary neurorehabilitation program after 24 months post injury, were compared. Change was measured by comparing status at admission and discharge for these variables.

Results: Results of this study indicate a positive change in the functional status of this sample as measured on the MPAI-4 ($t = 3.34$, $p = 0.001$) with 71.7% of individuals showing improvement in overall functioning. Results also indicate a significant increase in vocational status as measured by paid employment ($t = 0.33$, $p = 0.046$) with 17.8% of individuals showing improvement. Change in residence, however, was not significant ($t = 0.28$, $p = 0.085$).

Conclusions: Findings from this study support the efficacy of initiating neurorehabilitation for those with long standing TBI. This data suggests that individuals who experience functional deficits after 24 months post injury are likely to achieve greater functional and/or economic independence following the completion of a multidisciplinary neurorehabilitation program.

Correspondence: *Reshma Naidoo, Westside Neurorehabilitation Center, 600 Main Street, Lewiston, ME 04240. E-mail: rbnaidoo@gmail.com*

J. ANDERSON & M. SCHMITTER-EDGECOMBE. Memory predictions for episodic memory tasks in early recovery following severe traumatic brain injury.

Objective: Self-awareness and self-monitoring of memory abilities is important in accurate memory functioning. We examined memory self-awareness and self-monitoring abilities in participants with a severe traumatic brain injury (TBI) shortly following emergence from post-traumatic amnesia (PTA).

Participants and Methods: Twenty-four participants with severe TBI and 24 controls matched on age, gender, and education, completed a performance-prediction paradigm. To assess memory self-awareness, before completing list-learning and spatial-learning memory tasks, participants predicted the amount of information they would remember following trial 1, trial 5, and a 20-minute delay. Memory self-monitoring was assessed by participants' ability to increase accuracy of their predictions after exposure to the tests.

Results: The group with TBI performed more poorly on all list-learning indices and trial 1 of the spatial-learning task. However, no group differences were found on trial 5 or long delay indices of the spatial-learning task, suggesting that the TBI participants retained information equally well when given the opportunity to acquire information to the same level as controls. The groups did not differ in memory self-awareness. TBI participants predicted lower performance levels than controls and both groups adjusted their predictions correctly when estimating their memory performance after multiple learning trials and a long delay. The groups also did not differ in memory self-monitoring as both groups adjusted their predictions to be more accurate following exposure to the tasks.

Conclusions: These findings show intact memory self-awareness and self-monitoring abilities for newly learned information in severe TBI participants receiving inpatient rehabilitation following emergence from PTA. Correspondence: *Jonathan Anderson, Eastern Washington University, 220 Showalter Hall, Cheney, WA 99004-2444. E-mail: jonathan_w_anderson@yahoo.com*

P.M. ARENTH, K.C. RUSSELL, J.M. SCANLON & J.H. RICKER. An fMRI Study of Episodic Memory Following Traumatic Brain Injury.

Objective: This study utilized fMRI to examine possible changes in cerebral activation patterns related to episodic memory (i.e., memory for discrete information or events) following traumatic brain injury (TBI). Based on the few previous neuroimaging studies of this topic, (i.e., Ricker et al., 2001), it was hypothesized that differences in either intensity or location of fMRI activation would be observed in persons with TBI, as compared to healthy controls.

Participants and Methods: Ten persons with TBI and fifteen healthy controls completed a series of episodic memory tasks during fMRI scanning. Four types of stimuli were presented in encoding and recognition blocks: pictures, words, letters and shapes. Order of stimuli presentation was counterbalanced.

Results: Group differences in response times and accuracy were evaluated utilizing group by condition ANOVAs. Differences between stimuli types were assessed utilizing independent samples t-tests. fMRI activation patterns were evaluated using standard neuroimaging statistical

analysis (statistical parametric mapping). No group differences were found in overall response time for encoding or recognition. Overall, control subjects were significantly more accurate. Alterations in cerebral activation were noted in the TBI group, with increased activation in more posterior areas, as compared to healthy controls.

Conclusions: The lack of group differences in response times suggests that group differences in accuracy were not due to processing speed. Results indicating impaired episodic memory following TBI are consistent with previous literature. The hypothesis regarding alterations in cerebral activation patterns was also supported. Both groups were more efficient in encoding and recognizing "verbalizable" stimuli, which holds implications for rehabilitation.

Correspondence: *Patricia M. Arenth, PhD, Physical Medicine & Rehabilitation, University of Pittsburgh, Kaufmann Medical Building, Suite 201, 3471 Fifth Avenue, Pittsburgh, PA 15213. E-mail: arenthpm@upmc.edu*

C.M. BAILEY & P.A. ARNETT. Baseline MTBI Estimation in Collegiate Sports: Traditional vs. Newly Constructed Methods.

Objective: The current study examined the accuracy of estimating baseline MTBI neuropsychological performance (reading performance and demographic-based estimates) compared to newly constructed methods.

Participants and Methods: 106 collegiate athletes (74 male, 32 female) were administered baseline neuropsychological batteries as a part of the Penn State Concussion Program. The battery included: Wechsler Test of Adult Reading (WTAR), BVMT-R, Comprehensive Trail Making Test, Digit Span Test, HVLIT-R, SDMT, Stroop, and Vigil/W. Baseline performance estimates were developed according to demographics [WTAR demographics-only and Barona et al. (1984) methods], WTAR performance (WTAR-P), and WTAR-P plus demographics. Stepwise regressions predicting the observed performance of each baseline measure were conducted by entering the above estimation methods and significant demographic variables (age, sex, race, previous concussion status, and sport).

Results: Zero-order correlations between baseline estimates and observed baseline performance were small to moderate ($R^2=.01-.13$). The WTAR-P showed both the largest number of significant correlations with baseline scores and the largest effects. In the stepwise regressions, race (5 of 9 measures) and WTAR-P (3 of 9 measures) were most often significant predictors. The stepwise equations accounted for more variance ($R^2=.09-.21$) than the original baseline estimation methods for 4 measures. The WTAR-based estimates accounted for a similar amount of variance as the stepwise regression equations on 4 other measures ($R^2=.03-.18$).

Conclusions: These results suggest that both the stepwise-regression equations and WTAR-based estimates were the most accurate predictors of baseline performance. Race, which may be a proxy for socioeconomic status, and reading performance provided the most accurate baseline estimates. When actual baseline performance is not available, these variables may provide a reasonable estimate of baseline functioning in collegiate sports samples.

Correspondence: *Christopher M. Bailey, M.S., Psychology, Penn State University, 806 Walnut Woods Dr., Morrisville, NC 27560. E-mail: chrisbailey531@nc.rr.com*

E.L. BERCAW, T. LEE-WILK, P. DISCHINGER, C. MACKENZIE, K. MURDOCK, P. IMLE, J. KUFERA, K. AUMAN, A.N. CERNICH, L.L. WULFF & R.L. KANE. Effects of Overall Injury Severity on ANAM Performance in Mild Traumatic Brain Injury.

Objective: Patients with mild traumatic brain injury (mTBI; GCS 13-15) were recruited from an urban trauma center to investigate functional and cognitive outcomes following mTBI and to relate cognitive performance to the persistence of posttraumatic symptoms and functional status at 6 and 12 months post-injury.

Participants and Methods: At 6 months, age of participants (N=53) was 18-60 (M=36.45, SD=12.8), and 58% of the sample was male. The Automated Neuropsychological Assessment Metrics (ANAM), a brief computerized battery of neurocognitive measures useful in the assessment of neuropsychological effects of concussion, was used to track neurocognitive function at different time points post injury. While brain injuries were mild according to criterion, many participants sustained trauma to multiple areas of the body which could indirectly affect performance on neurocognitive measures. The goal of the present analysis was to establish the degree to which non-brain related physical injury, assessed by total Injury Severity Scale (ISS), impacted ANAM performance at 7-10 days and 6-months post-injury.

Results: Results indicated that moderate and severe injury (ISS 9-16 and >16, respectively) were associated with increased simple reaction time at 6 months when controlling for age, education, previous mTBI, and history of ADHD or learning disability ($p<.05$). However, ISS was not associated with performance on a complex reaction time test or on an overall index score reflecting performance efficiency on more cognitively demanding tasks.

Conclusions: Findings demonstrated that the extent of physical injury did not impact overall neurocognitive test performance but did impact simple reaction time, a measure commonly used to assess cognitive status post mTBI. Correspondence: *Edwin L. Bercau, M.A., VA Maryland Health Care System - Baltimore, 10 N. Greene St., Baltimore, MD 21201. E-mail: ebercau@psyc.umd.edu*

J.E. BOOTH, C. BOAKE, H.S. LEVIN, X. LI, S.S. DIKMEN, N.R. TEMKIN & F.C. GOLDSTEIN. N-back task and working memory in severe traumatic brain injury.

Objective: To investigate the feasibility of using the n-back paradigm as a measure of working memory in adults with severe traumatic brain injury (TBI).

Participants and Methods: Participants were 89 adults with severe TBI (average 23 months post injury) selected for a working memory deficit on either the PASAT or Subject Ordered Pointing task. We examined performance on a visual letter identity n-back task that varied memory load from zero to three items. We measured the correct detection of targets, false alarms, and the net percent score (percent targets minus percent false alarms).

Results: There were significant effects of memory load. Pairwise comparisons showed better patient performance under low memory load. Memory load had a greater effect on number of hits than false alarms, although both were significant. The pattern of errors suggested that participants had greater difficulty with working memory than impulsive responding (response inhibition) as the memory load increased. No relationships with task performance and GCS score, injury chronicity, or education were found. Age correlated with performance on the 3-back condition in the expected direction such that older age was associated with poorer performance.

Conclusions: The n-back task demonstrates an effect of memory load and can be performed by patients with severe TBI. The cognitive operations and simple motor response task requirements are of appropriate difficulty level for patients with severe TBI and low education. Implications are that the n-back task is a feasible measure of verbal working memory to administer in a severe TBI population and is useful in continued research with this population.

Correspondence: *Jane E. Booth, Ph.D., Baylor College of Medicine, 1517 Maryland Street, Houston, TX 77006. E-mail: janebooth@gmail.com*

C. BORNHOFEN & S. MCDONALD. Treating Emotion Perception Deficits in Traumatic Brain Injury.

Objective: The presence of significant emotion perception deficits in a large proportion of individuals with severe traumatic brain injury (TBI) has been the focus of numerous studies over the past few years. As yet, however, there has been no published research dealing with treatment of this kind of deficit with a TBI group. The present research is the first known randomly controlled treatment study in this area.

Participants and Methods: Participants were 14 outpatient volunteers (13 male, 1 female) with chronic TBI symptoms, who had been referred by staff members of a brain injury rehabilitation unit in the Sydney area. Following random allocation to treatment and waitlist groups, participants in the former group received 25 hours (across 8 weeks) of a specifically designed program, which incorporated a variety of remediation strategies found to be effective for other types of cognitive remediation with the TBI population. The main focus of the program was on mastery of basic emotion discrimination skills although skills involved in making social inferences (such as sarcasm) were also targeted in later segments of the program.

Results: ANOVA analyses indicated that participants significantly improved on both judgement of basic emotion cues and on comprehension of sarcasm.

Conclusions: The present findings suggest that emotion perception deficits in TBI are remediable. Future research should investigate the efficacy of specific strategies in facilitating treatment gains of this kind. Correspondence: *Cristina Bornhofen, Psychology, University of New South Wales, Unit 5., 17 Ormond St., Ashfield, NSW 2131, Australia. E-mail: cristinab@inet.net.au*

C. BORNHOFEN & S. MCDONALD. Comparing Strategies for Treating Emotion Perception Deficits in Traumatic Brain Injury.

Objective: Research investigating the remediation of emotion perception deficits in individuals with severe traumatic brain injury (TBI) has to date been extremely limited. The present research comprises the second of two treatment studies, the first of which found significant improvement following a treatment program focussed on basic emotion perception skills. This second study aimed to compare the efficacy of two strategies, errorless learning and self-instruction training, for remediating deficits in interpreting emotional cues. Both have been shown to be effective with TBI clients for retraining in other cognitive domains.

Participants and Methods: Following random allocation to errorless learning, self-instruction training and waitlist groups (17 male, 1 female, with chronic TBI symptoms), those undergoing treatment received 25 hours of a specifically designed program, which had been adapted so as to incorporate either errorless learning or self-instruction training, to the exclusion of the other technique. The main focus of the program was on mastery of basic emotion discrimination skills although the use of these skills in making social inferences (such as sarcasm) was also addressed.

Results: Analysis using interactions contrasts found that both treatment groups significantly improved in emotion perception, and that self-instruction training was a particularly effective strategy.

Conclusions: The present study suggests that self-instruction training is a powerful technique for use in emotion perception remediation with the TBI population. Future studies using larger samples should confirm the present findings.

Correspondence: *Cristina Bornhofen, Psychology, University of New South Wales, Unit 5., 17 Ormond St., Ashfield, NSW 2131, Australia. E-mail: cristinab@inet.net.au*

D.A. CARONE & B.P. RIEGER. Most Patients with Postconcussional Syndrome in a Clinical (Versus Forensic) Setting Exert Optimal Effort.

Objective: Many studies assessing effort in mild TBI and postconcussional syndrome (PCS) are derived from forensic settings. Most of these studies have shown significant rates of suboptimal effort (e.g., 49%) in such patients but it is possible that these findings do not generalize to clinical settings. Thus, we explored the rate of effort test performance in a small sample of clinically referred PCS patients.

Participants and Methods: 21 consecutive clinically referred patients with PCS (ICD-10 criteria) were administered 3 effort tests in the context of neuropsychological testing. Demographics: age ($M=35.3\pm 13.4$), education ($M=13.7\pm 2.8$), gender (M/F = 9/12). Patients were classified as exerting optimal effort if performance was above established cutoffs on the Medical Symptom Validity Test (MSVT), Reliable Digit Span (RDS), and Rey-Fifteen Item Test (Rey-15).

Results: 81% of PCS patients (17/21) performed optimally on all effort tests. All patients in the suboptimal group performed below the MSVT cutoffs. Of these, 75% performed at or below the RDS cutoff of 7. No patients performed below the Rey-15 cutoff. For PCS patients with optimal vs. suboptimal effort, comparative means were as follows: RDS = 9.9 ($sd=2.2$) vs 7.5 ($sd=1.7$), Rey 15 = 13.8 ($sd=1.9$) vs 12.5 ($sd=1.7$), average of MSVT IR, DR, and CNS subtests = 99.1% ($sd=1.4$) vs 81.8% ($sd=4.3$). On the MSVT memory measures, comparative scores between the optimal vs suboptimal groups were as follows: PA = 100% ($sd=0$) vs 67.5% ($sd=9.6$), FR = 78.8% ($sd=10.5$) vs 60% ($sd=10.8$). Of patients with suboptimal effort, 75% were involved in litigation compared to 59% of those with optimal effort. Pending workers compensation and/or disability claim rates were similar for both groups: (suboptimal = 25%, optimal = 29%). Formal statistical tests were precluded due to the low cell size in the suboptimal group.

Conclusions: Results support the hypothesis that the high percentage of effort test failure observed in forensic settings does not necessarily generalize to clinical settings.

Correspondence: *Dominic A. Carone, Ph.D., Physical Medicine and Rehabilitation, SUNY Upstate Medical University, 6375 Killoe Rd, Baldwinsville, NY 13027. E-mail: dcaronejr@aol.com*

D.A. CARONE & B.P. RIEGER. Use of the Beck Depression Inventory - Fast Screen in Postconcussional Syndrome and the Moderating Influence of Effort.

Objective: Postconcussional syndrome (PCS) encompasses a wide array of physical and cognitive symptoms (e.g., insomnia, distractibility) that overlap with depressive illness. Thus, use of the Beck Depression Inventory-II (BDI-II) with such patients can result in misleading elevated scores. To address this problem, the BDI - Fast Screen (BDI-FS) was designed to assess affective depressive symptoms and removing overlapping physical/cognitive symptoms. We compared scores from the BDI-II and BDI-FS to determine if interpretive ranges differed in PCS and whether effort was a significant moderating variable.

Participants and Methods: 21 consecutive clinically referred patients with PCS (ICD-10 criteria) were administered the BDI-II during neuropsychological testing. Specific BDI-FS items (identical to BDI-II affective items) were extrapolated and scored. Patients were classified as exerting optimal effort if performance was above established cutoffs on all of the following: Reliable Digit Span, Medical Symptom Validity Test, and the Rey-Fifteen Item Test. Demographics: age ($M=35.3\pm 13.4$), education ($M=13.7\pm 2.8$), gender (M/F = 9/12).

Results: For all patients, the mean BDI-II score was 20.4 ± 10.8 out of 63 (moderate). The mean BDI-FS score was 5.3 ± 3 out of 21 (mild). In patients with optimal effort ($n=17$), mean scores were both mild: BDI-II = 17.4 ± 9.4 and BDI-FS = 4.8 ± 2.8 . In patients with suboptimal effort ($n=4$), the mean score was severe for the BDI-II (33 ± 6.4) and moderate for the BDI-FS (7.8 ± 3).

Conclusions: If effort were not controlled for, results would show a slight increase in estimated depressive severity with the BDI-II (moderate) compared to the BDI-FS (mild). However, when effort was controlled for (reducing the effect of increased reported symptoms in patients with suboptimal effort), the BDI-FS yielded identical interpretive ranges to the BDI-II. Thus, in most PCS patients, BDI-II scores will not be distorted by overlapping symptoms, but this should always be assessed in individual cases. Correspondence: *Dominic A. Carone, Ph.D., Physical Medicine and Rehabilitation, SUNY Upstate Medical University, 6375 Killoe Rd, Baldwinsville, NY 13027. E-mail: dcaronejr@aol.com*

S. CARTER, E. MOES, P. FINN & E. KAPLAN. The Relationship Between Cognitive Functioning and Sleepiness in Moderate to Severe Traumatic Brain Injury.

Objective: To investigate whether individuals with traumatic brain injury (TBI) who complain of sleep difficulties demonstrate shorter sleep onset latencies (SOL) on an objective sleep measure, the Multiple Sleep Latency Test (MSLT), and to determine whether differences exist in cognition between non-sleepy (>10 min. SOL on MSLT) and sleepy (<10 min. SOL on MSLT) individuals. Further, relationships between subjective and objective sleep measures, depression, and cognitive performance were examined.

Participants and Methods: Twenty participants with a moderate to severe head trauma who reported ongoing symptoms related to their injury were studied. One participant did not complete the entire protocol and was excluded from the data analysis. Groups were matched for age, gender, IQ, education, caffeine, and alcohol use. Participants first completed a half-day of testing. After wearing an actigraph for one week, they returned for a full day of testing, including neuropsychological assessment, subjective sleep measures, and an MSLT involving EEG data during four timed naps.

Results: The two groups did not differ on the cognitive measures. Nonetheless, thirty percent of the cognitive variables were significantly correlated with subjective and objective measures of sleepiness. Depression was correlated with longer SOLs, but did not significantly affect most cognitive measures.

Conclusions: Sleep disturbances are related to cognitive performance. The lack of significant differences between groups is probably due to restricted sample size. Subjective sleepiness was related to performance. Depression was related to difficulty falling asleep (insomnia) rather than to sleepiness (hypersomnia).

Correspondence: *Shannon Carter, Masters, Psychology, Suffolk University, 41 Temple St, Boston, MA 02114. E-mail: shannon_carter@hotmail.com*

A.N. CLARK, M.A. STRUCHEN, A.M. SANDER & W.M. HIGH. Community Participation and Life Satisfaction One-Year Following Traumatic Brain Injury.

Objective: This study examines relationships between measures of community participation, employment, and subjective life satisfaction, and investigates predictors of life satisfaction at one-year post-injury.

Participants and Methods: Participants were 54 adults with TBI who participated in a longitudinal study of TBI outcome. All participants received inpatient brain injury rehabilitation. The mean (SD) age was 31.28 (13.18), mean education was 12.6 (2.8), and mean ER-GCS score was 6.52 (4.17). Participants were predominantly male (68.5%) and Caucasian (74%). Seventy percent were competitively employed at the time of injury, and 40% were employed at 1-year post-injury. Measures of community participation, employment, and general life satisfaction were administered at 1-year post-injury. Associations between demographic, injury severity, and functional outcome measures were examined with Pearson or point-biserial correlations. A series of hierarchical multiple regression analyses was used to predict life satisfaction from measures of community participation and employment, controlling for age, education and severity of injury.

Results: Community Integration Questionnaire total scores accounted for a significant proportion of variance in life satisfaction scores, $R^2_{change}=.086$, $p<.05$, controlling for covariates. In a separate analysis, CHART social integration scores also accounted for a significant proportion of variance in life satisfaction scores, $R^2_{change}=.24$, $p<.01$, controlling for covariates. Current vocational functioning was not predictive of self-reported life satisfaction at 1-year post-injury.

Conclusions: Greater life satisfaction was associated with increased participation in the community and in social relationships, but not with employment at one-year post-TBI. These results suggest that the ability to participate in the community and resume social relationships plays an important role in perceived well-being, and are important goals of brain injury rehabilitation.

Correspondence: Allison N. Clark, PhD, Physical Medicine & Rehabilitation, Baylor College of Medicine, 711 William St. #102, Houston, TX 77002. E-mail: anclark@bcm.tmc.edu

L.C. DAVIS, A.M. SANDER, M.A. STRUCHEN, M. SHERER, R. NAKASE-RICHARDSON & J.F. MALEC. Medical and Psychosocial Predictors of Caregiver Functioning After Traumatic Brain Injury.

Objective: To examine the relationship of caregivers' medical/psychiatric history, coping, and social support to distress/burden following traumatic brain injury (TBI).

Participants and Methods: Participants were 134 caregivers of persons with TBI (65.3% had severe injuries) recruited consecutively from 3 inpatient rehabilitation centers. Participants' mean(SD) age was 45.7(12.3) years, 83.5% were female, and 75.2% had ≥ 12 years of education. Caregivers' demographics and medical/psychiatric history were collected within 2 weeks of admission. Follow-up assessment occurred at a mean of 12.7 months post-injury, and included the Caregiver Appraisal Scale (CAS), Brief Symptom Inventory (BSI), Ways of Coping (WOC), and Multidimensional Scale of Perceived Social Support (MSPSS). Participants completing follow-up were compared to 103 caregivers lost to follow-up on demographic, medical/psychiatric, and injury severity variables. Linear regression was used to examine the contributions of medical/psychiatric history, social support, and coping to caregiver distress/burden, after accounting for caregiver demographics and functioning of the person with injury (Disability Rating Scale (DRS)).

Results: Participants differed from those lost to follow-up only on caregiver marital status; more divorced/separated persons were lost to follow-up. Regression results identified 3 significant predictors of the CAS Perceived Burden Scale (all assessed at follow-up): the DRS, MSPSS total score, and the Escape Avoidance scale of the WOC. When evaluating caregiver distress on the BSI General Symptom Index, medical/psychiatric history and Escape Avoidance were significant predictors.

Conclusions: Findings suggest that functional status of persons with TBI, social support, and the use of avoidance/denial as a coping strategy are related to caregiver burden. Caregivers' medical/psychiatric history and use of avoidance/denial as a coping strategy appear related to overall caregiver distress. Future interventions may benefit from addressing these variables.

Correspondence: Lynne C. Davis, Ph.D., Physical Medicine and Rehabilitation, Baylor College of Medicine, 2455 S. Braeswood Blvd., Houston, TX 77030. E-mail: lynneccole@yahoo.com

S. DIKMEN, G.D. ANDERSON, H. WINN, J.E. MACHAMER, J. BARBER & N.R. TEMKIN. Magnesium Sulfate for Neuroprotection after Traumatic Brain Injury: A Randomized Trial.

Objective: Traumatic brain injuries (TBI) represent an important and costly problem. Previous studies of neuroprotective therapies have failed to improve outcome. Supplemental magnesium positively affects many of the processes involved in secondary injury after TBI and consistently improves outcome in animal models. The present study was designed to test the hypothesis that treating TBI patients with magnesium would favorably impact outcome.

Participants and Methods: In a double-blind trial, 499 people age 14 or over with moderate or severe TBI were randomized to one of two doses of magnesium or placebo beginning within eight hours of injury and continuing for 5 days. Magnesium doses were targeted to achieve serum magnesium concentrations of 1.4 mmol/L or 1.75 mmol/L. The primary outcome was a composite of mortality, seizures, functional measures, and neuropsychological tests evaluated up to six months after injury.

Results: At either dose, magnesium showed no significant positive effect on the composite or individual measures. Moreover, those randomized to magnesium at the lower dose did significantly worse on the composite ($p=.02$). There was a trend toward higher mortality with each dose of magnesium. No subgroups were identified in which magnesium had a significantly positive effect.

Conclusions: Contrary to the positive results of supplemental magnesium in experimental models of TBI, five day continuous infusions of magnesium given within 8 hours to patients with moderate or severe TBI were not neuroprotective and may have a negative impact in the treatment of significant head injury.

Correspondence: Sureyya Dikmen, PhD, University of Washington, UW Box 356490, 1959 NE Pacific Street, Seattle, WA 98195. E-mail: dikmen@u.washington.edu

T. DIVER, G. GIOIA & S. ANDERSON. Discordance of Symptom Report Across Clinical and Control Groups with Respect to Parent and Child.

Objective: To examine parent and child concordance of post-concussive symptoms in mild traumatic brain injury and healthy controls.

Participants and Methods: The PCSI was administered to children with mTBI ($N = 196$) and their parents as well as a healthy control sample ($N = 201$) and their parents. Mean total symptom scores were generated

Results: A univariate ANOVA revealed a significant interaction effect as well as a main effect for clinical group.

Conclusions: Both children with mTBI and their parents reported significantly greater symptoms compared to healthy controls. Within the clinical sample, parents endorsed a greater number of symptoms relative to their children, whereas in the normal group, children endorse a greater number of symptoms compared to their parents. Findings suggest the importance of obtaining symptom reports from both parent and child.

Correspondence: Tanya Diver, Ph.D., Children's National Medical Center, 355 Elmcraft Blvd, Apt. 6304, Rockville, MD 20850. E-mail: tanyadiver@gmail.com

A. EDWARDS-STEWART, J. UOMOTO & J. SHAW. Impact of Litigation Status on Cognitive and Pain Subjective Complaints and Depression in Symptomatic Mild Traumatic Brain Injury.

Objective: To identify impact of litigation status (current or pending vs. none) on total number of cognitive and pain subjective complaints while controlling depression level among neuropsychological mild traumatic brain injury (MTBI) patients.

Participants and Methods: Preliminary analysis: 40 participants (55% female; 80% Caucasian) underwent neuropsychological assessments at a Pacific Northwest rehabilitation hospital. Two litigation status groups were determined based on attorney contact or current legal proceedings relating to injury. Depression was identified by the Personality Assessment Inventory. Twenty-three individuals were not in litigation and 17 were. A one-way MANCOVA was conducted with follow-up ANCOVA's.

Results: Preliminary analysis evaluating homogeneity-of-slope assumption indicated the relationship between the covariate (depression) and dependant variables (cognitive and pain subjective complaints) did not significantly differ as a function of the independent variable (litigation status). Overall MANCOVA results were significant, Wilks's $\Lambda = .80$, $F(2, 36) = 4.42$, $p < .05$, $\eta^2 = .20$. Follow-up ANCOVA's were significant for both cognitive complaints [$F(1, 37) = 7.23$, $p < .05$, $\eta^2 = .16$] and pain complaints [$F(1, 37) = 7.84$, $p < .01$, $\eta^2 = .18$]. Pairwise comparisons of subjective complaints by litigation status, after controlling for depression, found those in current litigation produced significantly more subjective complaints than those not. Depression was significantly associated with cognitive subjective complaints but not litigation status.

Conclusions: Findings suggest that individuals with MTBI who are in litigation, are more likely to endorse both cognitive and pain complaints at equally high levels, than those not in litigation. Depression appears to be equally above normative rates in both groups.

Correspondence: *Amanda Edwards-Stewart, M.S., Seattle Pacific University, 12221 100th Ave NE B101, Kirkland, WA 98034. E-mail: autonomy7@msn.com*

M.L. ETTENHOFER, N. ABELES & D. HAMBRICK. The Impact of Mild TBI on Cognitive Functioning and Post-Concussive Symptoms in the Post-Acute Phase of Injury: No Effects Relative to Injury Controls.

Objective: The aim of this study was to evaluate the significance of mild traumatic brain injury (mild TBI) to cognitive functioning and post-concussive symptoms in the post-acute phase of injury. Interpretation of the existing literature has been complicated by the small, treatment-derived samples of participants, high rates of litigation, and inappropriate control groups that are typical of studies in this area. We addressed these limitations by evaluating a relatively large, non-treatment-derived sample and including an orthopedic injury control group to account for generic effects of injury.

Participants and Methods: Latent and structural equation modeling techniques were used to evaluate theoretical models of long-term impairment following mild TBI. Participants ($n = 63$ mild TBI, $n = 63$ orthopedic injury) completed a comprehensive neuropsychological battery assessing executive functions, processing speed, and verbal memory, as well as the Post-Concussion Symptom Checklist (PCSC) and Brief Symptom Inventory (BSI). Time since injury ranged from three months to six years ($M = 36.75$ months). Participant involvement in litigation was low (2.4% overall).

Results: Mild TBI was not associated with impairments in any cognitive domains examined. Further, no relationship was found between the incidence of mild TBI and severity of post-concussive symptoms. Post-concussive symptoms were strongly related ($r = .50, p < .05$) to severity of general psychiatric symptoms.

Conclusions: These findings suggest that actual neurological injury from mild TBI may be of little clinical significance to long-term cognitive and symptom outcome following injury. Additional research is necessary to identify and characterize non-neurological factors that may impact long-term recovery.

Correspondence: *Mark L. Ettenhofer, M.A., Michigan State University, 1406 S. Saltair Ave. #4, Los Angeles, CA 90025. E-mail: ettenho1@msu.edu*

J.R. FESTA, R.M. LAZAR, R.S. MARSHALL, J.R. CRAWFORD, A.E. GELLER & M.F. BERMAN. Sedative Challenge Reveals Effects of Head Trauma.

Objective: We report three cases of mild head trauma with no neurological sequelae who demonstrated a significant decline in language or motor function after administration of a short-acting sedative.

Participants and Methods: Thirteen subjects were recruited as normal controls to participate in an investigation of sedative effects on neurological functioning. Three of the subjects had a history of head trauma with no clinically-obvious neurological symptoms. Participants were assessed for baseline and post-sedation language, visual-spatial, and motor functions. A short-acting sedative was administered intravenously. The change on the neuropsychological tests after sedation in the 3 trauma subjects' (TS) performance was compared to that of the control sample (CS) using Crawford and Howell's modified t test (using a two tailed test and alpha of 0.05).

Results: The 3 trauma subjects, baseline (pre-sedation) performance did not differ from that of controls on any of the tests (language, neglect, motor; all $ps > .05$). After mild sedation, control subjects showed anticipated, generalized slowing of motor speed (both hands $p < .03$),

however, TS's 1&3 demonstrated significant motor slowing in excess of effects seen in the control group with no effect seen in language or visual-spatial functions. TS 2 demonstrated significant language dysfunction during the sedative condition. All trauma and control subjects returned to their baseline performances after resolution of sedation.

Conclusions: Results indicate that a sedative challenge can unmask neurological sequelae of head trauma not clinically apparent either to the patient or by medical examination. A pharmacological challenge may serve as a "functional stress test" for head trauma sequelae.

Correspondence: *Joanne R. Festa, PhD, Neurology, Neurological Institute, Columbia University College of Physicians and Surgeons, 710 West 168th Street, 604, New York, NY 10032. E-mail: jf2128@columbia.edu*

W. GARMOE & A. NEWMAN. The Functional Self-Assessment Scale (FSAS) in Measurement of Self-Awareness Early Following Severe Traumatic Brain Injury.

Objective: The purpose of the present study was to replicate prior studies using the Functional Self-Assessment Scale (FSAS) in the measurement of self-awareness following traumatic brain injury (TBI). It was hypothesized that adults early in recovery following moderate and severe TBI would rate themselves significantly less impaired on the FSAS relative to ratings by therapists.

Participants and Methods: Forty-four adults early in recovery from severe TBI and participating in an acute inpatient specialized rehabilitation program were administered the FSAS and a neuropsychological screening battery. Each subject's physical or occupational therapist independently rated his/her functioning using the FSAS. Subject and therapist FSAS ratings were completed within 24 hours of one another.

Results: Mean age of the sample was 43.2 years (Range=18-75 years, $SD=16.5$) and mean education was 13 years (Range=9-20, $SD=2.6$). There were 34 males and 10 females. Mean GCS at time of injury was 7.8.

TBI subjects rated themselves to have very little impairment using the FSAS (Mean=16.4, $SD=3.9$), while therapists rated them as much more impaired (Mean=23.3, $SD=6.6$). Paired-samples t-test revealed this difference to be statistically significant ($p < .0001$).

This subject sample is being re-evaluated six months following discharge from inpatient rehabilitation to assess whether early FSAS scores predict functional outcome and self-awareness.

Conclusions: Adults early in recovery following severe TBI, as a group, show significant impairments in self-awareness. These results thus confirm prior research using the FSAS. There is significant range in level of self-awareness across subjects. Subsequent analyses will examine potential differences in cognitive functioning between subjects with good versus poor self-awareness. Once all subjects return for their six-month follow-up study, the data will allow for examination of whether early self-awareness assessment is predictive of long-term recovery following TBI.

Correspondence: *William Garmoe, Ph.D., Psychology Service, National Rehabilitation Hospital, 102 Irving Street, NW, Washington, DC, DC 20010. E-mail: william.s.garmoe@medstar.net*

S.M. GREMLEY & C. LAM. Self-Awareness and Memory Deficits in Sub-Acute Traumatic Brain Injury.

Objective: Anosognosia or lack of awareness of one's own decline in cognitive functioning has been found to occur in approximately 45 % of individuals with traumatic brain injury (TBI), and can lead to poor rehabilitation and vocational outcomes. Unfortunately, identifying deficits in self-awareness can be challenging. A more in depth understanding of the mechanism by which self-awareness occurs would likely lead to more effective means of identifying these deficits. Research supports the role of right-hemisphere functioning and working memory

abilities in self-awareness, but few studies have examined the relationship between commonly administered neuropsychological tests and self-awareness following TBI. The present study examined six neuropsychological tests as possible predictors of scores on two measures of self-awareness.

Participants and Methods: Thirty sub-acute TBI rehabilitation inpatients participated in the present study. Participants completed an interview and a battery of neuropsychological tests. One measure of self-awareness was completed by the participant's speech therapist.

Results: Two linear multiple regressions with forward comparisons and two one-way analysis of variance were performed. Results revealed that measures of immediate memory were the best predictors of level of self-awareness, and that those with right-hemisphere damage demonstrated more impairment in self-awareness than those with left-hemisphere damage.

Conclusions: It appears that those with sub-acute TBI who have difficulty learning newly presented information are more likely to have impaired self-awareness of deficits. It may be that insufficiencies in learning new information inhibits the individuals from encoding information regarding their current performances, which appears to be a lack of awareness of their cognitive deficits.

Correspondence: *Shelley M. Gremley, Ph.D., Neuropsychology, Medical College of Wisconsin, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: srouland@rcn.com*

T. HEITZMAN. Residual Effects of Head Injury: A Comparison of Self-Reports, Attention and Executive Functioning in Young Adults with and without a Reported History of Head Injury.

Objective: Cognitive deficits, emotional problems and limited insight are common following brain injury. This study investigated these residual effects of brain injury by comparing self-reports, attention and executive functioning in a sample of young adults with and without a reported history of head trauma.

Participants and Methods: Fifty undergraduates (ages 18-21) were interviewed and completed self-report scales (BRIEF-A and BASC-2), a brief IQ measure (WASI) and tests of attention and executive functioning (D-KEFS Color-Word Interference; WCST; Spatial Span; Coding). Two participants reported a diagnosis of Brain Injury, but twelve participants described history of head trauma one to four years prior to the study. Extent of injury was undetermined, but all reported at least one injury with a loss of consciousness and PTA. None of the injured participants described residual cognitive deficits, current therapy or accommodations.

Results: Contrary to self-reports, a matched-pair comparison between the injured and non-injured subgroups revealed significant differences in naming fluency, executive capacity and emotional distress. Specific differences were found on the D-KEFS (color naming), the WCST (number of trials, perseverative errors, categories completed, failure to maintain set) and the BASC-2 (Internalizing Problems; Emotional Symptoms; Personal Adjustment). Insignificant differences were found on other tests and self-reports of attention and executive functioning.

Conclusions: Results of this study (a) support the use of the WCST and D-KEFS to detect residual executive deficits; (b) demonstrate the potential for residual executive deficits, limited insight of those deficits, emotional distress and poor adjustment years after injury; (c) reveal a need for continued follow-up, emotional support and remediation.

Correspondence: *Timothy Heitzman, PhD, Psychology, Fairfield University, 1073 North Benson Rd, Fairfield, CT 06424. E-mail: theitzman@mail.fairfield.edu*

G.L. IVERSON, B.L. BROOKS & V. ASHTON. Effort testing and self-reported problems in patients with a post-concussion syndrome.

Objective: Protracted recovery from a mild traumatic brain injury (MTBI) is poorly understood. The purpose of this study was to examine effort testing and symptom reporting in patients deemed temporarily disabled from work with a post-concussion syndrome following an MTBI.

Participants and Methods: The sample consisted of 34 patients consecutively referred for an intake assessment or neuropsychological evaluation over an 11-month period (mean age=40.7, SD=12.4; 79% male; 71% Caucasian; 23.5% English as second language). All patients were receiving financial compensation through the Worker's Compensation system (mean=2.3 months post injury, SD=1.7, range=0.9-7.9 months). Performance on the Test of Memory Malingering (TOMM) and their responses on two formal self-report measures of post-concussion symptoms and cognitive complaints were examined.

Results: Using the recommended cutoff score, 23.5% failed the TOMM. The average scores for patients who failed the TOMM were 33.4 on Trial 2 (SD=9.2) and 32.1 on Trial 3 (SD=9.9). Those patients who failed the TOMM had greater total scores on the British Columbia Postconcussion Symptom Inventory ($p=.031$; Cohen's $d=1.17$, very large effect size). They also reported worse problems with memory ($p=.043$; $d=1.03$) and concentration ($p=.049$; $d=0.98$) on the British Columbia Cognitive Complaints Inventory compared to patients who passed the TOMM.

Conclusions: Effort testing is an integral part of an evaluation with patients receiving compensation for an MTBI. Nearly 1 out of every 4 patients failed the TOMM, and these patients reported more post-concussion-like symptoms and more problems with memory and concentration than those who passed effort testing.

Correspondence: *Brian L. Brooks, Ph.D., North Lawn Psychology, Riverview Hospital, 2601 Lougheed Highway, Coquitlam, BC BC, Canada. E-mail: blbrooks@bcmhs.bc.ca*

G.L. IVERSON, M.W. COLLINS & M.R. LOVELL. Predicting Recovery Time from Concussion in High School Football Players.

Objective: Based on the 2005 Prague Consensus Statement, athletes who recover within 10 days are classified as having "simple" concussions and athletes who take longer than 10 days are classified as having "complex" concussions. The purpose of this study was to determine if recovery time could be predicted within the first 72 hours based on symptom reporting.

Participants and Methods: More than 2,000 high school football players participated in a three-year study. One-hundred and thirty-six were concussed, and 117 were administered the Post-Concussion Scale (PCS) within 72 hours. A subsample of 85 athletes met inclusion criteria (i.e., they had to be seen at least twice and their precise outcome at 10 days post injury was known). The breakdown of athletes by recovery time was: (a) simple concussion ($n=60$, 70.6%), and (b) complex concussion ($n=25$, 29.4%).

Results: Athletes with complex concussions reported far more symptoms within 72 hours post injury ($p<.001$, Cohen's $d=1.47$, very large effect size). Athletes scoring 15 or less on the PCS were 24.8 times more likely to recover quickly (95% CI=5.8-103.6; positive predictive value=.95, 95% CI=.87-.99). A clinically-derived algorithm clearly differentiated the groups ($p<.001$, $d=1.94$). Athletes scoring two or greater on this algorithm were 46.4 times more likely to recover slowly (95% CI=6.9-297.3; positive predictive value=.92, 95% CI=.68-.99).

Conclusions: Subsets of athletes who are destined to recover quickly or slowly can be accurately identified based on symptom reporting within 72 hours post injury. These results are very encouraging and require replication.

Correspondence: *Grant L. Iverson, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T 2A1, Canada. E-mail: giverson@interchange.ubc.ca*

C. KIMBERG, S.C. HEATON, C. VELOZO, N. DONOVAN, K. WAID-EBBS & P. WEN. Development of a Measure of Functional Cognition for Adult TBI.

Objective: Cognitive deficits resulting from Traumatic Brain Injury (TBI) can have a profound impact on a survivor's ability to return to their previous level of functioning. Accurate assessment of these cognitive sequelae allows for focused interventions. While traditional neuropsychological measures generally have strong psychometric properties and

have been created to measure cognitive functioning, many argue that they are weak in terms of ecological validity. In contrast, measures of daily functioning used in rehabilitation settings are thought to measure function in daily life, but are often weak psychometrically and have little focus on cognition. In response, we sought to develop a computerized questionnaire designed to assess cognition in the daily lives of adults recovering from TBI. This new measure draws upon Item Response Theory and Computer Adaptive Technology to provide measurement precision while keeping patient burden low.

Participants and Methods: With the input from an expert national advisory committee and review of the TBI literature, cognitive constructs were selected. Traditional neuropsychological and neuroscience cognitive models, as well as rehabilitation models were employed to provide a structure for item development. Focus groups to review drafted items were then conducted with 35 healthcare professionals, 16 caregivers, and 9 patients.

Results: Six cognitive constructs were identified: attention, memory, processing speed, executive functioning, social communication, and emotional management. Next, 269 items were created with an item difficulty hierarchy spanning across stages of TBI recovery. Input from the focus groups led to substantial editing to the original item bank.

Conclusions: The current study presents a novel way of measuring cognitive functioning after TBI. Through the use of cognitive models, Item Response Theory, and professional and clinical focus groups, we have created an ecologically sensitive measure of functional cognition for adult TBI across the recovery span.

Correspondence: *Cara Kimberg, Clinical and Health Psychology, University of Florida, Health Science Center, PO box 100165, Gainesville, FL 32610. E-mail: ckimberg@pnhp.ufl.edu*

M.J. LARSON, D. NAGLE, K.G. KELLY, D. STIGGE-KAUFMAN, C. MAUER, R. STECKLEY & W.M. PERLSTEIN. Contingency Sensitivity and Reward Prediction Following Severe TBI: An ERP Investigation.

Objective: Survivors of severe traumatic brain injury (TBI) often demonstrate risky, impulsive behaviors possibly due to impaired sensitivity to stimulus-response contingencies and ability to predict reward. The neurobiological mechanisms underlying these deficits have not been thoroughly explored, but can be examined using the ‘feedback-related negativity’ (FRN)—an event-related potential (ERP) component evoked following performance or response feedback (e.g., whether a monetary reward is obtained) with greater-amplitude FRN following unfavorable than favorable outcomes and following unexpected, relative to predicted, unfavorable outcomes.

Participants and Methods: We examined ERPs elicited by favorable (monetary gain; ‘reward’) and unfavorable (no monetary gain; ‘non-reward’) feedback during a guessing task where expectation of reward outcome was manipulated (75% or 25% probability of reward counterbalanced across two blocks of 200 trials) in survivors of severe TBI and demographically-matched healthy participants.

Results: Replicating previous work, controls showed larger amplitude FRN to ‘non-reward’ feedback and largest amplitude FRN following ‘non-reward’ when ‘reward’ feedback was expected (i.e., when reward probability was greatest). In contrast, FRN in TBI participants did not significantly differentiate ‘non-reward’ from ‘reward’ trials and FRN was larger to ‘reward’ trials when ‘non-reward’ feedback was expected.

Conclusions: Findings implicate impaired reward prediction/contingency evaluation mechanisms in survivors of severe TBI and support previous findings that TBI survivors may be more focused on immediate reward and less concerned about future contingencies. Findings of an electrophysiological marker of impaired contingency evaluation, with heightened focus on immediate reward, has implications for rehabilitation and adds to the literature suggesting TBI patients show decrements in performance monitoring.

Correspondence: *Michael J. Larson, M.S., Department of Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: mlarson@hp.ufl.edu*

M.J. LARSON, D. STIGGE-KAUFMAN, D. NAGLE, R. STECKLEY, C. MAUER & W.M. PERLSTEIN. Awareness of Deficit, Performance-Monitoring, and Evaluative Control Following Severe TBI.

Objective: Survivors of severe traumatic brain injury (TBI) demonstrate impairments in deficit awareness and performance-monitoring. The neural instantiations of such deficits have not been thoroughly examined, but can be measured using the error-related negativity (ERN) and post-error positivity (Pe)—event-related potential (ERP) components generated following errors. Current theories suggest the ERN reflects automatic performance- and error-monitoring while the Pe reflects error-processing and awareness. We investigated the relationship between performance-monitoring and deficit awareness using behavioral and ERP measurements while participants performed a color-naming version of the Stroop task.

Participants and Methods: High-density ERPs were acquired while 15 severe TBI patients and 15 demographically-matched healthy controls performed a single-trial version of the Stroop task with 70% congruent and 30% incongruent randomly presented trials. Awareness of deficit was measured by discrepancy score between self- and caregiver-versions of the Frontal Systems Behavior Scale (FrSBe; Grace & Malloy, 2001). Response-locked ERPs were separately averaged for correct and error trials.

Results: Behaviorally, both groups demonstrated robust response-time and error-rate interference. ERP results indicated that overall ERN amplitude was attenuated in TBI patients, while Pe amplitude did not significantly differ between groups. ERN, but not Pe amplitude, significantly correlated with FrSBe self-/other-rated discrepancy score, with reduced amplitude ERN associated with decreased awareness of deficit.

Conclusions: Findings provide support for an electrophysiological marker of impaired performance-monitoring (i.e., ERN amplitude) following severe TBI. Furthermore, increased performance-monitoring decrements were associated with poorer deficit awareness, suggesting that electrophysiological indices of performance-monitoring and general error processing are related to “real-life” manifestations of awareness of functioning.

Correspondence: *Michael J. Larson, M.S., Department of Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: mlarson@hp.ufl.edu*

K.E. LOEHER, L.J. RAPPORT, S.J. VANGEL, R. HANKS, A. LEQUERICA, R. WHITMAN & S. LANGENECKER. Impulsivity and Traumatic Brain Injury: The Relationship Between Performance Measures, Rating Scales, and Behavioral Observation.

Objective: Prior research indicates that rating scales and performance tests designed to assess impulsivity show little association with each other. This descriptive study assessed the interrelationships of these methods with in vivo behavioral observation of impulsive behavior, accounting for the mode of expression (verbal or motor).

Participants and Methods: 40 rehabilitation inpatients with moderate to severe brain injury participated. Rating scales included patient self-report and informant reports completed by rehabilitation therapists. Performance measures included tests assessing aspects of impulsivity and executive functioning (go/no-go, stop-signal, Stroop, Trails B), as well as tests of attention, processing speed, visuospatial, and memory abilities. In vivo behavioral observation employed two raters of videotaped sessions of patients during physical and occupational therapy.

Results: Behavioral observation of verbal (BO-V) and motor (BO-M) impulsive behaviors were moderately related. BO-V showed moderate to strong correlation with rating scales but was largely unrelated to performance measures of impulsivity. BO-M was unrelated to rating

scales but showed moderate to strong correlation with impulsivity performance tests. Multiple regressions indicated that the Impulsivity Rating Scale made the most unique contribution to the prediction of BO-V, whereas Trails B made the most unique contribution to the prediction of BO-M.

Conclusions: Relationships of impulsivity rating scales and performance tests to in vivo behavior dissociated: Verbal impulsivity was best assessed by rating scales, whereas motor impulsivity was best assessed by performance tests. However, performance tests also had poor specificity, showing equally strong associations to tests of other neuropsychological domains. The findings may have implications for rehabilitation treatment that may facilitate patient recovery.

Correspondence: *Kristen E. Loehrer, M.A., Psychology, Wayne State University, 5057 Woodward, Detroit, MI 48202. E-mail: kristen.loehrer@wayne.edu*

C.D. MARQUEZ DE LA PLATA, M.G. HEWLITT, A.C. DE OLIVERA, C.R. HARPER, C.B. MOORE, S. SHAFI & R.R. DIAZ-ARASTIA. Ethnic Differences in Rehabilitation Placement and Outcome after TBI.

Objective: Recent studies indicate that ethnic minorities are at greater risk for poor functional outcome post-traumatic brain injury (TBI). While it is possible racial disparities in access to rehabilitation services after TBI exist, limited English proficiency may also impact rehabilitation placement and outcomes. We hypothesize that English-speakers (ES) will have a higher access to rehabilitation and better functional outcomes than patients who speak Spanish as their primary language.

Participants and Methods: The study was conducted in two urban Level 1 trauma centers in an ethnically diverse community. 1226 patients with blunt TBI were included in the study, consisting of 855 (70%) Caucasians (CAU), 97 (8%) African-Americans (AA), and 274 (22%) Hispanics (HIS), of which 99 were predominantly Spanish-speaking (SSH). Functional outcomes were assessed using the Glasgow Outcome Scale-Extended and the Functional Status Examination between 6 to 12 months post-injury.

Results: All groups had similar injury severity scores at admission to acute hospitalization. HIS had the lowest rate of insurance and rehabilitation placement of the three ethnic groups, even among the most severely injured. SSH were less likely to be placed in rehabilitation than Non-HIS ES (39% vs. 64%), but this difference was accounted for by insurance status. There were no outcome differences among uninsured ethnic or language groups; however, insured HIS and SSH had poorer outcomes than CAU and Non-HIS ES, respectively.

Conclusions: Our results suggest insurance status has a greater influence on placement into rehabilitation than ethnicity or proficiency with the English language. Insurance may also play a large role in functional outcome.

Correspondence: *Carlos D. Marquez de la Plata, PhD, Neurology, University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd., Dallas, TX 75390-9036. E-mail: carlos.marquezdelaplata@utsouthwestern.edu*

R. NAIDOO, B.W. ABLITZ & R.B. PERNA. Predictors of Independent Living After Traumatic Brain Injury.

Objective: Many people enter neurorehabilitation programs following TBI with impaired independent living skills. Living and working independently are two important TBI treatment goals that can be very difficult to accurately predict with neuropsychological measures. The purpose of this study was to investigate the strength of the MPAI-4 (Malec and Lezak, 2003) as a predictor of independent living following discharge.

Participants and Methods: The relationship between the total MPAI-4 at discharge, and living status and vocation at discharge and 3-months post discharge in a sample of 143 individuals with TBI were examined using simple linear regression analyses. The sample included 90 males and 53 females, with a mean age of 34.4, and a mean education of 11.8 years.

Results: Regression results indicate that MPAI-4 at discharge significantly predicted living status (Beta = .701, $F(1,141) = 136.295$, $p < 0.001$) and accounted for 70.1% of the variance in living status at discharge. Regression results also indicate that MPAI-4 at discharge significantly predicted vocational status (Beta = .594, $F(1,141) = 76.911$, $p < 0.001$) and accounted for 59.4% of the variance in vocational status at discharge. MPAI-4 significantly predicted living status (Beta = .596) and vocational status (Beta = .595) at 3 months post discharge.

Conclusions: These results suggest that the MPAI-4 at discharge is a good predictor of living status and vocation at the termination of a neurorehabilitation program. The implication of these findings is that the MPAI-4 at discharge can be used to estimate prognostic outcomes of independent living following discharge.

Correspondence: *Reshma Naidoo, Westside Neurorehabilitation Center, 600 Main Street, Lewiston, ME 04240. E-mail: rbnaidoo@gmail.com*

R. NAKASE-RICHARDSON, S.A. YABLON & M. SHERER. Predictive Utility of Acute Confusion Severity at One-Month Post Traumatic Brain Injury upon Late Employment Outcome: Prospective Comparison with Duration of Posttraumatic Amnesia.

Objective: Measurement of posttraumatic amnesia (PTA) duration is common practice, serving as an important index of traumatic brain injury (TBI) severity and predictor of functional outcome. Still, controversy exists regarding the nature of posttraumatic amnesia (PTA); some studies indicate that it is a confusional state with symptoms that extend beyond disorientation and amnesia. **Objective:** Evaluate the contribution of severity of acute confusion at one-month post-TBI to prediction of employment at one-year post injury, comparing it with PTA duration.

Participants and Methods: Prospective study involving 172 participants with complete data who met study criteria from 228 consecutive TBI Model System admissions. Outcome measures included weekly administration of the Delirium Rating Scale-Revised-98 (DelRS-R98) to measure severity of acute confusion. Evaluations closest to one-month post-injury were utilized for study purposes. PTA duration was defined as the interval from injury until two consecutive Galveston Orientation and Amnesia Test (GOAT) scores of ≥ 76 were obtained within a period of 24-72 hours. Univariable and multivariable logistic regression were used to predict employment status at one-year post injury.

Results: Age, education, and DelRS-R98 were significant predictors accounting for 33% of outcome variance. Individuals with greater confusion severity at one-month post injury, older age, and lower levels of education were less likely to be employed at one-year post-injury. Severity of confusion was more strongly associated with employment outcome ($r_s = 0.39$) than was PTA duration ($r_s = 0.34$).

Conclusions: In addition to demographic indices, severity of acute confusion makes a unique contribution to predicting late outcome after TBI. Correspondence: *Risa Nakase-Richardson, Ph.D., Neuropsychology, Methodist Rehabilitation Center, 1350 East Woodrow Wilson Drive, Jackson, MS 39216. E-mail: nakase@aol.com*

T.J. NEAL & R.S. DEAN. Predicting neurological impairment with cognitive ability.

Objective: Neuropsychological batteries serve to differentiate neurological impairment from normal functioning. Extensive research has been conducted examining the predictive capacities relevant to brain damage for the Halstead-Reitan Neuropsychological Battery and Luria Nebraska Neuropsychological Battery. While studies have established

the reliability and validity of components comprising the Dean-Woodcock Neuropsychological Battery (DWNB), the efficacy of the Woodcock-Johnson Tests of Cognitive Abilities, Third Edition (WJIII-COG) in discriminating between neurologically impaired and normal individuals deserves further attention. Specifically, the effectiveness of the WJIII-COG in discriminating between closed head injury and normal was evaluated.

Participants and Methods: A discriminant analysis evaluated the best set of independent variables in the correct classification and maximum differentiation between the two groups (closed head injury versus normals) for the standard and extended portions of the WJIII-COG. All participants (N=1880; Mean Age=31.02 years; SD=17.81 years) were administered the entire WJIII-COG as part of a comprehensive neuropsychological test battery.

Results: By analyzing discriminant analysis results, the ability of the WJIII-COG to differentiate between the closed head injury and normal subjects was significant, Wilks' Lambda=.891, Chi-square transformation(19, N=1880)=58.873, $p < .001$. Subsequent analysis determined the relative contribution of each predictor variable in discriminating between groups, with two subtests (Planning, Visual Matching) maximizing the separation among the groups.

Conclusions: Results add to the validity of the WJIII-COG relative to its ability to differentiate between neurologically impaired and normal individuals. Subsequent analyses provide evidence regarding the utility of the subtests to differentiate between the two groups. This poster will discuss the results of this study and the implications for practitioners and researchers.

Correspondence: *Tiffany J. Neal, MA, Educational Psychology, Ball State University, PO Box 121, Mt. Summit, IN 47361. E-mail: tjncall@bsu.edu*

T. NOVACK & S. PENNA. Validity of the Memory/Attention Scale of the Neurobehavioral Functioning Inventory: Patient vs. Caregiver.

Objective: Evaluate the relationship of the Memory/Attention scale of the Neurobehavioral Functioning Inventory (NFI) to neuropsychological test results.

Participants and Methods: The relationship of the Memory/Attention scale of the Neurobehavioral Functioning Inventory (NFI) to neuropsychological test results was examined at 3 and 6 months post-TBI using the delayed recall component of the Logical Memory test of the WMS-III, the Working Memory Index of the WAIS-III, and Part B of the Trail Making Test. The sample consisted of 42 TBI cases (the majority severely injured) at 3 months after injury (along with 39 caregivers); and 33 TBI cases followed at 6 months after injury (along with 30 caregivers).

Results: Based on multiple regression analyses, survivor ratings of Memory/Attention at 3 months did not significantly correlate with cognitive test performance as a group, although the individual correlation between the Memory/Attention and Logical Memory score was significant. However, caregiver ratings exhibited significant results, with 27% of the variance in Memory/Attention rating accounted for by cognitive tests ($p < .015$). At 6 months after injury, survivor Memory/Attention rating did not correlate significantly with the group of cognitive tests, although individual correlations were significant with the Logical Memory and Working Memory Index scores. Caregiver rating of Memory/Attention was again significantly correlated with the group of cognitive tests, accounting for 42% of the variance ($p < .005$).

Conclusions: These findings indicate that caregivers may be more aware of memory and attention problems, and perhaps cognitive deficits overall, than survivors early in recovery. Awareness does seem to increase for survivors from 3 to 6 months. These results lend support to the validity of the Memory/Attention scale of the NFI.

Correspondence: *Tom Novack, University of Alabama at Birmingham, SRC 530, 619 19th St. S., Birmingham, AL 35249. E-mail: novack@uab.edu*

K.F. PAGULAYAN, J.M. HOFFMAN, N.R. TEMKIN, J.E. MACHAMER & S.S. DIKMEN. Depression and Self-Reported Limitations After Traumatic Brain Injury: Direction of Causality.

Objective: Previous research has noted a close relationship between reported level of injury-related everyday difficulties and emotional distress among individuals with traumatic brain injury (TBI), but the direction of causality in this relationship remains unclear. This study aims to examine the longitudinal relationship between depressive symptoms and level of self-reported limitations after TBI using a causal model.

Participants and Methods: 156 individuals with complicated mild to severe TBI completed the Sickness Impact Profile (SIP) and the Center for Epidemiological Studies-Depression Scale (CESD) at 1, 6, and 12 months post injury. The SIP is a health-related quality of life measure that assesses physical and psychosocial functioning as well as areas such as work, recreation, and home management. A cross-lagged panel design was used to examine whether depressive symptoms predicted self-reported limitations and whether perceived limitations predicted depressive symptoms.

Results: CESD and SIP scores were significantly correlated within the same time points. Examination of these relationships over time revealed that early perceived limitations on the SIP predicted later CESD scores, even after controlling for early depressive symptoms and later functioning. No relationship was found between early depressive symptoms and later SIP scores. This same pattern was seen across all domains of functioning.

Conclusions: Perceived changes in daily functioning appear to influence emotional well-being over time after TBI. However, depressive symptoms do not appear to negatively impact individual's perception of later functioning. These results further our understanding of the complicated relationship between depressive symptoms and reported difficulties and may have important implications for treatment of depression following TBI.

Correspondence: *Kathleen F. Pagulayan, Ph.D., Rehabilitation Medicine, University of Washington, University of Washington, Box 356490, Seattle, WA 98195-6490. E-mail: farkat@u.washington.edu*

K.F. PAGULAYAN, N.R. TEMKIN, J. MACHAMER & S.S. DIKMEN. Magnitude and Characteristics of Impaired Self-Awareness Among Consecutively Hospitalized Individuals with Traumatic Brain Injury.

Objective: To examine the magnitude and characteristics of impaired self-awareness using discrepancy scores between persons with TBI and their significant others (SO).

Participants and Methods: 120 individuals with complicated mild to severe TBI and their SO completed the Sickness Impact Profile (SIP) at one and twelve months post injury. The SIP yields Psychosocial Factor, Physical Factor, and Total scores. One standard error of measurement (SEM) of the difference, calculated from SIP test-retest data, was used to determine minimum meaningful difference in patient-SO scores. The SEM was higher for the Psychosocial (SEM=8.19) than the Physical Factor (SEM=4.80).

Results: Average level of endorsed limitations was similar for patients and SOs. However, a range of concordance was evident among pairs and concordance was variable across time and domains. More patients under-reported physical (24%) than psychosocial difficulties (18%) at one month. Fewer people were classified as lacking awareness at one year; but it was more prevalent for psychosocial (14%) than physical functioning (4%) then. Finally, using this definition of awareness, a higher percentage of patients over-reported problems relative to their SO (hyperaware) than those who under-reported problems (unaware).

Conclusions: Awareness is a difficult concept to measure, but there are at least as many who over-report as there are who under-report symptoms. The SEM takes into account the normal variability in self-report and may protect some against erroneous estimates of impaired awareness. More investigation of the characteristics and functional correlates of both individuals who report fewer problems than their SO and those who report more problems is needed.

Correspondence: *Kathleen F. Pagulayan, Ph.D., Rehabilitation Medicine, University of Washington, University of Washington, Box 356490, Seattle, WA 98195-6490. E-mail: farkat@u.washington.edu*

S.P. PAVAWALLA, J. WEINS & M. SCHMITTER-EDGEcombe. Monitoring Behavior on a Time-Based Prospective Memory Task Following Traumatic Brain Injury.

Objective: Prospective memory (PM), or the ability to remember to execute future actions, is an important aspect of everyday functioning. This study examined monitoring behavior in a time-based PM task following traumatic brain injury (TBI).

Participants and Methods: Twenty participants with a TBI (≤ 6 months post-injury) and 20 controls matched in age and education were examined. Participants completed a time-based PM task concurrently with an ongoing vocabulary test. The PM task required participants to report the item number they were working on at the end of two, 2-minute time blocks. Passage of time could be monitored by checking a computerized clock displaying a 2-minute timer obstructed from continuous viewing. Examiners tracked PM accuracy and the number of times participants monitored the clock during each of the 4, 30-second intervals within each time block.

Results: Results revealed an overall prospective remembering accuracy rate of 89% for controls but only 66% for TBI participants. Although monitoring for both groups increased across the 30-second intervals, controls demonstrated significantly more monitoring behavior than TBI participants during the final 30-second interval. Correlational analyses, conducted separately for each group, revealed that greater monitoring behavior overall and during the final 30-second interval was associated with greater PM task accuracy.

Conclusions: We found that decreased monitoring behavior in TBI participants was associated with poorer time-based prospective memory performance. These findings are consistent with the notion that individuals with a TBI may have a reduction in available resources necessary for the effective utilization of strategic time monitoring abilities while engaged in other ongoing activities.

Correspondence: *Shital P. Pavawalla, M.S., Clinical Psychology, Washington State University, Washington State University - Dept. of Psychology, P.O. Box 644820, Pullman, WA 99164. E-mail: spavawalla@wsu.edu*

S. PENNA & T.A. NOVACK. Factors Associated with Life Satisfaction Following TBI at 3 and 6 Months Post-Injury.

Objective: Life dissatisfaction is common following traumatic brain injury; however, few studies have examined specific components related to life dissatisfaction. Physical, cognitive, and emotional domains were examined to assess relative contributions to life satisfaction.

Participants and Methods: Thirty-eight cases of TBI (moderate and severe) were followed at 3 and 6 months. Multiple regression analyses assessed the relation between life satisfaction, as measured by the Satisfaction with Life Scale, and physical, cognitive, and emotional functioning. The motor and somatic subscales of the Neurobehavioral Functioning Inventory comprised the physical disability variable. Standard scores from neuropsychological tests (WMI of the WAIS-III, Logical Memory- Delay subtest of the WMS-III, Trails B, Wisconsin Card Sort Test, and Oral SDMT) were summed, and the mean was used as a measure of cognitive functioning. Emotional distress was measured using a short form of the Hamilton Depression Rating Scale.

Results: At 3 months post-injury only emotional distress was significantly related to life satisfaction ($B = -.481, p = .005$). At 6 months emotional distress was less salient ($B = -.416, p = .06$); however, physical disability was significantly related to quality of life ($B = .534, p = .04$ for somatic symptoms, $B = -.570, p = .016$ for motor symptoms). There were no significant differences in life satisfaction at the two time points.

Conclusions: Awareness of deficits may account for the finding at 3 months, as those who are aware of deficits may experience more emotional distress as a consequence. Over time, as awareness increases, distress resulting from persistent physical limitations may become more salient, resulting in a greater contribution to life satisfaction after 6 months.

Correspondence: *Suzanne Penna, Ph.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 1051 24th St. South, Birmingham, AL 35205. E-mail: spenna@uab.edu*

S. PENNA & T.A. NOVACK. Relation of the Neurobehavioral Functioning Inventory to Other Self-Report Measures of Depression.

Objective: The Neurobehavioral Functioning Inventory (NFI) is frequently used to assess behavioral and emotional status following traumatic brain injury. It is composed of several subscales including one assessing depressive symptoms. The NFI-D has been validated as a measure of depression, and was highly correlated to SCID diagnosis (Kennedy et al, 2005). This study explored whether common measures of depressive symptoms (the Center for Epidemiological Studies-Depression [CES-D] and Hamilton Depression Rating Scale- short form [HDRS]) are as effective in detecting signs of depression in individuals with TBI as the NFI-D.

Participants and Methods: Using a sample of 33 patients with moderate to severe TBI, the NFI was compared to the CES-D and a short form of the Hamilton Depression Rating Scale, both commonly used measures of depressive symptomatology in non-brain injured populations.

Results: The CES-D was significantly correlated with both the patient ($r = .76, p < .001$) and family ($r = .45, p < .007$) forms of the NFI-D. Similarly, the HDRS was significantly correlated with both patient ($r = .66, p < .001$) and family forms of the NFI-D ($r = .34, p < .012$). The CES-D and HDRS were also highly correlated with each other ($r = .87, p < .001$).

Conclusions: Overall, there appears to be good support for the use of the HDRS and the CES-D for brain injured populations given the high correlation with the depression subscale of the NFI. This is particularly useful information as the NFI is not widely used outside the rehabilitation setting, and patients will often be followed in non-rehabilitation environments where the CES-D or HDRS may be more likely to be utilized than the NFI.

Correspondence: *Suzanne Penna, Ph.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 1051 24th St. South, Birmingham, AL 35205. E-mail: spenna@uab.edu*

V.S. PHATAK, J.F. MALEC, K. CICERONE, J. KREUTZER, C. LEVERONI, J.M. MEYTHALER, T.A. NOVACK, J. WHYTE & R. ZAFONTE. Patient Perception of Disability and Post-Injury Depression in Traumatic Brain Injury (TBI).

Objective: Previous research has typically estimated prevalence of depression is 5 to 8 times more common for individuals with TBI. This study's objective was to identify factors that were associated with post-injury depression.

Participants and Methods: Subjects consisted of 745 individuals with TBI who participated in a TBI Model Systems program. The patient-rated Neurobehavioral Functioning Inventory (NFI)-Depression subscale measured depression at 1-yr post-injury. The following factors were examined as potentially contributory: patient and significant other ratings of disability (obtained by combining the remaining NFI subscales; NFI-Imp), professional disability ratings (using Functional Independence Measure; FIM), demographic variables, and length of post-traumatic amnesia.

Results: Regression analysis found patient NFI-Imp was the only variable significantly associated with depression. We hypothesized that NFI-Imp captured both actual and perceived disability. To delineate the components, "actual" disability was operationalized as disability measured

by FIM, and perceived disability was derived by subtracting patient NFI-Imp from FIM. A linear stepwise regression found perceived disability accounted for 38% of unique variance of depression and the actual disability, 30%. The perceived disability was further categorized at three levels: reduced awareness, intact, and exaggerated. The depression scores for the reduced awareness (NFI-Dep=15.37), intact (NFI-Dep=26.88), and exaggerated (NFI-Dep=38.48) groups were significantly different ($F=115.94, p<.0001$), and indicated an increased awareness of disability was related to greater depression.

Conclusions: The results highlight the importance of assessing patient perception of disability in the TBI population and suggest that individuals who are keenly aware of their disability, whether actual or perceived, may be more vulnerable to depression.

Correspondence: *Vaishali S. Phatak, PhD, Psychiatry and Psychology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905. E-mail: vaishali@uwm.edu*

A.A. PICA, J.L. WOODARD, M. MCCREA & T. HAMMEKE. The Relationship between Concussion Grading Scales and Clinical Outcome following Sports Related Concussion.

Objective: The clinical utility of concussion grading scales in predicting outcome following concussion has not yet been empirically validated. This study investigated whether a variety of neurocognitive markers could differentiate between grades of concussion severity amongst adolescent athletes, as classified by the American Academy of Neurology (AAN), Colorado Medical Society (CMS), and Cantu Guidelines.

Participants and Methods: Participants consisted of 156 high school athletes (84 concussed, 72 matched controls) who were administered the post-concussive symptom checklist, the Standardized Assessment of Concussion, the Balance Error Scoring System, and a neuropsychological battery. Concussed and control athletes were assessed at baseline, immediately following injury, and 24 hours, six days, and 45 days post-injury.

Results: Ordinal regression was utilized to determine if post-concussive symptoms, postural stability, and neuropsychological functioning could differentiate between grades of injury severity. When concussion severity was classified according to AAN guidelines, concussed athletes with increasing injury severity demonstrated increased post-concussive symptom reporting and diminished mental status and attention deficits immediately following, 24 hours, and six days following injury. These athletes were not differentiated from one another based on postural stability or memory functioning at any time point following injury. Concussion severity as classified according to CMS and Cantu Guidelines yielded less consistent findings, although both were associated with post-concussive symptom reporting.

Conclusions: This study is one of the first to prospectively examine the clinical utility of three major grading scales and report at least some degree of association with symptomatic and cognitive recovery following concussion. Clinical implications with regard to diagnosis and return-to-play decisions are discussed.

Correspondence: *Ashley A. Pica, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 3222 N. Kenmore Ave. Apt. 2, Chicago, IL 60657. E-mail: ashleyapica@yahoo.com*

J. PONSFORD & K. DRAPER. Cognitive Functioning and Outcome Ten Years Following Traumatic Brain Injury.

Objective: Relatively few studies have examined in detail long-term outcomes following TBI. The aim of this study was to examine the interrelationships of cognitive function, measured both neuropsychologically and by self-report and outcome ten years post-injury in individuals with moderate-severe TBI.

Participants and Methods: Sixty participants with moderate-severe TBI (55% males; mean PTA = 26 days, range = 0.1-99 days), recruited 10 years post-injury and 43 uninjured controls, matched for gender, age,

education and IQ, were assessed using the Glasgow Outcome Scale-Extended (GOSE) as an outcome measure. Measures of cognition included Digit-Symbol Coding, Symbol-Digit Modalities Test-Oral, Trail-Making Test, Hayling Sentence Completion Test, Digit Span, Rey AVLT, Doors and People Test, Porteus Mazes and the SART. Self-reported cognitive-behavioural changes were captured with the Neurobehavioral Functioning Inventory (NFI) and emotional status with the Hospital Anxiety and Depression Scale (HADS).

Results: Outcome on the GOSE ranged from upper good recovery (31.7%) to lower severe disability (1.7%). The TBI group demonstrated significant cognitive impairment relative to controls on measures of attention, processing speed, memory and executive function. There were significant correlations between performance on cognitive measures and outcome. Performances on tests of planning and processing speed (Porteus Mazes and Digit-Symbol Coding) were significant predictors of outcome. TBI self-reported cognitive deficits were only weakly correlated with performances on cognitive testing and outcome and were more strongly correlated with emotional status.

Conclusions: A significant proportion of this sample with moderate-severe TBI showed cognitive impairments and residual handicap ten years post-injury. Objective cognitive measures were more strongly associated with outcome than self-reported cognitive changes, emphasizing the importance of including objective tests as well as self-report in long-term follow-up studies.

Correspondence: *Jennie Ponsford, Ph, Monash University, Wellington Road, Clayton, Melbourne, VIC 3500, Australia. E-mail: jennie.ponsford@med.monash.edu.au*

T. ROSKOS, J.D. GFELLER & G.J. ERKER. Factors affecting functional outcome following inpatient rehabilitation of TBI patients.

Objective: Numerous factors have been examined regarding their ability to predict outcome following neurorehabilitation of patients with traumatic brain injury (TBI). Functional status at admission and pre-morbid demographic variables, as well as neuropsychological functioning, appear to be some of the most robust predictors of functioning during rehabilitation, and at discharge. However, neuropsychological screening data have been neglected in the literature as a predictor of functional outcome. The purpose of this study was to examine the predictive power of two cognitive screening measures (Cognistat and MMSE) as well as other factors (e.g. demographics and injury characteristics) in relation to outcome (discharge FIM scores) following inpatient neurorehabilitation of patients with TBI. It was expected that performance on screening measures of cognitive functioning would be most strongly related to communication (expression and comprehension) cognitive (memory and problem solving), and social functioning (social interaction) FIM items and the overall FIM cognitive subscale.

Participants and Methods: Archival data were used and participants (N=249) included patients treated for TBI at an urban neurorehabilitation unit. Participant data were obtained through review of two archived data sources: the Uniform Data System for Medical Rehabilitation (UDSMR) database, and archived neuropsychological test scores maintained by the Neuropsychology Service.

Results: Preliminary results indicated there were significant moderate correlations between scores on cognitive screening measures and admission and discharge FIM scores, particularly cognitive and communication subscores. Cognitive screening measures also accounted for a significant proportion of the variance in discharge cognitive and communication FIM scores, supporting their predictive validity.

Conclusions: Cognitive screening at rehabilitation admission was predictive of functional outcome and may help guide treatment and rehabilitation planning with TBI patients.

Correspondence: *Tyler Roskos, M.S., Psychology, Saint Louis University, 901 South Ashland Ave., Apartment 901, Chicago, IL 60607. E-mail: tyler_roskos@rush.edu*

A.M. SANDER, M.A. STRUCHEN, A.N. CLARK, W.M. HIGH & H.J. HANNAY. Expectancies for Performance in Persons With Mild Traumatic Brain Injury.

Objective: To examine expectancies for cognitive performance in persons with mild traumatic brain injury (MTBI) and their relationship to performance, stress, self-efficacy, and depression

Participants and Methods: One hundred four persons consecutively admitted to a Level I trauma center ER with MTBI (36 complicated; 68 uncomplicated) were evaluated within one month post-injury. The sample was predominantly Black (44%) or Hispanic (24%) and male (67%), with a mean education of 12 years. Participants completed cognitive measures of learning/memory, processing speed, and executive functioning, and self-report questionnaires including the Stressful Life Events Questionnaire, Self-Efficacy Scale, and Center for Epidemiologic Studies-Depression Scale. After instructions for each cognitive measure, but prior to beginning the task, participants rated on a 5-point scale how they expected to perform compared to others of similar age and education.

Results: Persons with complicated MTBI expected to perform worse than those with uncomplicated MTBI on learning/memory measures. The groups did not differ in actual performance. For the complicated mild group, number of stressful life events was inversely related to expectancies for learning/memory and speed of processing performance. For the uncomplicated mild group, self-efficacy was related to expectancies regarding executive functioning performance. For the entire sample, expectancies added significantly to the variance in performance on learning/memory tasks, $R^2_{change}=.096$, $p<.01$, and processing speed tasks, $R^2_{change}=.045$, $p<.05$, after accounting for injury severity (uncomplicated versus complicated mild) and self-efficacy scores.

Conclusions: Among persons with MTBI, expectancies regarding cognitive performance are related to prior stressful experiences and to self-efficacy. Expectations contribute to performance, even after accounting for injury severity and self-efficacy.

Correspondence: *Angelle M. Sander, Ph.D., Physical Med & Rehab, Baylor College of Medicine, Brain Injury Research Center, 2455 South Braeswood, Houston, TX 77030. E-mail: asander@bcm.tmc.edu*

M.R. SCHOENBERG, K.A. DAWSON, W.D. RUWE, N.B. MCDONALD, P.C. FORDUCEY & B. HOUSTON. Comparing Functional Outcomes of a Computer-Based Cognitive Rehabilitation Teletherapy Program to Face-to-Face Rehabilitation Treatment: Cost equivalency.

Objective: This study compared outcomes of 19 patients who received computer-based cognitive teletherapy rehabilitation to 20 patients who received face-to-face speech-language cognitive therapy rehabilitation services. The study compared outcomes from two "real-word" treatment programs provided by an outpatient rehabilitation center.

Participants and Methods: All patients had sustained a moderate-to-severe closed head injury. Thirty nine participants were included in the study. All participants began treatment a minimum of one year following injury. Patients in the computer based teletherapy group received services from Cognitive Systems Incorporated (CSI) and the treatment program marketed as the CRI/PSS Teletherapy System. The computer system program provides exercises targeting attention, working memory, visuospatial skills, and problem solving. The program parameters were developed and monitored by trained speech-language therapists. Participants in the face-to-face group received the standard of care speech-language treatment from certified speech language therapists. Dependent variables were clinical indicators of functional status that included independent living status, return to work/school, and independent driving. Cost measures included the total cost of the treatment and a measure of service costs per hour.

Results: Time since injury was a covariate and an ANCOVA revealed no differences between groups in independent living, driving status, re-

turn to work/school, or total treatment costs. Evaluation of baseline to end of treatment found the number of participants' living independently, driving, and working significantly improved for both groups ($p<.01$). Evaluation of costs revealed no significant differences between the group's average total costs ($p = .23$).

Conclusions: The computer based teletherapy cognitive rehabilitation program provided similar outcomes to face-to-face speech-language therapy at a similar total cost.

Correspondence: *Mike R. Schoenberg, Ph.D., Neurology, University Hospitals of Cleveland/Case Western Reserve University School of Medicine, 11100 E. Euclid Ave., Cleveland, OH 44106-5000. E-mail: Michael.Schoenberg@uhhs.com*

L. SCHWARZ, J. GFELLER & M. OLIVERI. Mental Flexibility in Patients with Traumatic Brain Injury: An Examination of Contemporary Measures of Verbal Fluency and Set-Switching.

Objective: Given the value of assessing executive functioning in persons with traumatic brain injury (TBI), the current investigation examined measures of verbal fluency for evaluating the executive function of mental flexibility. Mental flexibility was operationally defined as set-switching. The ability to set-switch was examined across a variety of contemporary measures of verbal fluency and other executive functioning tests. The construct validity of the Delis-Kaplan Executive Functioning System (D-KEFS) Verbal Fluency subtest was also examined (Delis, Kaplan, & Kramer, 2001).

Participants and Methods: Participants were 50 adult individuals (mean age=34.68) who experienced a TBI and were referred for a neuropsychological evaluation as a part of their acute or post-acute care (mean days post injury=41.20). Injury severity was classified using the Glasgow Coma Scale (GCS). CT scan and loss of consciousness (LOC) data were also utilized when available.

Results: Participants had a mean GCS score of 12.50. Additionally, 70.73% of participants experienced positive LOC. Results showed significant correlations between: D-KEFS Verbal Fluency, Controlled Oral Word Association Test (COWAT), Trail Making Test (TMT) B, Stroop color-word condition, and Wisconsin Card Sorting Test (WCST). Contrary to prediction, D-KEFS Verbal Fluency and WCST did not significantly correlate.

Conclusions: Based on the findings of the current study, contemporary measures of verbal fluency, such as the D-KEFS Verbal Fluency subtest and COWAT, assess similar functions. Other traditional tests assessing mental flexibility, such as Stroop Color and Word Test, TMT, and WCST are also related to verbal fluency measures.

Correspondence: *Lauren Schwarz, M.S.(R), Saint Louis University, 9324 Fredric Court, St. Louis, MO 63144. E-mail: schwarzl@slu.edu*

M. SHERER, M.A. STRUCHEN, S.A. YABLON & T.G. NICK. Comparison of Indices of Traumatic Brain Injury Severity.

Objective: Depth of coma (as determined by the Glasgow Coma Scale [GCS]), length of coma (LOC), and duration of post-traumatic amnesia (PTA) are 3 common indices of severity of traumatic brain injury (TBI). The current investigation studied interrelationships among these indices with correlations and by developing regression models for predicting LOC and PTA.

Participants and Methods: Participants were 556 persons with TBI who were admitted to one of 2 inpatient brain injury rehabilitation programs. The mean (SD) age for participants was 32.4 years (14.8). 398 (70.8%) of participants were male. 189 (34.0%) had less than a high education, 181 (32.6%) were high graduates, and 186 (33.4%) had greater than a high school education. Based on GCS criteria, 383

(68.9%) sustained severe injuries while 173 (31.1%) sustained moderate or complicated mild injuries. Correlations were calculated using Spearman's coefficient. Multivariable linear regression analyses were completed using demographic and injury characteristics to predict LOC and PTA.

Results: Correlational analyses revealed that GCS correlated -0.51 with LOC and -0.41 with PTA. The correlation of LOC with PTA was 0.67. Regression analysis found that GCS, initial CT scan findings (pathology vs. no pathology) and initial pupil responsiveness (responsive vs. non-responsive) contributed to prediction of LOC accounting for 23% of the variability. The second regression analysis found that LOC, year of injury, age, GCS, cranial operation (done vs. not done), and pupil responsiveness predicted PTA accounting for 62% of the variability.

Conclusions: Findings of this investigation indicate that GCS, LOC, and PTA are significantly interrelated. Durations of LOC and PTA can be predicted with good fidelity from demographic and injury characteristics that are available early after injury. The predictive models derived in this investigation will be helpful to clinicians seeking to give feedback to family members regarding estimates of LOC and PTA for persons with TBI.

Correspondence: *Mark Sherer, Ph.D., Neuropsychology, Methodist Rehabilitation Center, 1350 E. Woodrow Wilson, Jackson, MS 39216. E-mail: marks@mmrc rehab.org*

N.D. SILVERBERG & R.A. HANKS. Validity of the Cognitive Estimation Paradigm in Traumatic Brain Injury.

Objective: The cognitive estimation paradigm, in which examinees are challenged to produce plausible responses to questions without "correct" answers, was developed to measure a unique aspect of executive dysfunction that closer approximates real-world impairment. The present study explores the construct and ecological validity of the most recent iteration of this paradigm, the Biber Cognitive Estimation Test (BCET; Bullard et al., 2005), in a traumatic brain injury sample.

Participants and Methods: Seventy-seven consecutive patients enrolled in the Southeastern Michigan Traumatic Brain Injury System program completed the BCET in the course of a neuropsychological evaluation at 1 to 10 years post-injury. Functional status was measured by the Disability Rating Scale.

Results: BCET total scores correlated moderately with other standard measures of executive functioning, and contrary to our hypotheses, at least as high with neuropsychological tests with minimal demands on executive functioning. Moreover, partialing out WAIS-3 Information subtest scores (the portion of BCET variance not attributable to executive functioning) markedly attenuated the former correlations (all fell to $p > .05$). With respect to ecological validity, BCET scores did not predict concurrent functional status. By comparison, standard measures of executive functioning strongly correlated with each other, correlated with non-executive functioning measures (somewhat) less strongly, and predicted functional status.

Conclusions: Unlike standard measures of executive functioning, the BCET demonstrated poor construct and ecological validity in traumatic brain injury patients.

Correspondence: *Noah D. Silverberg, Department of Psychology, University of Windsor, 401 Sunset Ave., Windsor, ON N9B 3P4, Canada. E-mail: noahsilverberg@hotmail.com*

A. SIM, L. TERRYBERRY-SPOHR & K. WILSON. Adolescent Athletes Demonstrate Prolonged Recovery of Memory Functioning Following mTBI.

Objective: The purpose of this study was to investigate the recovery pattern of adolescent athletes following mTBI.

Participants and Methods: Participants included 15 athletes (mean age = 15.6) who were baseline tested prior to their sports season using the Automated Neuropsychological Assessment Metrics (ANAM) and then sustained an in-study head injury. They were serially re-assessed on the ANAM at approximately 2.5 (time 1), 6 (time 2), and 10 (time 3) days post-injury.

Results: Paired samples t-tests were performed. Although not statistically significant after Bonferroni correction, medium-sized associations were found between baseline and time 1 scores on ANAM subtests of information processing speed ($t = 2.855, p = .014; d = .539$) and delayed memory ($t = 2.875, p = .013; d = .543$), suggesting that deficits in these areas may persist up to 2.5 days post-injury.

While processing speed scores returned to baseline by time 2, a statistically significant difference was found between baseline and time 2 delayed memory scores ($t = 3.325, p = .009; d = .744$). No significant difference was found at time 3 ($t = -.611, p = .556; d = .137$).

Conclusions: The results of this study indicate that adolescent athletes can demonstrate memory dysfunction at least 6 days post-mTBI, which is on average longer than the published rate of collegiate athletes (e.g., Field et al., 2003). Therefore, this study lends support to the growing body of literature (e.g., Lovell et al., 2003) indicating that younger athletes demonstrate a protracted recovery period and should consequently be managed more conservatively than older athletes.

Correspondence: *Anita Sim, Ph.D., University of Virginia Medical Center, 2663 Hydraulic Road, D, Charlottesville, VA 22901. E-mail: anitasim1@gmail.com*

M.A. STRUCHEN, A.M. SANDER, A.N. CLARK, D.M. KURTZ, L.C. DAVIS & M.R. MILLS. Reliability and Discriminant Validity of the Script Analysis Measure for Persons with Traumatic Brain Injury.

Objective: Script generation/evaluation has been utilized to assess planning in experimental studies of individuals with prefrontal cortical lesions. The current study investigates interrater reliability and discriminant validity of the Script Analysis Measure (SAM) as a clinical measure of executive functioning for persons with traumatic brain injury (TBI), using a modified "non-routine activity" task and novel scoring procedure.

Participants and Methods: Participants were 120 adults with TBI recruited from a longitudinal outcome study following inpatient rehabilitation and 80 non-injured matched controls. The mean (SD) age of TBI participants was 36.9(11.7), mean years of education was 13.3(2.38), gender was 68.3% male, mean ER-GCS score was 6.73(3.77), and all were at least 1-year post-injury (Md=6.0 years). Two raters independently scored the SAM. Paired t-tests were used to compare SAM performance between TBI participants and matched controls.

Results: Interrater reliability for most SAM measures (actions generated; script generation time; total, key element, and late closure errors) ranged from $r=0.91-0.99$, while intra-class correlations for early closure errors and mean key element importance ratings were $r=0.88$ and 0.81 respectively. Adults with TBI took significantly more time to generate actions ($t=3.41, p=0.001$), made a greater number of total ($t=3.37, p=0.001$) and key element errors ($t=3.55, p=0.001$), and had lower importance ratings for key elements ($t=-2.07, p<0.05$) than did controls. **Conclusions:** Preliminary investigation of the SAM, using a novel scoring procedure, indicates acceptable interrater reliability and discrimination between persons with TBI and controls on key measure indices. The SAM shows promise as a clinical measure of executive functioning for TBI.

Correspondence: *Margaret A. Struchen, Ph.D., Physical Medicine & Rehabilitation, Baylor College of Medicine, 2455 S. Braeswood, Houston, TX 77007. E-mail: struchen@bcm.edu*

M.A. STRUCHEN, A.M. SANDER, A.N. CLARK, D.M. KURTZ, M.R. MILLS & L.C. DAVIS. Concurrent Validity of the Script Analysis Measure as a Test of Executive Functioning for Persons with Traumatic Brain Injury.

Objective: The Script Analysis Measure (SAM) utilizes a novel scoring procedure to adapt an experimental measure of planning for clinical use. This study investigates relationships between the SAM and both executive functioning measures and community integration measures.

Participants and Methods: Participants were 110 adults with TBI recruited from a longitudinal outcome study sample following inpatient rehabilitation. The mean (SD) age of participants was 36.5(11.38), mean years of education was 13.4(2.27), mean ER-GCS score was 6.68(3.76), gender was 70.9% male, and all were at least 1-year post injury (Md=6.0 years). Participants completed a battery of communication, executive functioning, and functional outcome measures. Pearson or point-biserial correlations were utilized to examine relationships between key SAM indices and commonly utilized clinical executive function measures. Separate multiple regression analyses were utilized to investigate the contribution of two key SAM indices to functional outcomes after controlling for age, education, and injury severity.

Results: Primary SAM indices were significantly correlated with key indices of commonly used executive functioning measures administered (DKEFS Color-Word Interference Test and Sorting Test, Trail Making Test, and Controlled Oral Word Association). After controlling for covariates, mean key element importance ratings were shown to account for a significant unique proportion of variance in Community Integration Questionnaire (CIQ) total scores (R² change=0.065, $p < 0.01$) and CHART(Short Form) social integration scores (R² change=0.044, $p < 0.05$), while total SAM errors accounted for 3.4% ($p = 0.05$) of variance in CIQ total scores and 3.9% ($p < 0.05$) in CHART-SF social integration scores.

Conclusions: Concurrent validity for the SAM has been demonstrated with respect to correlations with other executive functioning measures and with concurrently measured functional outcomes. Such evidence provides additional information regarding the utility of the SAM for clinical use.

Correspondence: *Margaret A. Struchen, Ph.D., Physical Medicine & Rehabilitation, Baylor College of Medicine, 2455 S. Braeswood, Houston, TX 77007. E-mail: struchen@bcm.edu*

B. SUFFIELD, A. SIEGENTHALER, B. UTTL & J. MCMULLIN. Does Conventional Wisdom Explain the Miserable Minority? Risk Factors and Outcome from MTBI in a Compensation System.

Objective: Conventional wisdom holds that many factors contribute to a poor recovery from mild traumatic brain injury (MTBI), including compensation/litigation status, severity of injury, age, education, psychiatric history, premorbid substance abuse, previous head injury, and life stress. Our recent work, however, did not find support for the conventional wisdom regarding year-before-injury stress, or for several other factors assumed to influence recovery from MTBI.

Participants and Methods: Extending our previous work, we examined recovery from MTBI in over 250 consecutive referrals from a Workers' Compensation Board. Workers were referred within days or weeks of injury for assessment and treatment of MTBI. All workers participated in an initial 2-hour neuropsychological intake interview and education session, and a subset completed a more thorough assessment, such as a cognitive screen or full neuropsychological assessment. Over 200 workers met ACRM/WHO criteria for MTBI and were treated prospectively. Time to return to work and claims costs were primary outcome measures.

Results: Workers returned to work much later than non-compensated adults with similar injuries. Consistent with Conventional Wisdom, poor effort and comorbid injuries delayed some workers' return to work. However, neither pre-injury factors (age, gender, psychiatric history, previous head injuries, stress) nor other injury factors (severity of injury, symptom reporting) predicted others' outcome.

Conclusions: Compared to non-compensated adults with similar injuries, involvement in a compensation schema substantially delays return to work. Most Conventional Wisdom "predictors" of outcome did not predict recovery from MTBI, suggesting that other factors may be more important in determining recovery from MTBI in compensation schemas.

Correspondence: *Braxton Suffield, Ph.D., Columbia Health Centres, 2121 29th St., NE, Calgary, AB T1Y 7H8, Canada. E-mail: braxton.suffield@columbiahealth.ca*

R.L. TATE, A. PFAFF & M. PERDICES. Predicting the End of Post-traumatic Amnesia at the Beginning of Rehabilitation Admission.

Objective: Formal assessments and cognitive therapies are usually initiated after patients with traumatic brain injury have emerged from post-traumatic amnesia (PTA). Knowing in advance when a patient is likely to emerge from PTA has many clinical advantages. We previously developed a regression equation that predicts PTA duration using data from the first five days of PTA testing (Tate et al., 2001). This study aimed to: 1. develop another regression equation taking into account our recent data suggesting a new criterion to signal the end of PTA, and 2. explore the suitability of different predictor variables.

Participants and Methods: The sample comprised a consecutive series of 84 patients with traumatic brain injury admitted to a specialist rehabilitation unit between 2000 and 2005 who met study criteria. A series of regression equations were developed for predicting the length of time between the commencement of PTA testing (using the Modified Oxford PTA Scale) and end of PTA using the revised criterion (first day scoring 12/12).

Results: The best model for prediction comprised a single variable (sum of PTA scores for the first three days of testing), which accounted for 45% of the variance. Median discrepancy in days post-trauma between the predicted and actual times was -0.35 days (IQR 7.92). Large discrepancies occurred in 8/84 patients, most of whom had extended PTA durations between 2-3 months.

Conclusions: Our regression model enables the clinician to reliably and easily predict duration of PTA within the first few days of testing the patient, thereby providing a practical adjunct for clinical care and management.

Correspondence: *Robyn L. Tate, PhD, Rehabilitation Studies Unit, Faculty of Medicine, University of Sydney, PO Box 6, Ryde, QLD 1650, Australia. E-mail: rtate@med.usyd.edu.au*

K. WHITEFIELD, D.N. COX, J. TSAI, R.T. FOULADI & A.E. THORNTON. Chronic Post-Concussion Symptoms are Differentially Associated with Concussion Exposure in Active versus Retired Athletes.

Objective: To evaluate the relationship between concussion exposure and post-concussion symptoms in active versus retired rugby players.

Participants and Methods: Eighty-six active rugby players were recruited by canvassing rugby clubs in British Columbia and 19 additional retired rugby players were recruited through a mass mailing of letters sent to a British Columbia registry of rugby athletes. All participants completed a questionnaire that assesses self-reported frequency and severity of sports-related concussion and the Post-Concussion Symptom Checklist (PCSC; Gunstad & Suhr, 2001).

Results: To evaluate predictors of chronic post-concussion symptoms, analyses were conducted by entering group membership (mail recruitment/retired players versus club recruitment/active players), concussion exposure, and their interaction into an ordinary least square regression model. The analyses revealed a significant interaction term, with results indicating that post-concussion symptoms were associated with concussion exposure only in the retired athletes.

Conclusions: These results illustrate a dose response relationship between concussion exposure and post-concussion symptoms in a subgroup of retired athletes recruited by mail from a larger population. The

relationship was not observed in active rugby players recruited from local clubs. Relative to active athletes, retired players may exhibit symptom exacerbation with increasing concussion exposure that leads to retirement. Although the mass mailing ascertainment method used to recruit retired athletes might introduce bias and findings in our sample may not generalize to the retired population from which they were drawn, the retired subgroup may be illustrative of individuals who experience poor symptomatic outcomes following multiple concussions.

Correspondence: *Allen E. Thornton, Ph.E., Psychology, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada. E-mail: aethornt@sfu.ca*

T. TSAOUSIDES & C.A. FILANOSKY. Using the URICA to assess rehabilitation readiness for individuals with Traumatic Brain Injury.

Objective: The purpose of this study was to determine the applicability of the URICA (McConaughy, Prochaska, & Velicer, 1983) in assessing readiness for participation in cognitive rehabilitation in a TBI population. It was expected that scores on the URICA would differentiate individuals in terms of stage of change (precontemplation, contemplation, action, maintenance) and predict stage of change accurately based on criterion measures.

Participants and Methods: The URICA was modified for TBI and administered to a group of 24 individuals with documented TBI ranging from mild to severe. The instrument consists of 32 items rated on a 5-point Likert scale, and it is self-administered, although assistance is provided as requested. Completion time required is approximately 15 minutes.

Results: The distribution of scores showed differentiation in terms of stage of change. One participant was identified as being in the precontemplation stage, 11 in contemplation, 8 in action, and 4 in maintenance. Consistent with theoretical predictions, beginning treatment was associated with the contemplation stage while involvement in treatment was associated with the action stage $\chi^2(2) = 7, p < 0.05$.

Conclusions: The results suggest that the URICA could be used in identifying readiness for participation in cognitive rehabilitation in a TBI population. Appropriate identification of readiness to change could maximize correspondence between readiness for treatment and intervention, thus increasing success and reducing attrition.

Correspondence: *Theodore Tsaousides, Ph.D., Mount Sinai School of Medicine, One Gustave E. Levy Place, Box 1240, New York, NY 10029. E-mail: theodore.tsaousides@mountsinai.org*

W. VANVOORST, J.F. MALEC, N.N. DIEHL & A.M. MOESSNER. Self-Awareness, Injury Severity, History of Substance Use, and Family Functioning Following Traumatic Brain Injury.

Objective: Impaired self-awareness (SA) is common following moderate-severe traumatic brain injury (TBI) and is an important factor impacting outcome. Little is known about the relationship between post-injury SA and other individual difference variables. The current study sought to examine the relationship between TBI severity, history of substance use, family functioning, and SA following TBI.

Participants and Methods: A total of 165 patients with moderate-severe TBI (Glasgow Coma Scale < 13 or post-traumatic amnesia (PTA) > 24 hours or trauma-related neuroimaging abnormalities) admitted to the hospital were recruited as part of a larger study investigating outcome predictors. Participants completed questionnaires within one week of their admission to the hospital or as soon as PTA resolved.

Results: Hierarchical regression analyses revealed that duration of PTA accounted for a significant amount of unique variance in the prediction of post-injury SA ($R^2 = .11, p = .050$). Longer PTA predicted more impaired SA whereas a history of substance use and family functioning were not significant predictors of post-injury SA.

Conclusions: TBI severity is more closely associated with post-injury impairment in SA than premorbid history of substance use and family dysfunction. Nonetheless, further exploration of the potentially complex relationship among these variables will be of interest.

Correspondence: *Wendy A. VanVoorst, Mayo Clinic, Rochester, MN, 200 First St SW, Rochester, MN 55905. E-mail: vanvoorst.wendy@mayo.edu*

K.A. WHITNEY & K.M. ADAMS. Symptom Validity Testing Among Operation Iraqi Freedom (OIF) Polytrauma Military Patients.

Objective: Veterans Administration (VA) researchers are proposing that the human brain may be vulnerable to the primary effects (high pressure shock waves) of blast injury associated with improvised explosive devices, rocket propelled grenades and other explosions (Taber, Warden, & Hurley, 2006). In light of the latter, the VA system has implemented a new Quality Enhancement Research Initiative (QUERI) for the implementation of practices in polytrauma and blast-related injuries. In association, soldiers returning home from Operation Iraqi Freedom (OIF) are routinely asked about exposure to blasts and probed for symptoms of mild traumatic brain injury (MTBI) and post-traumatic stress disorder (PTSD). In the present investigation, we attempted to explore the potential importance of assessing symptom validity in the cases of four OIF serviceman otherwise judged have cognitive impairments.

Participants and Methods: The individuals ranged in age from 19 to 36 and were referred for neuropsychological testing by the newly established network polytrauma rehabilitation team. All reported symptoms of PTSD and experienced MTBIs with little to no loss of consciousness and no post-traumatic amnesia. All were receiving intensive services from the physical medicine and rehabilitation department (PM&R) at the time of referral. As a part of testing, all of the men were administered the Fake Bad Scale of the MMPI-2 and the Test of Memory Malingering.

Results: All of the men failed both symptom validity tests, suggesting that continuation of intensive PM&R services may not have been indicated.

Conclusions: Results indicate that symptom validity testing may be an essential component of neuropsychological evaluation among OIF veterans reporting persistent cognitive dysfunction after MTBI.

Correspondence: *Krisinda A. Whitney, Ph.D., Psychiatry 116P, Roubush VA Medical Center, 1481 W. 10th Street, Indianapolis, IN 46202. E-mail: kamarks@iupui.edu*

M.A. RAMOS, R. YALLAMPALLI, Z. CHU, E.D. BIGLER, J.V. HUNTER, X. LI, C.R. HANTEN, H.S. LEVIN & E. WILDE. Diffusion Tensor Imaging of the Cingulate and Relation to Reaction Time in Pediatric Traumatic Brain Injury.

Objective: Functional neuroimaging studies suggest that injury to the prefrontal-cingulate network may account for some cognitive deficits associated with traumatic brain injury (TBI). Diffusion tensor imaging (DTI) has recently been utilized to examine disruption of fiber integrity in white matter systems. In this study, we examined differences in fractional anisotropy (FA) using DTI in the cingulate gyri in children with TBI and a comparison group of children with orthopedic injury (OI). We also wished to investigate the relation of cingulate FA to reaction time (RT) on the Sternberg Item Recognition Task.

Participants and Methods: Seventeen children (3 female, 14 male) aged 9-16 with TBI years and 16 OI children of comparable age (3 female, 13 male) underwent DTI on a 1.5T scanner 3 months post-injury. Analysis of the cingulate was performed by three raters using PRIDE v4.1 fiber tracking software. Inter-rater and intra-rater reliability were excellent (intraclass correlational coefficients > 0.9). All children were administered the Sternberg task with three standard conditions (memory loads 1, 4, and 6).

Results: Analysis of variance revealed significant group differences on mean FA for the right cingulate ($F(1,29)=18.93, p < 0.001$) and left cingulate ($F(1,29)=7.14, p = 0.012$). Additional analyses indicated sig-

nificant relations between right cingulate FA and RT on condition 1 ($F(1,26)=4.88$, $p=0.0363$), 4 ($F(1,26)=5.70$, $p=0.025$), and 6 ($F(1,26)=4.89$, $p=0.036$), and left cingulate FA and RT on the same three conditions of the Sternberg task ($F(1,28)=7.46$, $p=0.011$), ($F(1,28)=7.12$, $p=0.013$), and ($F(1,28)=7.46$, $p=0.011$), respectively. Increased RT was associated with lower FA.

Conclusions: DTI is promising tool to detect white matter abnormality in pediatric TBI.

Correspondence: *Elisabeth Wilde, PhD, Physical Medicine and Rehabilitation, Baylor College of Medicine, 1709 Dryden Rd, Suite 725, Houston, TX 77030. E-mail: ewilde@bcm.tmc.edu*

Symposium 2

11:00 a.m.–12:30 p.m.

The Relationship Between Depression and Cognition in Different Neurological Patient Populations

Chair: Robyn Busch

Discussant: Meryl Butters

R.M. BUSCH, M.F. DULAY, J.S. HAUT, J.M. SMERZ, C.S. KUBU, M.A. BUTTERS & R.M. BUSCH. **The Relationship Between Depression and Cognition in Different Neurological Patient Populations.**

Symposium Description: Over the past several decades, it has become increasingly clear that greater level of depressive symptoms is associated with poorer cognitive functioning in depressed individuals being treated for co-existing neurologic disorders. This symposium will present data on the relationships between depression and neuropsychological function in patients ranging in age from the very young to the elderly with a variety of neurologic diagnoses. Dr. Jennifer Haut will present data supporting the importance of considering parent- and self-report of a child's mood state when interpreting memory abilities before and after surgery in children with intractable epilepsy. Dr. Mario Dulay will discuss the different conclusions that can be reached when studying the relationship between depression and cognition 3 months after mild TBI when defining depression with DSM-IV versus checklist methods. Dr. Robyn Busch will present findings on the cognitive risks associated with temporal lobectomy in adults patients with intractable epilepsy and depressed mood. Dr. Jessica Smerz will present data supporting the influence of depressed mood on cognition before and after ventriculoperitoneal shunt placement in individuals with normal pressure hydrocephalus. Finally, Dr. Cynthia Kubu will discuss the association between depressed mood and cognition before and after implantation of deep brain stimulation electrodes in the subthalamic nucleus for treatment of Parkinson disease. The findings from these individual studies highlight the importance of looking at depression as a potential marker of neurobiological dysfunction as well as a risk factor for cognitive change following neurosurgical interventions. The data also highlight important methodological issues in the assessment of depression in neurological patient groups. Our discussant, Dr. Meryl Butters, will critically discuss these issues and the importance of considering the role of depressed mood state in neuropsychological test performance.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

J.S. HAUT, M.F. DULAY, P.A. KLAAS, R.M. BUSCH, G. TESAR, W. BINGAMAN & P. KOTAGAL. **Depression and Memory Before and After Temporal Lobectomy in Children with Epilepsy.**

Objective: Depression and memory problems are common in children with intractable epileptic seizures. Research indicates that depression severity is associated with degree of cognitive impairment in adults with temporal lobe epilepsy (TLE), especially in individuals with left-sided seizure foci. It is unclear if this association also exists in children with TLE. This study examined the relationship between depressive symptoms and memory in children before and after temporal lobectomy (left-sided = 13; right-sided = 13).

Participants and Methods: Twenty-six children and adolescents (mean age = 11 years, range 5-15) received measures of visual and verbal memory (Children's Memory Scale-R, CMS) and neuropsychiatric status (self-report Children's Depression Inventory [CDI, 6 with missing data] and parent-report Child Behavior Checklist anxious / depression subscale).

Results: Greater severity of depressive symptoms (self- and parent-report) was strongly associated with poorer visual and verbal recall ability for left (but not right) surgery patients both before and after surgery. For example, the CMS Immediate Visual Memory Index was correlated with the CDI total score before ($r=-0.83$, $p<0.01$) and after surgery ($r=-0.80$, $p<0.01$) for left-sided surgery patients but not before ($r=-0.05$, ns) or after surgery ($r=-.21$, ns) for right-sided surgery patients.

Conclusions: Results demonstrate that a relationship exists between mood and memory performance in children with left, but not right, temporal lobe epilepsy. This holds true for both self- and parent-report. Results are consistent with the adult literature and suggest that level of depressive symptoms and side of surgery should be taken into account when interpreting memory test performance before and after temporal lobectomy.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

M.F. DULAY, C. BOAKE, S.R. MCCAULEY, S.A. BROWN, H.S. GOODMAN, S.G. MERRITT & H.S. LEVIN. **Depression and Cognitive Test Performance 3 Months After Mild TBI.**

Objective: Previous studies offer conflicting data regarding whether cognitive test performance following mild to moderate TBI is influenced by depressed mood. This prospective study evaluated the effect of depressed mood on test performance using alternative diagnostic criteria for depression (structured interview versus self-report) and statistical analyses controlling for confounders.

Participants and Methods: Participants were 298 unselected adults (mean age = 31 years, range 16-59) with mild TBI enrolled at a Level-I trauma center. Depression was classified alternatively by the Center for Epidemiologic Studies Depression Scale (CES-D, score of 22+ defining major depression) or the Structured Clinical Interview for DSM-IV (SCID). Attention, cognitive speed, memory, and executive functioning scores were combined into one construct using principal component analysis. Statistical comparisons controlled for age, education, Glasgow Coma Scale score, CT brain abnormality, and litigation status.

Results: ANCOVA, controlling for confounders, indicated that patients meeting DSM-IV criteria for Major Depressive Episode performed significantly more poorly on the global cognitive measure than patients who did not meet DSM-IV criteria. There was a significant difference

between CES-D defined depressed and non-depressed patients on cognitive performance before (but not after) controlling for confounders. The effect of depression on cognitive test performance was small (accounting for 4.7% of the variance) compared to factors such as age and education.

Conclusions: Results suggest that conflicting results of previous studies may be attributable to (a) different diagnostic criteria for depression, (b) inconsistent control of confounding variables, and/or (c) the relatively small independent effect of depression on cognitive performance after mild TBI.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

R.M. BUSCH, M.F. DULAY, J.M. SMERZ, W. BINGAMAN, G. TESAR, I.M. NAJM & R.I. NAUGLE. Depression and Memory Before and After Temporal Lobectomy in Adults with Epilepsy.

Objective: Depression is the most common psychiatric disturbance found in individuals with epilepsy, with prevalence rates ranging from 8 to 50%. Severity of depression is associated with greater cognitive impairment in individuals with medically intractable seizures, especially on measures of memory. This study examined the relationship between depression and memory before and after anterior temporal lobectomy (ATL) in patients with epilepsy.

Participants and Methods: A total of 232 adults received the Wechsler Memory Scale-III (Auditory, Visual, and General Memory Indices) before and after ATL (left = 116; right = 116). Level of depression was categorized based on the BDI-II (i.e., non-depressed, mildly depressed, moderately/severely depressed). Repeated measures ANOVAs were conducted examining memory scores as a function of depression severity and side of surgery prior to and following ATL.

Results: Fifty-four percent of the sample was identified as non-depressed, 23% mildly depressed, and 23% moderately to severely depressed. Repeated measures ANOVAs indicated several significant 3-way interactions such that patients with moderate/severe depression had the largest declines in verbal and general memory scores from before to after left-ATL compared to mildly depressed and non-depressed patients who underwent left-ATL (e.g., General Memory Index Pillai's Trace = .044, $F[1,43]=5.229$, $p=0.006$). On the other hand, right-ATL patients with and without depressed mood maintained or improved their verbal or general memory scores from before to after surgery.

Conclusions: Results suggest that moderately/severely depressed patients who undergo left ATL are at greater risk of significant memory declines compared to mildly or non-depressed patients who will undergo left ATL. If replicated, these results would suggest that significantly depressed mood should be taken into account when evaluating and providing feedback to patients about risks associated with ATL.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

J.M. SMERZ, M.F. DULAY, R.M. BUSCH, P.A. KLAAS, M. LUCIANO & R.I. NAUGLE. Depression and Cognition Before and After VP Shunt Placement in Patients with Normal Pressure Hydrocephalus.

Objective: Normal pressure hydrocephalus (NPH) and depression are associated with a similar 'pseudodementia' cognitive profile, making it difficult to determine the relative contribution of each etiology to cognitive performance. Thus, depression may interfere with the ability to predict, based on cognitive performance, who will benefit from a shunt to treat NPH. Data illustrate the relationship between depression and cognition in NPH candidates for ventriculoperitoneal (VP) shunt.

Participants and Methods: Patients with NPH underwent evaluations at baseline, after CSF drain, and after shunt placement ($n=51$, mean age = 70.0 years, range 31 to 85). Subjects received the Beck Depression Inventory-II (BDI-II) and a neuropsychological test battery (some missing data) at each time point

Results: Nineteen percent of patients had depressed mood both before and after surgery, 19% only before surgery, 4% with new onset after surgery, and 58% without depressed mood both before and after surgery. ANOVA revealed that pre-surgery depressed mood (but not post-surgery depression) was related to poorer performance across all cognitive measures, although not all differences were statistically significant. Repeated measures ANOVA revealed significant interactions such that depressed patients had greater improvement in total Dementia Rating Scale raw score ($F[1,44]=4.31$, $p=.044$) and letter fluency raw score ($F[1,43]=5.74$, $p=.021$) from before to after shunt placement compared to non-depressed subjects.

Conclusions: Results indicate that depressed individuals with NPH demonstrate greater improvements in cognition after VP shunt placement. Depressed mood may contribute to poor cognitive test performance prior to shunt placement making it difficult to determine an accurate neurocognitive profile.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

C.S. KUBU, R.M. BUSCH, M. GIROUX, A. MACHADO & A.R. REZAI. Depression and Memory Before and After Deep Brain Stimulation in the Subthalamic Nucleus in Patients with Parkinson Disease.

Objective: Depression is commonly associated with Parkinson's Disease (PD) and there is some question as to whether depression is associated with additional unique cognitive deficits in patients with PD. Deep brain stimulation (DBS) in the subthalamic nucleus (STN) is viewed as an effective, generally safe treatment for most well selected patients with PD. However, few studies have examined the role of potential risk factors in moderating cognitive morbidity following STN DBS. We examined the relationship between pre-operative depression and cognitive outcome following STN DBS.

Participants and Methods: Patients with PD completed neuropsychological assessments prior to and following placement of bilateral DBS electrodes in the STN ($n=39$). The participants were divided into two groups (depressed, not depressed) based on Beck Depression Inventory-II scores. Repeated measures ANOVAs were used to assess significant cognitive changes as a function of depression.

Results: The majority of participants were not depressed (71.3%). There were no significant differences between the depressed and not depressed groups on relevant demographic, disease, or general cognitive variables. ANOVAs revealed significant interaction effects for measures of prose memory and word list learning. Evidence of depression prior to surgery was associated with greater declines on verbal memory measures following DBS. Participants who were depressed prior to surgery demonstrated a decline in depressive symptoms following surgery whereas BDI-II scores did not change in the non-depressed group.

Conclusions: Pre-operative depression is associated with greater declines on measures of verbal memory following STN DBS in patients with PD despite a reduction in overall level of depression following surgery in this group. These findings, if replicated, support consideration of pre-operative mood state as predictor of cognitive outcome following DBS in patients with PD.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry & Psychology, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: buschr@ccf.org*

Paper Session 4

11:00 a.m.–12:30 p.m.

Adult and Child CNS Injury Impact

K. GANESALINGAM, K.O. YEATES, M.S. GINN & H.G. TAYLOR. Family Functioning Following Mild Closed-Head Injuries in Children and its Association with Post-Concussive Symptoms.

Objective: Studies have shown moderate to severe traumatic brain injuries in children to adversely affect family functioning, but little is known about the impact of mild closed-head injuries (CHI) on the family. We examined the impact of mild CHI and post-concussive symptoms (PCS) on family outcomes 3 months post-injury.

Participants and Methods: Participants included 8 to 15 year old children, 71 with mild CHI accompanied by loss of consciousness (LOC), 110 with mild CHI without LOC, and 97 with orthopedic injuries not involving the head (OI). Participants were assessed shortly after injury and at 3 months post-injury. Children and parents rated PCS. Parents also rated perceived family burden and their own psychological adjustment post-injury.

Results: After controlling for socioeconomic status and premorbid family functioning, families of children with mild CHI accompanied by LOC reported greater perceived family burden at 3 months than families of children with mild CHI without LOC, and those with OI. Over and above group membership, higher parent-rated PCS shortly after injury predicted higher ratings of perceived family burden and parental psychological distress at 3 months, although shared rater and method variance may have contributed to these relationships. Higher child-rated PCS shortly after injury also predicted higher ratings on aspects of parental psychological distress.

Conclusions: Perceived family burden is higher in children with mild CHI than those with OI, especially when injuries are associated with LOC. Further, PCS occurring shortly after injury predicts perceived family burden and parental psychological distress. These findings have implications for rehabilitative management of family outcomes following mild CHI.

Correspondence: *Kalaichelvi Ganesalingam, PhD, Psychology, Columbus Children's Research Institute, 700 Children's Drive, Columbus, OH 43205. E-mail: GanesaKa@chi.osu.edu*

Y. GOVEROVER, M.V. JOHNSTON, J. TOGLIA & J. DELUCA. Treatment to Improve Self-Awareness and Functional Independence for Persons with TBI: A Pilot Randomized Trial.

Objective: The objective of this research was to conduct an experimental investigation on the effects of an awareness training protocol embedded within practice of instrumental activities of daily living (IADLs) in patients with traumatic brain injury (TBI).

Participants and Methods: 10 participants with a history of TBI received the self-awareness training while they performed IADLs (experimental group), and 10 participants (control group) performed the same activities but received conventional therapeutic practice without self-awareness training.

Intervention: Participants were given six intervention sessions with six different IADL tasks over 3-weeks. In the experimental group, participants were asked to predict their performance before each task performance and to estimate their performance level during and after the performance. A choice of strategies to improve task performance was also offered in the experimental group.

Outcome measures: The assessment of participants involved standardized measures of general self-awareness with collateral report by informants (e.g., Awareness Questionnaire); specific self-awareness (Assessment of Awareness of Disability), and Self-Regulation skills Inventory (SRSI). Performance in IADLs assessed using the Assessment of Motor and Process Skills (AMPS).

Results: Compared to the control group, self-awareness intervention significantly helped to improve IADL performances, especially in cognitive IADLs; task-specific-self-awareness; and self-regulation. The treatment did not significantly improve general self-awareness, motor aspects of IADL performance, or community integration.

Conclusions: The self-awareness intervention helped participants improve self-awareness during IADL task performance as well as improving functional performance. The results support the continuation of this study with a larger sample size and more treatment sessions.

Correspondence: *Yael Goverover, PhD, Occupational Therapy, New York University, 35 West 4th Street, 11th Floor, New York, NY 10012. E-mail: ygoverover@kmrrec.org*

S.E. HUESTIS, N.M. MINICH & H. TAYLOR. Associations of Neuropsychological and Behavioral Outcomes in Late Adolescent Survivors of Very Low Birth Weight.

Objective: To delineate the relative impact of neuropsychological domains on the development of internalizing, externalizing, attention-related, and total behavioral disorders among late-adolescent survivors of very low birth weight (VLBW, <1,500 g).

Participants and Methods: Participants were 93 adolescent survivors of VLBW and 47 term-born controls. Neuropsychological outcomes were assessed using factor-derived composites for language, memory, visual-motor skills, and executive functioning. Behavioral measures included the Child Behavior Checklist (CBCL) and Child Depression Inventory (CDI). Analysis of covariance was used to examine group differences in these outcomes with age and SES as covariates, and multiple regression to investigate neuropsychological predictors of behavior disorders.

Results: Children with the lowest birth weights had more problems on the CBCL Attention scale than term controls, but only marginally more global problem ratings on the CBCL and the CDI. In contrast, children with the lowest birth weights had lower scores on all neuropsychological domains except language than the controls. Lower scores in several of the neuropsychological domains predicted more problems on CBCL Total Problems, Externalizing, and Attention-Related scales (range of R² change=.045-.130, all p's <.05); and a lower memory score was associated with more symptoms of depression on the CDI (R² change=.052, p<.05).

Conclusions: Results document associations of neuropsychological weaknesses in VLBW adolescents with externalizing and attention problems. These findings may reflect either their common association of cognitive and behavioral outcomes with neuropathology or the contribution of cognitive weaknesses to behavior disorder. Behavioral follow-up is warranted for survivors with neuropsychological impairments.

Correspondence: *Samantha E. Huestis, B.S., Psychology, Case Western Reserve University, Mather Memorial Building #103, 11220 Bellflower Road, Cleveland, OH 44106-7123. E-mail: samantha.huestis@case.edu*

K.A. ESPY, J. HUGGENVIK, C. STOPP, S. WIEBE, D. GILBERT & T. JAMESON. Prenatal Tobacco Exposure and Neonatal Attention and State Regulation: Role of Genetics?

Objective: Prenatal tobacco exposure (PTE) is a specific risk factor for externalizing symptoms, although studies to date largely use retrospective measurement of prenatal exposure or clinically selected samples.

Participants and Methods: Participants (N=170; half PTE, half NE) prospectively recruited during pregnancy with biochemical verification of exposure status were enrolled. Neonatal attention control and state/stress regulation were examined at one month of age using both

direct observation and maternal report. Infant groups were equivalent in most background variables ($p > .48$). As expected, at 16 and 28 weeks, and at delivery, maternal urine cotinines differed between PTE and NE groups (all $p < .01$). Genotyping was conducted for markers relevant to externalizing symptomatology; 5HTTPR, DRD4, and DRD2.

Results: At age 1 month, PTE was related to attention and state regulation, as was infant birth urine and meconium cotinines (all $p < .05$). Exposed infants also were described as more withdrawn, less adaptable, more irritable, and less distractible ($p < .04$). While there was no difference in the genotype distribution by exposure, genotype was related to outcome and exposure-related differences in mood, distractibility, and adaptability were robust after controlling for genotype (all $p < .07$). **Conclusions:** Prenatal smoking is related to neonatal behavior across assessment methods. Exposed infants were more irritable to a range of stimuli, consistent with maternal reports of everyday behavior. Latent selection biases for smoking do not account for the observed exposure effect. This neonatal pattern fits generally with the observed symptom picture later in development and the neurobiology of tobacco on the developing nervous system. Longitudinal studies characterizing these specific pathways are needed.

Correspondence: *Kimberly A. Espy, Ph.D., Office of Research/Dept of Psychology, University of Nebraska-Lincoln, UNL, 303 Canfield Administration Building, Lincoln, NE 68555-0403. E-mail: kesp2@unl.edu*

Symposium 3

11:00 a.m.–12:30 p.m.

Neurocognitive Impairment Following Chemotherapy: Finding “Chemobrain”

Chair: Bart Brigidi

B.D. BRIGIDI, C.A. MEYERS, E.F. JACKSON, J.S. WEFEL & B.D. BRIGIDI. Neurocognitive Impairment Following Chemotherapy and Therapeutic Radiation.

Symposium Description: Neurocognitive measures now accompany traditional endpoints in cancer research such as survival and time to progression. Cancer patients are living longer due to early detection and aggressive treatment approaches, but living longer has not necessarily been without cost. One of the costs of survivorship has been termed “chemobrain” but its roots remain poorly understood. Likewise, debate continues regarding neurocognitive impairment following from therapeutic radiation. As such, the current symposium aims to further clarify which treatments are associated with neurocognitive deficits; the duration of neurocognitive deficits; the neural substrates and etiologic mechanisms that underlie the observed neurotoxicity.

The current symposium will cover diverse topics such as breast, brain, and hematologic cancers, as well as diverse methodologies, including self-report, neuropsychological testing, and neuroimaging. Dr. Christina Meyers will present unique data on patients with acute leukemias or myelodysplastic syndrome demonstrating correlation between neurocognitive impairment, fatigue, and levels of circulating cytokines, providing support for a cytokine-immunologic activation hypothesis for cancer-related symptoms. Dr. Jeffrey Wefel will present data on 3 prospective clinical trials demonstrating that up to two-thirds of patients develop neurocognitive dysfunction while receiving and shortly after

completing standard dose adjuvant chemotherapy. Dr. Edward Jackson will present data on patients with 1-3 newly diagnosed metastatic brain lesions initially treated with radiosurgery with versus without whole brain radiotherapy, and will describe possible etiologic mechanisms of neurotoxicity in brain met patients treated with radiation.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

J.S. WEFEL. Cognitive Sequelae Of Chemotherapy.

Objective: Chemotherapy related cognitive dysfunction, termed “chemobrain” or “chemofog”, has been frequently reported by patients. However, it was not until recently that compelling evidence has been published from prospective clinical trials demonstrating this relationship. This untoward side effect of treatment poses a large survivorship issue for the growing number of cancer survivors who wish to resume their occupational, educational, or social endeavors that demand optimal cognitive function.

Participants and Methods: Patients from from 3 prospective clinical trials conducted at UTMDACC.

Results: Results demonstrated that up to one-third of patients with non-CNS disease present with cognitive deficits prior to receiving systemic chemotherapy. Subsequently, up to two-thirds of patients develop cognitive dysfunction while receiving and shortly after completing standard dose adjuvant chemotherapy with only one half of these patients demonstrating improvements in cognitive function one year after completion of chemotherapy.

Conclusions: Methodological challenges in designing clinical trials to measure this neurotoxicity will be reviewed.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

B.D. BRIGIDI, R.H. RAYNOR, L. FORNNARINO, H.S. FRIEDMAN, J.E. HERNDON, D.A. REARDON & D. BIGNER. Assessment of Neurocognitive Impairment and Quality of Life in High Grade Glioma Patients Treated With Iodine-131-Labeled Anti-Tenascin Monoclonal Antibody (81C6) Radioimmunotherapy Administered into the Resection Cavity.

Objective: Debate continues regarding effects of systemic treatments on cognition and quality of life (QOL) in cancer patients.

Participants and Methods: Neurocognitive/QOL data were pooled for subjects from 11 radioimmunotherapy protocols involving the administration 131I-labeled anti-tenascin monoclonal antibody (81C6) into the resection cavity of newly diagnosed and recurrent primary brain tumor patients. Follow-up assessments were conducted up to 3 years after surgery. The 59 patients were: a mean of 49 years old, 71% male, 95% Caucasian, 81% with glioblastoma multiforme (GBM), and a mean of 94% Karnofsky Performance Status. A random coefficients model was used to model the linear effect of time since surgery on each of the neurocognitive and QOL outcomes and conducted for 3 time periods: First 50 days, first year, and over all time.

Results: There were no significant changes in analyses of first year or over all time. Within the first 50 days, statistically significant changes included visual attention (high and low distraction conditions) and executive functioning. Only the measures of visual attention remained significant ($p < .003$) after accounting for multiplicity of tests, with z-scores improving over time. Results did not differ after accounting for prior radiation or systemic therapy.

Conclusions: Except for transient changes in visual attention, preliminary data show that there are no statistically significant changes in neu-

rocognitive functioning or perceived QOL among primary brain tumor patients treated with 131I-81C6 radioimmunotherapy. Results are discussed with respect to the number of newly diagnosed versus recurrent patients, as well as the administered dose of 131I-labeled monoclonal antibody.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

E.F. JACKSON, S. MAHANKALI, J.S. WEFEL & E.L. CHANG. Evaluation of Functional Magnetic Resonance Imaging, Relative Cerebral Blood Volume, and Neuropsychological Testing in Patients With 1-3 Brain Metastases Treated With Stereotactic Radiosurgery +/- Whole Brain Radiation.

Objective: The number of applications of functional magnetic resonance imaging (fMRI) techniques in cancer patients continues to grow. However, there remain relatively few examples of matched comparisons of such assessments with neuropsychological measures to help examine the nature and etiology of treatment related neurotoxicity. This study reflects one such comparison in patients with 1-3 newly diagnosed metastatic brain lesions initially treated with radiosurgery with versus without whole brain radiotherapy.

Participants and Methods: The specific fMRI techniques include blood oxygen level dependent (BOLD) assessments of the hemodynamic response to a picture recognition task and dynamic susceptibility change (DSC) assessments of relative cerebral blood volume (rCBV). Neuropsychological assessment of learning and memory using the HVLTR was obtained at matched timepoints. Imaging data were obtained at 1.5T and 3.0T using GE Excite scanners (GE Healthcare Technology, Waukesha, WI) and IFIS/SA fMRI stimulus delivery systems (Medrad, Inc, Gainesville, FL). For both the BOLD and rCBV data, regions of interest included the entire right frontal region as well as a subregion of the right frontal lobe containing Brodmann's areas 9, 44 and 45.

Results: Functional imaging and neurocognitive data have been obtained at three timepoints or more in 21 patients. Interim analysis of the data has demonstrated promising correlation of neurocognitive and rCBV and BOLD functional imaging findings. For example, decreases in rCBV in the right frontal regions often compared favorably with decreases in neurocognitive measures at similar timepoints.

Conclusions: To our knowledge, this is the first time correlative neuropsychological, rCBV, and BOLD fMRI studies have been performed in this patient population. Correspondence between changes in functional imaging techniques and neuropsychological performance suggest etiologic mechanisms that underlie the observed neurotoxicity in brain met patients treated with radiation.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

C.A. MEYERS. Neurocognitive Impairment in Hematologic Malignancies.

Objective: Patients with hematologic malignancies are at particular risk for developing cognitive impairments due to the disease itself, and due to the intensive treatments that are offered. Determine association between neurocognitive impairment, fatigue, and cytokine levels.

Participants and Methods: Fifty-four patients with AML/MDS were seen for pretreatment evaluation of their cognitive function and symptoms, with 50% of the sample reevaluated 1 month later.

Results: Higher IL-6 levels were associated with poorer executive function, whereas higher IL-8 levels were associated with better memory performance. IL-6, IL-1RA, and TNF- levels were related to ratings of fatigue. Because current treatments are more

effective in producing long-term remissions and cures, the neurocognitive symptoms are becoming increasingly important. The biological basis for these neurocognitive impairments appears to be related in part to an inflammatory process, which will guide targeted therapies to improve patient functioning.

Conclusions: Patients with AML/MDS experience neurocognitive impairment and fatigue before the initiation of their treatment. Correlation between neurocognitive impairment, fatigue, and cytokine levels support a common immunologic mechanism for cancer-related symptoms. Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

THURSDAY AFTERNOON, FEBRUARY 8, 2007

Poster Session 4: Aging/Dementia

12:30–2:00 p.m.

Dementia Alzheimer's Disease

B. ALLY, E. BETH, J. WARING & A. BUDSON. Memorial Response Bias in Patients with Alzheimer's Disease.

Objective: Previous research has shown that patients with Alzheimer's disease (AD) exhibit higher levels of false recognition and a liberal response bias on recognition memory tests of words compared to healthy older adults. A liberal response bias is defined as responding "old" to more than half of the items on a recognition memory test. Research involving healthy older adults reported that pictures can reduce false recognition and create a shift to a more conservative response bias. The aim of the current study was to determine whether patients with AD could use pictures to decrease false recognition and shift to a more conservative response bias.

Participants and Methods: Twelve patients with mild AD studied three lists of words and three lists of pictures of varying length for a subsequence recognition memory test. In addition, neuropsychological tests measuring executive, attention, memory, language, and visuospatial functions were administered. Correlations were performed between neuropsychological measures and our experimental measures of recognition memory accuracy (d') and response bias (C).

Results: Results revealed that pictures were better recollected than words, and AD participants made fewer false alarms on the picture tests. However, response bias stayed consistent over both study modality (pictures versus words) and list length. Additionally, bias was correlated with CERAD word list recognition.

Conclusions: Because patients demonstrate similar biases for differing stimuli modalities and list lengths that result in differing accuracy, we suggest that memory accuracy and bias are determined by distinct parts of the brain, and that AD pathology likely affects both. We conclude that patients with AD exhibit a consistent liberal bias that can be a diagnostic aid and the target of future interventions.

Correspondence: *Brandon Ally, Ph.D., Department of Neurology, Boston University School of Medicine, GRECC, Bldg. 62, Rm. B31-A, 200 Springs Rd., Bedford, MA 01730. E-mail: bally@bu.edu*

L. ASHENDORF, A.L. JEFFERSON, R.C. GREEN & R.A. STERN. Test-Retest Consistency of the WRAT-3 Reading Subtest Among Older Adults.

Objective: The Wide Range Achievement Test-3 (WRAT-3) Reading subtest is used in dementia evaluations to estimate premorbid intelligence and education quality, particularly among racially diverse elders. However, the test-retest reliability of this measure is unclear when assessing elders with and without cognitive impairment.

Participants and Methods: Participants, ages 50-104 (73.2±8.5 years old; 62.5% female, 80% Caucasian), were enrolled through the Boston University Alzheimer's Disease Center patient/control registry. A multidisciplinary consensus team diagnosed individuals as cognitively normal elders (n=158), mild cognitive impairment (MCI; n=111), or Alzheimer's disease (AD; n=40). WRAT-3 Reading scaled scores from the Tan test form were obtained at two consecutive annual neuropsychological evaluations.

Results: Test-retest reliability for the entire sample (n=309) was $r=0.89$ (SEM=3.2). The MCI group had the highest reliability ($r=.92$); the control ($r=.79$) and AD ($r=.80$) groups were also strong. When scores were assigned descriptive labels recommended by the test manual (e.g., 90-109="average," 80-89="low average"), the descriptor changed between the two time points for 28.5% of the entire sample, regardless of diagnosis or racial group.

Conclusions: Test-retest reliabilities for the WRAT-3 Reading subtest among our older and cognitively diverse cohort were strong, consistent with prior investigations using younger samples, and supportive of the overall stability of this test. However, categorical descriptions of performance may be adversely influenced by subtle variability in individual scores.

Supported by NIH grants P30-AG13846 and M01-RR00533

Correspondence: *Lee Ashendorf, Ph.D., Psychology, Edith Nourse Rogers Memorial Veterans Hospital, 200 Springs Road, 116B, Bedford, MA 01730. E-mail: lash@bu.edu*

L. ASHENDORF, M.K. O'CONNOR, R.C. GREEN, A.L. JEFFERSON & R.A. STERN. Utility of Trail Making Test Errors in MCI and AD.

Objective: Although Trail Making Test (TMT) time scores are often used to assess cognitive impairment, error frequency is not traditionally used beyond qualitative observation. This study sought to establish an empirical basis for using TMT errors in assessing older adults for mild cognitive impairment (MCI) or Alzheimer's disease (AD).

Participants and Methods: All participants, ages 55-98, were enrolled through the Boston University Alzheimer's Disease Core Center (BU-ADCC) patient/control registry. A multidisciplinary diagnostic review team classified individuals as healthy controls (n = 218), MCI (n = 139), or AD (n = 48) using Petersen et al. (2004) workgroup criteria for MCI and NINCDS-ADRDA (McKhann et al., 1984) criteria for AD. Exclusion criteria included history of major psychiatric illness, other neurological illness, or head injury with LOC.

Results: As expected, control participants committed fewer TMT B errors than MCI ($X^2=47.8$, $p<.001$) and AD ($X^2=67.9$, $p<.001$) participants, though MCI and AD participants were not discrepant from each other. To predict diagnostic classification using TMT scores, a TMT B time z-score of -1.0 and an error score ≥ 1 were used. Classification accuracy statistics using (1) error score, (2) time score, (3) error and time score, and (4) error and/or time score were compiled for each set of diagnostic comparisons.

Conclusions: The positive predictive power (PPP) of using a combined error-and-time algorithm was greater than the PPP of the TMT B time score alone, advocating for the use of both variables in the identification of cognitive impairment in older adults.

Supported by NIH grants P30-AG13846 and M01-RR00533

Correspondence: *Lee Ashendorf, Ph.D., Psychology, Edith Nourse Rogers Memorial Veterans Hospital, 200 Springs Road, 116B, Bedford, MA 01730. E-mail: lash@bu.edu*

K.J. MILLER, J. BEDICS, A. KAPLAN, P. SIDDARTH, L. ERCOLI & G.W. SMALL. Verbal Fluency among Individuals at Familial and Genetic Risk for Alzheimer's Disease.

Objective: Clinical researchers have become increasingly interested in identifying preclinical signs and markers of Alzheimer's disease (AD). Much of this research has discovered that the early stages of AD may be characterized by language deficits in verbal fluency. The present study examined the phonemic and semantic verbal fluency of asymptomatic individuals who have a preclinical risk for developing AD, either by virtue of their relation to patients with AD or their possession of APOE-4. It was predicted that individuals who possess both preclinical risk factors would show the greatest impairment in semantic verbal fluency.

Participants and Methods: A total of 223 participants (133 women; M age = 62.74, SD = 10.57) completed the FAS, Animal Naming task and Fruits/Vegetables Naming task. Of the participants, 87 carried an APOE-4 allele (3/4 or 4/4) and 74 had a family member with Alzheimer's. All participants had mini-mental status exam scores of 25 or greater (M=29.01, SD=1.22).

Results: Preliminary results using hierarchical regression analysis suggest that genetics (the presence of APOE-4) have a significant effect on fruit/vegetable naming regardless of familial risk and demographic variables such as age, gender, education, $F(4, 213) 11.79$, $p<.000$. Results were not significant for the effect of APOE-4 or familial risk factors on FAS or animal naming, when controlling for relevant demographic variables.

Conclusions: The present findings support the importance of assessing a variety of semantic categories as each category may represent a unique lexicon more susceptible to decline in the preclinical stages of Alzheimer's disease.

Correspondence: *Jamie Bedics, MS, Fuller Graduate School of Psychology, 839 Woodland Drive, Sierra Madre, CA 91024. E-mail: jbedics@hotmail.com*

S.J. BLEASE, R. AU, Y. DU, A. MCKEE, S. DEVINE, W. RINN, H. DENISON, M. O'CONNOR, A. BEISER, H. CABRAL, S. AUERBACH, S. SESHADRI, P. WOLF & E. KAPLAN. Relating Clock Drawing Performance and Alzheimer's Disease Pathology in the Framingham Heart Study.

Objective: To determine the relationship between performance on the Clock Drawing Test (CDT) and Alzheimer's disease pathology as measured by Braak criteria.

Participants and Methods: Subjects consisted of 29 participants (16 females and 13 males) who had come to autopsy and had been administered a CDT as part of a neuropsychological test battery within two years of death. The average age at death was 89.7 years (range 67.4 - 105.2 years.) Using the newly developed Framingham Heart Study Clock Scoring protocol, a CDT score was computed for both copy and command conditions. This 25 point scoring system (0= normal; 25=severe impairment) quantifies qualitative elements of the clock drawing. The Braak stages were dichotomized into those without pathological AD (No Path; Braak Stages 0, I, II, III) and those with pathological AD (Path AD; Braak Stages IV, V, VI).

Results: The mean CDT command score in the Path AD group was 8.607 (sd=2.193, n=7), significantly higher than the mean of 4.636 (sd=3.502, n=22) in the No Path group ($p=0.009$). The two groups did not differ significantly ($p=0.54$) in mean CDT copy scores, with means of 3.464 (sd=3.626) and 2.557 (sd=1.311), respectively. Additional multiple regression analyses, adjusted for age, sex and education also revealed a significant linear association between Braak stage and CDT command score ($p=0.002$), but not CDT copy score ($p=0.664$).

Conclusions: These findings suggest that CDT performance is related to the extent of AD pathology. The small study sample warrants further investigation.

Correspondence: *Sophie J. Blease, Boston University, 7 Timber Ledge Drive, Holliston, MA 01746. E-mail: sjblease@gmail.com*

S.A. COSENTINO, J. METCALFE, K. STAVITSKY, R. VALLURY & Y. STERN. Metamemory Profiles offer Insight into Disordered Awareness for Memory Loss in Alzheimer's Disease.

Objective: To clarify the nature of disordered awareness of memory loss in Alzheimer's disease (AD) by examining metamemory profiles on objective testing.

Participants and Methods: 21 participants with mild AD were assigned to two awareness groups on the basis of clinical interviews regarding their perception of their memory. Participants then completed a metamemory battery requiring them to predict their performance on an item by item basis over the course of four learning trials. Average performance was subtracted from average predictions to determine the extent to which individuals were over or under confident (calibration). We analyzed incorrect responses and use of the Memory for Past Test (MPT) heuristic (i.e., the association between performance at Trial N and predictions for Trial N+1).

Results: The unaware group rated their memory as average for their age, while the aware group assigned themselves below average ratings, $F(1, 19) = 6.75, p = .02$. Repeated Measures ANOVA revealed a significant interaction such that both groups were calibrated at Trials 1-2 on metamemory testing, but the unaware group progressively overestimated their memory at Trials 3-4, $F(1, 16) = 19.51, p < .001$. The unaware group less frequently acknowledged that they did not know an answer when they were incorrect ($F(1, 11) = 6.58, p = .013$ and did not use MPT in the latter trials ($t = 2.91, p = .03$).

Conclusions: Disordered awareness of memory loss may reflect poor recognition of individual errors, and/or systematic adherence to outdated perceptions of memory abilities rather than incoming information regarding memory failures.

Correspondence: *Stephanie A. Cosentino, Ph.D., Sergievsky Center, Columbia University Medical Center, 630 West 165th Street, P&S Mailbox 16, New York, NY 10032. E-mail: sc2460@columbia.edu*

J. DAVIS, G. TREMONT, B.R. OTT, E.K. FESTA & W.C. HEINDEL. Longitudinal Analysis of Neuropsychological Functioning and On-road Performance in Drivers with Mild Dementia.

Objective: The longitudinal relationship between cognitive functioning and driving safety is unclear. We examined neuropsychological functioning and on-road driving over one year in drivers with mild dementia.

Participants and Methods: Forty-two drivers formally diagnosed with mild dementia completed neuropsychological tests (MMSE, Trail Making A, Hopkins Verbal Learning Test, Neuropsychological Assessment Battery Driving Scenes, Rey-Osterrieth Complex Figure-BQSS Organization, Finger Tapping) and standardized on-road driving test at baseline, 6, and 12 months. A professional driving instructor rated drivers as safe, marginal, or unsafe.

Results: Participants were grouped into those who changed driving rating categories versus those who remained the same over one year ($n=26$ same; $n=17$ decline). There were no baseline differences in age, illness duration, dementia severity, premorbid intellect, miles driven per week, on-road driving score, or neuropsychological functioning. Group (same versus decline) \times Time (0, 6, 12 months) mixed model ANOVAs with neuropsychological tests as dependent measures showed a significant interaction indicating greater declines on the MMSE for drivers who became hazardous by 12 months. Drivers who became marginal/unsafe declined 3.5 points on the MMSE (mean=20.6) compared to a 1.2 point decline (mean=23.9) in participants who showed no change in driving rating. No other neuropsychological variable was significant.

Conclusions: Participants whose driving became more hazardous over one year showed greater declines in global cognition, but not attention, executive functioning, memory, motor skills or spatial functions, compared to participants whose driving skills remained stable. Hazardous driving may not be associated with declines in specific cognitive domains. Rather, annual declines in global cognition may be particularly relevant for judging driving safety in dementia.

Correspondence: *Jennifer Davis, Ph.D., Psychiatry, Rhode Island Hospital/Brown Medical School, 110 Lockwood Street, Suite 430, Providence, RI 02806. E-mail: jdavis3@lifespan.org*

L. DELANO-WOOD, A. JAK, B. SCHWEINSBURG, C. WIERENGA, N. HORNE, D.P. SALMON, L.J. THAL, L.R. FRANK & M.W. BONDI. Posterior White Matter Changes in MCI: Associations With Cognition and Stroke Risk.

Objective: Little is known about early manifestations of white matter alterations in those at risk for Alzheimer's disease (AD). Using diffusion tensor imaging (DTI), we examined the integrity of corpus callosal subregions thought to correspond to frontal (genu) and temporoparietal (splenium) regions in participants with mild cognitive impairment (MCI).

Participants and Methods: Forty nondemented participants were divided into two groups on the basis of their cognitive status (MCI: $n = 9$; Normal Control [NC]: $n = 31$). Groups were comparable on age, education, gender, stroke risk, and depressive symptoms. Structural T1-weighted and DTI sequences were performed and estimates of fractional anisotropy (FA) and mean diffusivity (MD) of the genu and splenium were obtained.

Results: MCI and NC groups were comparable on whole brain, gray matter, white matter, and CSF volumes. The MCI group demonstrated significantly lower splenium FA but not genu FA relative to NC participants. Within each group, higher stroke risk was associated with lower genu but not splenium FA. Splenium FA was significantly associated with global cognition, whereas genu FA was significantly correlated with tests of executive function, suggesting regional differences by FA in terms of neuropsychological performance.

Conclusions: Consistent with white matter changes in AD, findings demonstrate that subjects with MCI show selective impairment of posterior white matter. Alterations in anterior white matter were associated with stroke risk. Results implicate involvement of white matter pathology in the development of MCI-related cognitive changes and suggest a possible gradient of FA alterations in temporoparietal regions consistent with AD.

Correspondence: *Lisa Delano-Wood, Ph.D., Psychiatry, University of California, San Diego, 3350 La Jolla Village Dr, Bldg 13 —151C, San Diego, CA 92161. E-mail: ldelano@ucsd.edu*

A.M. DISIMONE, T. GIOVANNETTI, D.J. LIBON, B. BETTCHER, L. BRENNAN, K. DUEY, R.K. KESSLER & A. CHOPRA. Aricept (Donepezil) Reduces Everyday Action Errors in Alzheimer's Disease.

Objective: Aricept is the most frequently prescribed medication for the treatment of mild/moderate Alzheimer's disease (AD). Several studies using caregiver/clinician ratings have reported that Aricept improved everyday functioning in AD. This study used a comprehensive, performance-based test to examine whether/how Aricept affects everyday functioning.

Participants and Methods: Thirteen participants (MMSE = 22.0, SD = 2.5) were videotaped while they completed the Naturalistic Action Test (NAT). Overall impairment, accomplishment, and errors (sequence, substitution, etc.) were coded. The NAT was administered at baseline (Time 1) and after 4-6 weeks on 5mg of Aricept (Time 2). Eight participants were also tested after an additional 4-6 weeks on 10 mg of Aricept (Time 3).

Results: Comparisons between Time 1 and Time 2 showed that participants were less impaired at Time 2 ($z = 2.0, p = .04$). Task accomplishment did not differ, but error rate was significantly lower at Time 2 (15.8 vs. 11.8, $z = 2.3, p = .02$). Specifically, participants made fewer sequence errors (3.0 vs. 1.8; $z = 2.0, p = .04$); other error types did not differ. Performance at Time 3 did not differ from Time 2.

Conclusions: Aricept significantly improved performance on everyday activities, and performance remained stable after 8 weeks. Aricept significantly reduced errors, specifically sequence errors, but did not improve accomplishment. This implies Aricept improved task organization and serial ordering, which is consistent with prior reports stating that Aricept improved performance on tests of executive functioning. Importantly, these findings suggest that Aricept should be used in conjunction with other interventions that facilitate task accomplishment.

Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

M.A. FEARING, E.D. BIGLER, M.C. NORTON, J.T. TSCHANZ, C.M. HULETTE, C. LESLIE & K.A. WELSH-BOHMER. Autopsy-Confirmed Alzheimer's Disease versus Clinically-Diagnosed Alzheimer's Disease in the Cache County Study on Memory Health and Aging: A Comparison of Quantitative MRI and Neuropsychological Findings.

Objective: Atrophy of specific, regional, and generalized brain structures occurs as a result of the Alzheimer's disease (AD) process. Comparing AD patients who have histopathological confirmation of the diagnosis at autopsy to those who were clinically diagnosed using the same antemortem criteria but were not examined at autopsy can provide further evidence of the utility and accuracy of neuropsychological assessments at the time of diagnosis. Efficacy of antemortem quantitative magnetic resonance imaging (qMRI) in diagnosing the disease can also be assessed. The Cache County Study on Memory Health and Aging provides a unique opportunity to examine these relationships.

Participants and Methods: qMRI volumes of various brain structures, as well as neuropsychological outcome measures from an expanded battery, were obtained in 31 autopsy-confirmed AD subjects and 45 clinically-diagnosed AD subjects.

Results: Of the 7 qMRI variables examined, only total temporal lobe volume was different. Individuals with post-mortem confirmation had reduced volume. No significant differences between the two groups were found with any of the neuropsychological outcome measures.

Conclusions: These findings confirm the similarity in neuroimaging and neuropsychological assessment findings between those subjects with a clinical diagnosis of AD and those with autopsy-confirmed AD in the moderate-to-severe stage of the disease at the time of diagnosis.

Correspondence: *Michael A. Fearing, PhD, Aging Brain Center, Hebrew SeniorLife, 1200 Centre Street, Boston, MA 02131. E-mail: mfearing.1@netzero.com*

M.A. FEARING, E.D. BIGLER, M.C. NORTON, J.T. TSCHANZ, C.M. HULETTE, C. LESLIE & K.A. WELSH-BOHMER. Neuroimaging Correlates of the IQCODE in Autopsy-Confirmed Alzheimer's Disease versus Clinically-Diagnosed Alzheimer's Disease: The Cache County Study on Memory Health and Aging.

Objective: The 26-item Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) relies on a close informant who can rate a patient's cognitive, mental and ADL skills, and is used with patients unable to complete the MMSE or other direct measures of cognitive function. In the current study, we examined IQCODE ratings related to quantitative MRI (qMRI) findings in patients clinically diagnosed with Alzheimer Disease (AD) wherein approximately half of the subjects received autopsy confirmation of the disorder. The remaining subjects did not undergo autopsy, but all met clinical criteria for the diagnosis of possible and probable AD. This comparison provides the opportunity to examine relationships between IQCODE ratings and neuropathological changes as determined by qMRI, and whether differences exist between those with autopsy-confirmed AD and those only clinically diagnosed with AD.

Participants and Methods: IQCODE ratings and qMRI volumes of 7 brain structures were obtained in 17 autopsy-confirmed AD subjects and 18 clinically-diagnosed AD subjects.

Results: Both groups had an equal degree of impairment as determined by the overall IQCODE score, suggesting that at the time of death, the two groups were equilibrated in level of deficit. Both groups demonstrated severe cerebral atrophy based on several qMRI measurements and did not differ significantly, once correction for head size differences was used. Combining the two groups, a robust relationship was observed between IQCODE defined impairment and qMRI global measures of cerebral atrophy.

Conclusions: These findings confirm the similarity in IQCODE ratings between those subjects with a clinical diagnosis of AD and those with autopsy-confirmed AD. Furthermore, these findings generally support the utility of MRI structural measures and informant reports as objective means for tracking dementia progression.

Correspondence: *Michael A. Fearing, PhD, Aging Brain Center, Hebrew SeniorLife, 1200 Centre Street, Boston, MA 02131. E-mail: mfearing.1@netzero.com*

M. GARCÍA VIEDMA, S. FERNÁNDEZ GUINEA & R. MARTOS MONTES. Set shifting and control cognition in early stages of Alzheimer's disease: task switching paradigm.

Objective: Recent studies have showed alterations in some components of the attention system and executive functions at the early stages of Alzheimer's disease (García-Viedma, 2001; García-Viedma, Fernández-Guinea, López-Luengo, Delgado Losada & Martos-Montes, 2001; Johannsen, Jakobsen, Bruhn & Gjedde, 1999; Nebes & Brady, 1993; Parasuraman & Haxby, 1993; Perry & Hodges, 1999, 2000; Perry, Watson & Hodges, 2000). These results could indicate the influence of the attentional control system alteration in these deficits, as Morris suggested (1986). We explored attentional control operation such as the ability to switch information retrieval strategies or switch the mental configuration (Baddeley, 1996; Miyake et. al. 2000) in early stages of Alzheimer's disease.

Participants and Methods: Twenty-eight participants, 14 healthy older adults and 14 patients with Alzheimer disease (DAT) in early stage make a task-switching. The participants must solve the following mathematical operations: add or subtract 1. The task has two blocks of successive responses with the same operation (add 1 or subtract 1), and a block of successive responses that demand to switch of mathematical operation. This task implies the capacity to switch information retrieval strategies or switch the mental operation.

Results: The results show that DAT patients need more time [$F(1,26)=7.774, p=.010$], show a greater error percentage [$F(1,26)=5.601, p=.026$] and have higher general costs of switching [$F(1,26)=6.309, p=.019$] than older adults to answer.

Conclusions: DAT patients show problems with the ability to change information processing strategies that point out difficulties with the maintenance and configuration of different mental operations. It is concluded that attention control difficulties are present in the early stages of Alzheimer's disease.

Correspondence: *Sara Fernández Guinea, Ph.D., Psicología Básica II (Procesos Cognitivos), Universidad Complutense de Madrid, Facultad de Psicología, Campus de Somosaguas, Madrid 28223, Spain. E-mail: sguinea@psi.ucm.es*

M.E. FITZGERALD, M.L. RIES, B.M. JABBAR, G.G. GLIORI, M.A. SAGER & S.C. JOHNSON. Decreased Medial Parietal fMRI Activity in Healthy Middle-Aged Adults with a Parental History of Alzheimer's Disease.

Objective: Recent research suggests that neuropathological changes occur in individuals at risk for Alzheimer's disease (AD) well before symptoms occur. Medial parietal regions particularly (e.g., posterior cingu-

late cortex (PCC), precuneus) are vulnerable to early structural and functional changes associated with AD. Functional MRI (fMRI) studies suggest that these regions are involved in episodic retrieval (ER), specifically, retrieval of information encoded in a self-referential context (SRER). The current fMRI study examined memory function in these regions in 16 asymptomatic late middle-aged individuals with varied risk for AD.

Participants and Methods: We administered a task that allowed us to examine activation associated with ER and SRER, using faces as stimuli. Participants included eight at-risk volunteers with a parental history of AD (mean age= 62.1 (2.7), mean education=14.8 (2.6)) and eight volunteers with no parental history (mean age= 60.0 (1.1), mean education=16.8 (2.1)). Participant groups did not differ significantly with respect to age, education or performance on visual and verbal memory tests.

Results: Whole-brain random-effects statistical analysis of BOLD signal revealed a family history effect on measured activation in medial parietal regions. During ER, the at-risk group showed significantly less activation than controls in the precuneus region (p uncorrected= .05); during SRER, there was less activation in the PCC (p uncorrected=.05).

Conclusions: This study joins others from our lab demonstrating pre-clinical differences in the cerebral response many years in advance of typical disease onset. Longitudinal follow-up is needed to determine whether these findings are predictive of subsequent development of Mild Cognitive Impairment or AD.

Correspondence: *Michele E. Fitzgerald, BA, Medicine/Geriatrics, University of Wisconsin, GRECC/VA Hospital, 2500 Overlook Terrace, Madison, WI 53705. E-mail: mef@medicine.wisc.edu*

G. GIBSON-BEVERLY. Examining the Impact of Severity on HRB and WRAT-Reading Subtest Performance in Alzheimer's Dementia Patients.

Objective: Determining how illness severity impacts neuropsychological test performance is essential for the diagnosis, prognosis, and treatment of brain impairment. Psychological abilities are differentially affected by severity, with some skills being more vulnerable to brain dysfunction than others. Measures of specific cognitive abilities exist on a continuum of "hold" and "don't hold" tests.

Participants and Methods: The present study utilizes 151 Alzheimer's disease (AD) patients to determine how dysfunction severity impacts performance on the Halstead-Reitan Battery (HRB) and the Wide Range Achievement Test (WRAT) - Reading subtest. Performance on each subtest was correlated with Mini Mental Status Exam (MMSE) scores. The coefficients between the subtest and severity were then ranked according to strength of the relationship.

Results: Analyses demonstrate that all subtests, except measures of motor ability, are correlated with severity. Consistent with previous research, the Category Test ranks highest, making it the strongest "don't hold" subtest examined. The Rhythm Test, Trail Making Test A, and SSPT ranked 2nd, 3rd, and 4th, respectively. This suggests that these are also strong "don't hold" subtests and are highly related to dysfunction severity. Further analyses revealed that the strongest "hold" subtests were Grip Strength and Finger Tapping. This suggests that motor skills are preserved even in AD patients with severe cognitive deficits. The WRAT-Reading subtest ranked 5th, suggesting that it is also a strong "don't hold" subtest. Subtest performance is highly related to measures of severity, which has implications for its ability to accurately estimate pre-morbid functioning.

Conclusions: Overall, the results of the present study indicate that the HRB and WRAT-Reading subtest are differentially affected by participant severity, with tests of reasoning and attention/ concentration being particularly compromised while tests of motor ability are largely preserved. Correspondence: *Gina Gibson-Beverly, M.S., Louisiana Tech University, 13463 Addison Ave., Gulfport, MS 39503. E-mail: gina.gibsonbeverly@va.gov*

T. GIOVANNETTI, B. BETTCHER, D.J. LIBON, L. BRENNAN, R.K. KESSLER & K. DUEY. Omissions and Commissions: Dissociable Deficits in Everyday Action Performance in Alzheimer's Disease.

Objective: Relative to disorders of language and memory, very little is known about the breakdown of everyday action performance in dementia. The resource theory proposes that all action errors reflect a singular deficit in general cognitive capacity. This study examined whether various everyday action errors reflected a unitary deficit or dissociable aspects of action impairment.

Participants and Methods: Fifty participants with Alzheimer's disease were administered the Naturalistic Action Test (NAT), which requires completion of three everyday tasks. Performance was videotaped and errors were tallied and classified as omissions or various commission error types (e.g., substitution, sequence, etc.) A neuropsychological protocol was also administered. Correlations were examined among NAT error types. Regressions were performed to determine which neuropsychological variables predicted various NAT error types.

Results: Commission and omission errors were not significantly correlated ($r = .12$); correlations among commissions showed only two significant relations (sequence & substitution, $r = .38$; substitution & addition, $r = .37$). Omissions were significantly predicted by MMSE ($\beta = -.47$, $p < .01$) and episodic memory scores ($\beta = -.34$, $p = .02$), but the regression for commissions was non-significant.

Conclusions: Contrary to the resource theory, omission and commission errors reflect distinct components of everyday action impairment. Thus, a subset of dementia participants demonstrated a deficit in accomplishing task goals (omissions) with relatively few commissions, whereas other participants showed the opposite pattern, or both deficits. We propose that specific rehabilitation strategies that target omission versus commission deficits might be most effective for improving everyday action in dementia.

Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

T. GIOVANNETTI, D.J. LIBON, M. GROSSMAN, A. SIDEROWF & B. BETTCHER. The Nature of Everyday Action Impairment in Parkinson's Dementia.

Objective: Parkinson's disease dementia (PDD) differs neuropsychologically from Alzheimer's disease (AD). This study examined whether these populations also differed in everyday action performance.

Participants and Methods: Ten PDD participants (MMSE=21.9) and 10 AD participants (MMSE = 21.9) were videotaped while they performed the Naturalistic Action Test (NAT). Participants completed three untimed tasks differing in the number of task goals and the presence of distractor objects. Executive, memory, language, and motor speed measures were also administered.

Results: The groups did not differ in total NAT errors, but demonstrated different error patterns. PDD participants demonstrated a greater proportion of omissions (56% vs. 32%) whereas AD participants had relatively more commissions (44% vs. 68%; $\chi^2=19.4$, $p < .01$). On the task requiring completion of a single goal with distractors, PDD participants accomplished fewer task steps ($M = 55.5\%$ vs. 100% ; $z = 3.3$, $p < .01$) and committed more errors ($M = 5.8$ vs. 2.1 ; $z = 2.0$, $p < .05$). Performance on this task correlated exclusively with a measure of visuoconstruction/executive functioning ($r = .53$, $p < .03$). The groups did not differ on other NAT tasks involving one or two goals without distractor objects; performance on these NAT tasks correlated with numerous neuropsychological tests (e.g., executive, memory, language).

Conclusions: Distinct patterns of everyday action impairment in PDD and AD appear to reflect group differences in initiation deficits (e.g., omissions vs commissions) and susceptibility to interference from distractors. Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

F.C. GOLDSTEIN, A.V. ASHLEY, Y. ENDESHAW, J.J. LAH, A.I. LEVEY, V. GARNER, J. CELLAR & A.J. KIPPELS. Vascular Comorbidities and Cognitive Functioning in Patients with Mild-Moderate Alzheimer's Disease.

Objective: Vascular comorbidities are risk factors for Alzheimer's disease. Neuropathological studies reveal that co-existing cerebrovascular disease is common and that pure vascular dementia without AD pathology is rare. This study examined whether vascular comorbidities (VCs) affect the pattern and severity of neurobehavioral symptoms in AD. It was hypothesized that an increase in the number of VCs would be associated with greater deficits in memory and executive functioning.

Participants and Methods: Seventy-four patients with mild-moderate probable AD who did not have histories of TIA or stroke, neurologic signs, or imaging findings of large vessel strokes were prospectively recruited. They underwent objective measurement of VCs via blood pressure readings, blood tests, and EKGs, and received neuropsychological assessment of attention, language, memory, visuospatial/visuomotor skills, and executive functioning.

Results: The presence of hypertension, hyperlipidemia, diabetes, and cardiac disease were diagnosed according to published guidelines. Multiple regression analyses were performed with the number of VCs (0-4) as a predictor of cognitive performance, controlling for age, gender, education, and race. An increase in the number of VCs was significantly ($p < .05$) associated with poorer verbal memory (CERAD Word Lists), visuospatial skills (Line Orientation), and verbal reasoning (Similarities), with a trend ($p = .09$) as well for poorer clock drawing and category fluency.

Conclusions: VCs are associated with greater impairments in episodic and semantic memory, visuospatial performance, and executive functioning, with a relative preservation of attention and language, in AD patients. The mechanism may reflect associated white matter disease. Since VCs are potentially treatable, the findings should alert clinicians to the importance of their control.

Correspondence: *Felicia C. Goldstein, Ph.D., Neurology, Emory University School of Medicine, 1841 Clifton Road, NE, Atlanta, GA 30033. E-mail: fgoldst@emory.edu*

F.C. GOLDSTEIN, A.V. ASHLEY, Y. ENDESHAW, J.J. LAH, A.I. LEVEY, V. GARNER, J. CELLAR & A.J. KIPPELS. Vascular Comorbidities and Neuropsychiatric Symptoms in Patients with Mild-Moderate Alzheimer's Disease.

Objective: Vascular comorbidities are associated with mood and neuropsychiatric symptoms including depression and psychosis in elderly patients. This study examined whether vascular comorbidities (VCs) also affect the presence of these symptoms in patients with Alzheimer's disease. It was hypothesized that VCs would be related to greater neuropsychiatric disturbances including depression.

Participants and Methods: Patients with mild-moderate probable AD who did not have histories of TIA or stroke, neurologic signs, or imaging findings of large vessel strokes were prospectively recruited. They underwent objective measurement of VCs via blood pressure readings, blood tests, and EKGs. Patients completed the Geriatric Depression Scale, and their caretakers completed the Neuropsychiatric Inventory which assesses 12 patient domains such as mood and psychotic symptoms. The presence of hypertension, hyperlipidemia, diabetes, and cardiac disease were diagnosed according to published guidelines. Patients were included in the analysis if they were not taking psychotropic medication. Nineteen patients had 3-4 VCs and were group matched on overall cognitive status and demographic features to 15 AD patients with 2 or less VCs.

Results: A one-way ANOVA indicated that patients with 3-4 VCs endorsed significantly ($p < .05$) greater depression on the GDS compared to those with 2 or less VCs. Chi-square analyses revealed that the presence of delusions, agitation/aggression, and motor and sleep disturbances was significantly greater in those with 3 or more VCs.

Conclusions: VCs are associated with neuropsychiatric disturbances in AD patients. The mechanism may be due to a metabolic syndrome in those with 3 or more VCs which produces oxidative stress and small vessel disease disrupting fronto-subcortical circuits.

Correspondence: *Felicia C. Goldstein, Ph.D., Neurology, Emory University School of Medicine, 1841 Clifton Road, NE, Atlanta, GA 30033. E-mail: fgoldst@emory.edu*

R. GRIFFITH, K. NETSON, K. BELUE, L. HARRELL, J. BROCKINGTON & D. MARSON. Impaired Financial Abilities Predict Dementia in Patients with Amnesic Mild Cognitive Impairment.

Objective: Persons with amnesic mild cognitive impairment (MCI) are at elevated risk for dementia due to Alzheimer's disease (AD). By definition MCI patients have generally intact instrumental activities of daily life (IADLs), although research is increasingly indicating that mild impairments exist in higher-order IADLs in MCI. Our group has reported direct assessment evidence of impaired financial abilities in patients with MCI. The purpose of the current investigation was to determine if financial ability impairments in MCI were predictive of subsequent risk of conversion to AD.

Participants and Methods: Fifty-three amnesic MCI participants completed the Financial Capacity Instrument (FCI) at baseline and were followed up for 1-2 years subsequently. Performance on the FCI was dichotomized as compromised or not compromised based upon a cutoff of -1.5 SD below a matched control group.

Results: During the follow-up period, 9 participants converted to AD dementia (17%). Retrospective analysis using an FCI Total Score revealed that a significantly greater proportion of MCI participants who subsequently converted to AD demonstrated compromised baseline FCI performance (7 of 9) when compared to MCI patients who did not convert to AD (16 of 44) ($X^2 = 5.22, p = 0.02$).

Conclusions: MCI patients who later converted to AD showed compromised financial abilities 1-2 years prior to their AD diagnosis. Such data suggests that mildly impaired daily activities in patients with MCI have potential prognostic value. Direct assessment measures of IADLs may hold promise for identifying persons at risk for future dementing illnesses.

Correspondence: *Randall Griffith, Ph.D., Neurology, University of Alabama at Birmingham, 1216 Jefferson Tower, 625 19th Street South, Birmingham, AL 35233. E-mail: rlgriffith@uabmc.edu*

K.M. HAYDEN, L. SANDERS, C.F. PIEPER, J.T. TSCHANZ, M.C. NORTON, M. TOO HILL, J.N. BROWNDYKE, J.C. BREITNER & K.A. WELSH-BOHMER. Screening for Prodromal Dementia in the Community: The Cache County Memory Study.

Objective: Reliably identifying and treating very early stage neurodegenerative dementia is a health care priority. We examined the utility of conventional screening methods (Modified Mini Mental State Examination, 3MS) along with more detailed neuropsychological methods in reliably detecting early disease states in a population based sample of very old individuals.

Participants and Methods: 2,346 individuals (age range 72-100) completed a screening battery comprised of the 3MS, Hopkins Verbal Learning Test (HVLT), Digit Span, and Clock Drawing. In a fully clinically evaluated subsample ($n = 732$) we explored the performance characteristics (Receiver Operating Curves) of these instruments together and in combination for detecting incident cases of dementia and clinically diagnosed early dementia prodromes.

Results: The 3MS performed reasonably well in detecting incident dementia over a three year interval after including age, sex, and education in the model (area under the curve $AUC = 0.888$), and was only marginally augmented by adding memory measures (HVLT delayed recall $AUC = 0.906$). All measures alone performed poorly in detecting pro-

dromal cases but improved with inclusion of age, sex, and education (3MS AUC=0.732; HVLIT AUC=0.739). Further improvement (AUC=0.781) was gained by combining the 3MS with the HVLIT (recognition false alarms), and adding an indicator for difficulties with Instrumental Activities of Daily Living (IADLs).

Conclusions: All neurocognitive measures, even sensitive tests of memory function, are limited in their ability to reliably detect true cases of early dementia. Supplementation of neurocognitive screening methods with additional memory items and other sources of information (e.g. IADL) or surveillance with repeated, even brief assessments likely will increase detection.

Correspondence: *Kathleen M. Hayden, PhD, Department of Medicine, Division of Neurology, Duke University Medical Center, Bryan ADRC, 2200 West Main St., Suite A-230, Durham, NC 27705. E-mail: khayden@duke.edu*

A.L. HESTER, L.H. LACRITZ, C.M. CULLUM, L.S. HYNAN, J.C. WEBSTER, C.L. WHITE & F.J. BONTE. Neuropsychological Performance in Tangle Predominant Senile Dementia and Alzheimer's Disease.

Objective: Tangle-predominant senile dementia (TPSD) differs from Alzheimer's disease (AD) neuropathologically, and while less is known about it clinically, TPSD has been associated with later age of onset and primary impairment of memory. We explored baseline neurocognitive results in well-matched groups of patients with TPSD and AD.

Participants and Methods: Subjects included 18 individuals with neuropathologically confirmed diagnoses matched by age, gender, and education (TPSD n = 9, M age of onset = 73.3, M age at testing = 80.0, M education = 11.7; AD n = 9, M age of onset = 74.8, M age at testing = 78.8, M education = 11.8). Subjects were administered the MMSE, Trailmaking Test, and the CERAD neuropsychological battery (Animal Fluency, Modified Boston Naming Test, Constructional Praxis, and Word List Recall) at the time of initial presentation. Results were compared using the Mann-Whitney U test.

Results: Groups were similar on the MMSE (TPSD M = 17.6, Range: 10-22; AD M = 17.6, range: 12-23), and did not differ significantly on any neuropsychological measures.

Conclusions: These findings indicated highly similar neurocognitive functioning in individuals with TPSD and AD, suggesting that neuropsychological differential diagnosis may be difficult. Our samples were small and had a younger age of onset than previously reported for individuals with TPSD. Thus, further examination of neuropsychological status, changes over time, and demographic factors in TPSD compared to other dementing illnesses is needed.

Correspondence: *Andrea L. Hester, Ph.D., UTSW Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8846. E-mail: Andrea.Hester@UTSouthwestern.edu*

T. CHENG, M. HUA, M. CHIU, T. CHEN, C. YANG & P. YIP. Gist Memory in Patients with Mild Alzheimer's Disease.

Objective: Researches revealed that an increase of stimulus exposure trials could facilitate AD patients' gist memory functioning. However, studies with a manipulation of stimulus features, such as using black-and-white line drawings as stimulus items could not confirm such findings. Using the Deese-Roediger-McDermot paradigm in which three forms of stimuli were exposed to AD patients and normal healthy elderly controls, this study was thus to re-explore these controversial issues.

Participants and Methods: Thirty-six mild AD patients and thirty-six normal healthy elderly controls matched for sex, age, and education level participated in the study. All subjects received a battery of neuropsychological tests and false memory tasks in which subjects received three types of stimulus conditions, auditory words with visual words, with black-and-white line drawings, and with colored photos.

Results: AD patients' performance on the false memory tasks, involving stimulus conditions of auditory words plus either visual words or black-and-white line drawings were significantly lower than their normal counterparts, except for their performance on the task with the stimulus feature of auditory words plus colored photos. The patients' false memory scores on the task condition involving color photos were the best followed by the conditions of black-and-white line drawings and words. Nevertheless, the score differences among these three conditions were not statistically significant.

Conclusions: Our mild AD patients evidenced semantic memory problem, but auditory memory task accompanying with colored photos might facilitate mild AD patients' gist memory functioning. Further study on a large scale to investigate these issues is necessary.

Correspondence: *Mau-Sun Hua, Ph.D., Psychology, National Taiwan University, Dept. of Psychology, National Taiwan University, #1, Sec. 4, Roosevelt Rd., Taipei 106, Taiwan. E-mail: huams@ntu.edu.tw*

H. JEON & K. LEE. Auditory and Visual Naming in Early Dementia.

Objective: Deficits on confrontation naming tasks occur early in the course of Alzheimer disease (AD). Given the more frequent and earlier involvement of the temporal cortex than the occipital cortex in the disease, we reasoned that naming objects by their auditory features may be impaired more and earlier than visual naming (VN). Thus, we developed a task for auditory naming (AN) of objects, and compared its performance by AD patients with that in VN of the same objects. Response times (RT), as well as percent correct, were measured with the hope that the additional measure would yield more information for the assessment of naming capability.

Participants and Methods: Normal subjects (NM, n = 31), patients with mild cognitive impairment (MCI, n = 42), and those with dementia (n = 15) were tested on AN and VN.

Results: The percent correct performance of AN/VN (mean, (SD)) was 88(8.9)/92.9(5.4) for NM, 86.9(10.4)/91.3(5.2) for MCI and 55.9(25.4)/79.4(6.2) for dementia patients. Correlation between naming RT and MMSE score revealed that RT in AN was more strongly correlated ($r=-.406$, $p=0.007$) than that of VN ($r=-.278$, $p=0.071$), for the range of MMSE scores that came under the MCI and dementia categories, i.e., between 22 and 27.

Conclusions: The results suggest that naming by auditory features is impaired in AD sooner than that by visual features. Also, AN appears to reflect the severity of the disease better than VN. Therefore, AN tests may prove more useful in early detection and clinical monitoring of AD progression.

Correspondence: *Hyeon-Ae Jeon, a PhD candidate, Seoul National University, Department of Neurology, Seoul National University Hospital, 28 Yonkeun-Dong, Chongno-Gu, Seoul 110-744, South Korea. E-mail: hokmah4j@gmail.com*

J.E. JONES, A. LARUE, T. BONCYK, B.P. HERMANN & S. MARK. Do Serial Position Profiles Have Promise as a Cognitive Marker of Pre-Clinical Alzheimer's Disease?

Objective: In rote list learning, the serial position curve (SPC) provides information regarding relative dependence on primary memory (recency effect) versus secondary memory (primacy and middle). Alterations of the SPC are seen in Alzheimer's disease (AD), namely, an exaggerated recency effect. The purpose of this investigation was to determine whether alterations in the SPC characterize asymptomatic persons at increased risk for AD.

Participants and Methods: Participants included 619 asymptomatic middle-aged individuals with a positive family (FH+) of AD (median = 53 years) and 155 persons with a negative family history (FH-) of AD. All participants were administered the Rey Auditory Verbal Learning Test (AVLT).

Results: There was no significant difference in total words recalled between the FH+ and FH- groups. However, compared to the FH- group, the FH+ group showed a significantly greater tendency to recall words from the end (recency) versus beginning (primacy) of the list (difference in percent recalled = 5% vs -1%, $p = .01$), as well as the end versus the middle of the list (17.8% vs. 13.3%, $p = .03$), with demographics covaried. Serial position effects were unrelated to ApoE.

Conclusions: Asymptomatic persons at risk for AD do not show a difference in total words recalled compared to controls, but exhibit a distinctly different serial position curve suggesting greater reliance on immediate as opposed to secondary memory. Whether alterations in serial position recall, a known correlate of AD, will serve as a promising marker of preclinical AD remains to be determined.

Correspondence: *Jana E. Jones, PhD, Neurology, University of Wisconsin-Madison, H4/665 CSC, Madison, WI 53792-6180. E-mail: jejones@neurology.wisc.edu*

M.A. KAYNE-LANGILL, C. SANDERS & M. SCHMITTER-EDGE-COMBE. Task Switching Ability for Older Adults with Very Mild Dementia.

Objective: Task switching is characterized as a hallmark of executive control. This study investigated whether patients experiencing very mild dementia demonstrate a decline in task switching above that seen for healthy older adults.

Participants and Methods: Participants were 16 younger adults, 16 healthy older adults, and 16 persons with very mild dementia. We used a predictable, externally cued task-switching paradigm that required participants to switch between making 'odd-even' number judgments and 'consonant-vowel' letter judgments every 4 trials. The target stimuli appeared in a circle divided into eight equivalent parts. Presentation of the stimuli rotated clockwise. Switch costs were obtained by comparing switch and nonswitch trials. Nonswitch costs were obtained by comparing nonswitch trials from the task-switching task with trials from a similar baseline task that did not require a switch in the type of judgments to be made.

Results: For all three groups, switch costs were limited to the first trial in the run. However, switch costs were greater for the very mild dementia group (48% slowing) compared to the healthy older adult group (35% slowing). In addition, both older adult groups exhibited greater switch costs than the younger adults (13% slowing). In contrast, nonswitch costs for all groups were minimal and did not differ between groups.

Conclusions: The results showed more impaired task switching ability for healthy older adults compared to younger adults and revealed that older adults with very mild dementia exhibit even greater task switching difficulties. In conclusion, task switching ability appears to be vulnerable in the very earliest stages of dementia.

Correspondence: *Michelle A. Kayne-Langill, MS, Psychology Dept, Washington State University, 11-210 NW Anthony St, Pullman, WA 99163. E-mail: mkayne@wsucougars.com*

E. LEE, B.P. HERMANN, A.L. RUE, F. CHAN, J.E. JONES & M.A. SAGER. Cognitive Profiles in Persons at Risk for Alzheimer's Disease.

Objective: Extensive efforts are now directed at identifying the earliest signs preclinical Alzheimer's disease (AD). Our focus is the effect of family history of AD on cognitive course in clinically asymptomatic middle aged individuals. The purpose of this investigation is to determine whether distinct and clinically meaningful profiles cognition can be detected in this group.

Participants and Methods: Adults (age 45-60) with a parent with AD ($n=538$) and healthy controls without a family history of AD ($n=130$) underwent neuropsychological assessment. Raw scores were converted to age, gender and education adjusted z-scores based on the controls

and mean cognitive domain scores were derived (language, visuoperception, executive function, verbal memory) for the AD children. Cognitive domain scores were analyzed using Ward's hierarchical agglomerative clustering method with squared Euclidean distance as the index of pair-wise similarity-dissimilarity between participant profiles.

Results: Three cognitive profiles were identified: Cluster 1: Low average cognition ($n = 249$) characterized by significantly lower scores than controls in language ($p=.0001$), visuoperception ($p=.0001$), and executive function ($p=.0001$). Cluster 2: Average/high average cognition ($n=211$), characterized by significantly higher scores than controls across all four cognitive domains (all p 's = .0001 to .017). Cluster 3: Memory impaired ($n=78$) characterized by significantly worse ($p=.0001$) verbal memory compared to all groups and ($p=.0001$) better visuoperception domain compared to controls.

Conclusions: Among persons at risk for AD, a distinct subset of exhibit a cognitive profile characterized by memory dysfunction. Whether different cognitive trajectories will be associated with these cognitive profile types remains to be determined.

Correspondence: *Eun-Jeong Lee, MA, University of Wisconsin-Madison, H4/676 600 Highland Ave., Madison, WI 53792. E-mail: eunjeonglee@wisc.edu*

K. MANNING, M. ALBERT & J. BRANDT. Impairment in Semantic Fluency is Not a Marker of Preclinical Alzheimer's Disease.

Objective: AD patients are described as being more impaired on word-list generation guided by meaning than that guided by lexical properties. Recently, a similar pattern has been described in amnesic MCI (aMCI), and offered as evidence that this represents pre-clinical AD. We hypothesized that this pattern: 1) is dependent on the specific semantic categories and initial letters selected, and 2) is not specific to AD and aMCI.

Participants and Methods: Forty cognitively-normal elderly (NC), 74 MCI patients [25 pure amnesic, 27 "amnesic, multiple domain" (mdMCI), and 22 non-amnesic (naMCI)], and 29 AD patients were tested with the same fluency tasks as in Murphy et al. (2006) (F-words and animals).

Results: ANOVA revealed a group x task interaction ($p<.001$). Score on animals was higher than score on F-words only for aMCIs and NCs ($ps<.001$). The mdMCIs and naMCIs, not the aMCIs, resembled the AD patients. Overall, the semantic task generated more responses than the phonemic task ($p<.001$).

When the groups were tested for fluency for S-words and vegetables, the opposite pattern was observed: phonemic was better than semantic, and the group x test interaction was not significant.

Finally, we compared the groups on semantic and phonemic composite measures. Semantic was easier overall ($p=.05$), and the group x test interaction was significant ($p=.006$). All the patient groups showed a deficit on semantic fluency. Moreover, the aMCIs looked most like the NCs and most unlike the ADs.

Conclusions: In conclusion, specific fluency tasks give different results, and a deficit in semantic fluency is neither sensitive nor specific to aMCI.

Correspondence: *Kevin Manning, Johns Hopkins University, 600 North Wolfe Street, Meyer 21S, Baltimore, MD 21287. E-mail: kmannin4@jhmi.edu*

M.J. MARQUINE, E.L. GLISKY & S. RAPCSAK. Self-Knowledge and Self-Referential Processing in Alzheimer's Disease and Mild Cognitive Impairment.

Objective: The main purpose of this study was to explore the extent to which self-referential (SR) processing might enhance memory in indi-

viduals with Mild Cognitive Impairment (MCI) and Alzheimer's Disease (AD). This self-reference effect (SRE) in memory has been found in normal young and older adults. We were also interested in exploring whether patients have a stable and accurate sense of self, and whether the SRE is dependent on such self-knowledge.

Participants and Methods: Nine patients, five with probable AD and four with MCI, participated in the study. Additionally, nine normally-aging older adults, matched for age, sex and years of education to the patients, served as controls. Patients and controls studied lists of personality-trait adjectives under three encoding conditions: shallow processing, deep processing, and SR processing. Participants and informants completed personality trait questionnaires on two occasions to assess reliability and validity of patients' self-knowledge.

Results: A mixed model ANOVA indicated that patients showed a normal levels of processing effect, but a considerably reduced SRE relative to controls. Most patients had a relatively stable sense of self, but in some cases this self-knowledge was not accurate. The SRE was correlated with the reliability of self-knowledge and with basic memory measures. Further, both memory and executive function measures were correlated with self-knowledge accuracy.

Conclusions: Patients varied in their ability to benefit from SR processing and to show an accurate sense of self. The SRE appeared to be at least partly dependent on a stable sense of self but was also related to general memory function.

Correspondence: *Maria J. Marquine, MA, Psychology, University of Arizona, 3131 E Terra Alta Blvd. #2, Tucson, AZ 85716. E-mail: marquine@u.arizona.edu*

L. MICKES, J.T. WIXTED, C. FENNEMA-NOTESTINE, D. GALASKO, M.W. BONDI, L.J. THAL & D.P. SALMON. Progressive Impairment on Neuropsychological Tasks in a Longitudinal Study of Preclinical Alzheimer's Disease.

Objective: Previous research suggests that patients with Alzheimer's disease exhibit cognitive impairment in the years preceding a clinical diagnosis. Memory impairments are particularly pronounced, but the relative degree to which other cognitive functions are impaired and the speed with which they decline during the preclinical years remains unclear.

Participants and Methods: We report a detailed neuropsychological evaluation of 11 patients (and 11 matched controls) over the course of three years up to and including the first year of non-normal diagnosis.

Results: Aggregate z-score values were calculated for the following cognitive domains: episodic memory, semantic knowledge, and executive functioning.

Conclusions: The results suggest that performance falls off rapidly in all areas of cognitive functioning, but abilities thought to be subserved by the medial and lateral temporal lobes (episodic and semantic memory, respectively) appear to be substantially more impaired than those thought to be subserved by the frontal lobes.

Correspondence: *Laura Mickes, MA, Psychology, UCSD, 9500 Gilman Drive, 0109, La Jolla, CA 92093-0109. E-mail: lmickes@ucsd.edu*

J.C. MITCHELL, R. ZIEGLER, M.B. DICK, P.L. PIKE & J.K. WILLIAMS. Using the Dementia Severity Rating Scale to Identify Groups of Normal, MCI, and AD Community-Dwelling Older Adults.

Objective: The current study investigated the utility of the Dementia Severity Rating Scale (DSRS) to identify groups of normal, MCI, and AD community dwelling older adults.

Participants and Methods: This study consisted of 320 older adults evaluated at the University of California in Irvine, Alzheimer's Disease Research Center. The participants in this study included 85 (26.6%) normal controls, 96 (30%) individuals with amnesic MCI affecting single (n=50) or multiple domains (n=46), and 139 (43.4%) with a diagnosis of possible (n=28) or probable (n=111) AD. Par-

ticipants were given a thorough examination consisting of a comprehensive standardized neuropsychological battery, assessment of functional status, neurological evaluation, general medical evaluation, imaging, and laboratory analyses. All diagnoses were made based on a consensus of a board-certified neurologist and licensed clinical neuropsychologist

Results: Results indicated that (a) the DSRS was highly correlated to cognitive and functional status as measured by a battery of widely-used neuropsychological and functional measures, and (b) the control, MCI, and AD groups differed significantly in terms of daily functioning as measured by the DSRS. Additional discriminant analyses revealed that the DSRS was moderately accurate at classifying diagnostic groups. That is, the DSRS accurately identified 81% of the control group, 60% of the MCI group, and 78% of the AD group. When used in conjunction with the CERAD Word List 5-minute delay recall test, the tests accurately identified 98% of the control group, 76% of the MCI group, and 82% of the AD group.

Conclusions: The DSRS is a brief and useful screening tool for differentiating between groups of normal, MCI, and AD older adults. It possesses a number of advantages over other functional and cognitive measures including its brevity, comprehensiveness, and ability to track disease progression over time. Implications for clinical practice and proposed areas of future research are discussed.

Correspondence: *Joel C. Mitchell, MA, Rosemead School of Psychology, Biola University, 13800 Biola Avenue, La Mirada, CA 90639. E-mail: joel.c.mitchell@biola.edu*

L.D. NELSON & K.E. SCHEIBEL. Detecting Dementia in Down Syndrome: A Paradigm for Alzheimer's Disease.

Objective: Down syndrome (DS) is a condition in which individuals acquire symptoms of Alzheimer's disease (AD) at a much earlier age and relatively higher incidence than the population at large. Unfortunately, development of dementia in Down syndrome does not always correspond to development of AD pathology. The current study was designed to improve detection of AD in DS by using measures of learning and memory derived from animal models of human brain aging.

Participants and Methods: Thirty-four adults with Down syndrome, ranging in age from 24 to 55 years, participated in this study. Mean WAIS-III Full Scale IQ score for this sample was 51.31 (SD = 6.58). Four experimental (comparative neuropsychology) nonverbal tasks and five informant-based measures of emotional and language functioning were administered. Nineteen subjects and their informants were retested on these measures approximately one year later.

Results: Test-retest reliability was highest from comparative measures of spatial and frontal functioning. Internal consistency (Cronbach α) ranged from .70 to .92 on informant emotional tests and informant scales that measured dementia-like symptoms. The tests showing highest correct classification rates (> 80%), sensitivity, and specificity were informant measures of pragmatic language functioning and the cognitive scale from the dementia-based questionnaire.

Conclusions: Results demonstrated high levels of validity and reliability for select comparative and informant-based measures of cognitive and emotional functioning. Utility of these assessment methods for early and reliable detection of symptoms of AD-type dementia in Down syndrome was strongly supported. Results were discussed in terms of their implication for individuals who may be unable to be tested using traditional neuropsychological techniques (e.g., people in middle- to late-stage AD; developmentally disabled individuals).

Correspondence: *Linda D. Nelson, Ph.D., Psychiatry, University of California, Los Angeles, 760 Westwood Plaza, Semel Institute for Neuroscience and Human Behavior, Rm. CS-749, Los Angeles, CA 90095. E-mail: lnelson@mednet.ucla.edu*

P.K. OGROCKI. The Exploration of Behavioral Symptoms in Subtypes of Mild Cognitive Impairment.

Objective: Mild Cognitive Impairment (MCI) is a clinical condition based on the presence of specific cognitive deficits that may represent a prodromal dementia. Recent research suggests that MCI exists in different forms, such as MCI, amnesic subtype (MCI-A), characterized by memory impairment only, and MCI, multiple cognitive domain subtype (MCI-MCD), characterized by impairment in multiple cognitive domains in addition to memory, or with impairment only in non-memory domains. Although behavioral syndromes are common in Alzheimer's disease (AD) and other dementias, minimal attention has been given to the study of behavioral changes in MCI.

Participants and Methods: To address this issue, groups of patients who met the criteria for MCI-A (n=20) and MCI-MCD (n=54) were compared on measures of behavioral symptoms (BRSD, GDS, NPI-Q). For exploratory purposes, patients were also grouped into amnesic, single or multi-domain (n=62) versus non amnesic, single or multi-domain (n=12).

Results: After controlling for demographic variables and duration of symptoms, the MCI-A group was characterized by more sleep and appetite disturbances ($p < .05$), with a trend towards more dysphoria ($p = .07$). After controlling for demographic variables and duration of symptoms, a trend of more anxiety and depression ($p = .07$) emerged in the amnesic, single or multiple domain group.

Conclusions: Overall, the MCI, amnesic group, single or multi-domain, appeared to experience more behavioral symptoms. These findings suggest that there are differential patterns of behavioral symptoms among these subtypes, in addition to their different cognitive profiles. Understanding the behavioral symptoms of MCI may better identify subtypes, particularly those that may progress to AD or other forms of dementia. Correspondence: Paula K. Ogrocki, PhD, Neurology, Case Western Reserve University, 12200 Fairhill Rd., Cleveland, OH 44120. E-mail: paula.ogrocki@case.edu

N.J. PASTOREK, W. LEBER, R. ADAMS & J. SCOTT. Differential Neuropsychological Profiles in Normal Older Adults and Patients with Depression, Mild Cognitive Impairment, and Alzheimer's Disease.

Objective: Depression in older adults can result in impairments in cognition and activities of daily living, a complex of symptoms commonly referred to as dementia syndrome of depression. As the name implies, this syndrome shares many characteristics with true dementing illnesses, such as Alzheimer's Disease (AD). Making an accurate differential diagnosis of dementia versus depression is essential so that appropriate treatment can be implemented expeditiously. The current study was designed to assess the possibility that neuropsychological assessment can improve the accuracy of this differential diagnosis.

Participants and Methods: This retrospective study included 239 older adults who were referred for neuropsychological assessment. Participants with AD, Mild Cognitive Impairment (MCI), depression, and normal older adults were selected for inclusion in the study based on their completion of the Mini Mental State Examination (MMSE), the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), and the Geriatric Depression Scale (GDS). ANCOVA and profile analysis were employed to examine group differences on the MMSE and RBANS.

Results: Profiles of RBANS subtest performance better discriminated between participants in the four groups compared to the MMSE. Specifically, patients with depression performed better on RBANS subtests of delayed memory compared to those diagnosed with MCI. Depressed patients did not, however, perform differently than normal older adults on the MMSE or RBANS.

Conclusions: Administration of brief cognitive screening measures is not adequate to detect subtle but extremely important differences in neuropsychological functioning. Investment of additional time to complete more extensive neuropsychological testing can potentially improve diagnostic accuracy, thus expediting the initiation of appropriate intervention.

Correspondence: Nicholas J. Pastorek, Ph.D., Rehabilitation, Michael E. DeBakey VA Medical Center, 1910 W State LN, Stillwater, OK 74075. E-mail: nick_pastorek@yahoo.com

J.L. POOCK, M. CROSSLEY, V. DAL BELLO-HAAS & D. MORGAN. The Effects of "Talking While Walking" in Early Stage Alzheimer Disease and Normal Aging.

Objective: Cognitive tasks can influence the speed and accuracy of concurrent walking in individuals with Alzheimer Disease (AD) (Camicoli et al., 1997; Sheridan et al., 2003; Cocchini et al., 2004), possibly contributing to fall risk. The present study examined the effects of easy and difficult verbal tasks on gait speed in early stage AD and normal aging.

Participants and Methods: Fourteen healthy older adults (8 females; M age = 72.9) and 15 early stage AD participants (11 females, M age = 76.7, MMS ranging from 21-28) performed a timed walking task and easy (i.e., counting forward by 1's) and difficult (i.e., counting backwards from 70 by 2's) counting tasks in 15s single and dual-task trials.

Results: During single task trials, AD participants compared to normal older adults, had a significantly slower walking rate (40.6 vs 54.0 feet/15s, $p < .001$), and generated fewer digits during difficult (10.5 vs. 15.8 digits, $p < .005$), but not during easy counting trials (31.4 vs. 36.8 digits, $p = .363$). To control for single task differences, percent decrement scores were computed to compare AD and normal participants during dual-task performance. For both groups, walking was slowed more by difficult than by easy counting (M=28% vs M=7.9%, $p < .001$), however, the early AD participants were not differentially affected by the dual-task demands, or by the task difficulty manipulation.

Conclusions: When their significantly slower single-task walking rates were controlled for through percent decrement calculations, there were no additional divided attention costs for AD participants when compared to normal older adults, regardless of task difficulty.

Correspondence: Jocelyn L. Poock, B.A. Honours, Psychology, University of Saskatchewan, 230-4230 Degeer St., Saskatoon, SK S7H 5G9, Canada. E-mail: j_poock@hotmail.com

B. REED, L. ALVING, M. CARTER, H. DAVIES, J. KRAMER, R. MULNARD, D. MUNGAS, C. ROBINSON & F. SEGAL-GIDAN. A Multi-site Study of Determinants of Capacity to Consent for Research.

Objective: Dementia raises concerns of whether or not consent to research can be truly "informed". Although standards for determining capacity have been proposed, little has been reported about how capacity decisions are implemented, and what the determinants of decisions regarding research participants' capacity are.

Participants and Methods: Staff at 8 Alzheimer's Disease Research Centers of California (ARCCs) specifically evaluated the capacity of participants to consent to a simple research protocol (i.e. capacity determinations were not simply based on diagnostic or clinical data). There were 616 participants: 140 cognitively normal (CN), 130 mild cognitive impairment (MCI), and 346 demented (D). Of the demented cases, 73% were diagnosed with Alzheimer's disease and 16% with mixed dementia (usually AD plus).

Results: Diagnosis of cognitive syndrome (CN, MCI, D) was a powerful predictor of retained capacity: all CN cases and 98% of MCI cases were judged to possess capacity. D cases (mean Mini Mental State (MMS) = 18.9) were slightly more likely to possess capacity than to lack it (54% vs. 44%). Restricting the analysis to D only, both MMS and the Blessed Dementia Rating Scale, an ADL measure, predicted capacity in bivariate models ($R^2 = .31$, and $.18$, respectively) and had independent effects in a joint model. The range of MMS scores associated with intact capacity was large (10-30) and overlapped substantially with that associated with incapacity (0-29). There were significant differences between ARCCs in overall rates of incapacity judgment in D (range of participants judged incapable = 27% to 63%) that were not explained by between-ARCC differences in the mean MMSE scores of D cases.

Conclusions: Judgments of capacity to consent to research in dementia are related predictably (though not entirely consistently) to dementia severity, and so much variance is left unexplained that simple, mental status test based algorithms for judging capacity to consent do not appear feasible.

Correspondence: *Bruce Reed, PhD, Neurology, UC Davis, UC Davis ADC, 150 Muir Road (127a), Martinez, CA 94553. E-mail: brreed@ucdavis.edu*

A. RUEDA & M. SCHMITTER-EDGEcombe. Time Estimation in Healthy Older Adults and Very Mild Dementia.

Objective: Given the important role that time estimation plays in structuring daily activities, we investigated the impact of cognitive impairment on temporal cognition using a sample of younger adults, healthy older adults and participants with very mild dementia.

Participants and Methods: Twenty-two participants in each group provided prospective, verbal time estimations for intervals of 15, 25, 45, and 60 seconds. To prevent subvocal counting, participants read aloud numbers that appeared randomly on a computer screen during each trial. The following measures of time estimation were examined while controlling for education: mean time estimation, absolute error, and coefficient of variance.

Results: We found that the absolute difference between subjectively estimated time and the actual time increased for healthy older adults compared to younger adults. Furthermore, participants with very mild dementia demonstrated greater absolute deviation when compared to both younger and healthy older adults. The group differences in time estimation could not be attributed to greater individual variability in time estimates by the older adult groups as the coefficient of variance did not differ between the groups or across varying interval durations. The three groups also did not differ from each other in terms of mean estimations, but rather there was a subset of individuals in the older adult groups who consistently overestimated or consistently underestimated time.

Conclusions: These findings indicate that decreased time estimation accuracy is associated with healthy aging and mild dementia. Future research is necessary to understand why some healthy older adults and persons with very mild dementia significantly underestimate time while others overestimate time.

Correspondence: *Alicia Rueda, M.A., Psychology, Washington State University, 2290 NE Westwood Dr., #C103, Pullman, WA 99163. E-mail: adrueda@wsu.edu*

M. SCHMITTER-EDGEcombe, J. ANDERSON & S. CREAMER. Very Mild Dementia and Feeling-of-knowing in Episodic Memory.

Objective: The ability to accurately monitor one's memory is a metacognitive ability important in everyday life. We examined whether participants with very mild dementia would exhibit a dissociation between prospective and retrospective memory monitoring accuracy at the time of retrieval.

Participants and Methods: Participants were 20 healthy older adults and 20 persons with very mild dementia, matched in age, gender and education. All participants studied 36 critical cue-target word pairs. Following a brief delay, they were asked to recall the target that corresponded to a given cue. Confidence ratings were made for recalled words and feeling-of-knowing (FOK) judgments were made for non-recalled words in terms of the likelihood of recognizing the target word on a subsequent recognition test.

Results: We found that the very mild dementia group demonstrated less accurate recall but Hamann coefficients computed between confidence level ratings and recall performance revealed that their retrospective memory monitoring accuracy was above chance ($M = .59$) and did not

differ significantly from that of the healthy older controls ($M = .70$). In contrast, the prospective memory monitoring accuracy of the very mild dementia group ($M = .07$), assessed by the relationship between FOK ratings and recall performance, did not differ from chance and was significantly poorer than that of the healthy older adult group ($M = .34$).

Conclusions: In a very mild dementia group with episodic memory impairment we found intact retrospective monitoring accuracy but impaired prospective memory monitoring at the time of retrieval. These findings suggest that memory monitoring is not a unitary construct.

Correspondence: *Maureen Schmitter-Edgecombe, Ph.D., Department of Psychology, Washington State University, PO Box 644820, Pullman, WA, WA 99164-4820. E-mail: schmitter-e@wsu.edu*

A.M. SEELYE, D.B. HOWIESON, K.V. WILD, M.M. MOORE & J.A. KAYE. Face Recognition Memory in Mild Cognitive Impairment and Alzheimer's Disease.

Objective: The WMS-III Faces subtest was designed as a brief and reliable test of nonverbal recognition memory. However, face recognition memory research in patients with mild Alzheimer's disease (AD) has yielded mixed results, and little is known about WMS-III Faces sensitivity in patients with mild cognitive impairment (MCI).

Participants and Methods: In the present study, WMS-III Faces performance was examined in participants with MCI ($n = 24$), AD ($n = 46$), and elderly controls ($n = 98$), aged 52 to 105 years ($M = 81$, $SD = 9.5$). We hypothesized that Faces would be sensitive to MCI and AD. The first evaluation of each participant with complete Faces data, from longitudinal studies of aging and dementia, was selected for analyses. Dementia diagnosis was based on Clinical Dementia Rating (CDR) scores at evaluation. Ten neuropsychological tests were included in analyses.

Results: Analyses of covariance showed that AD participants performed significantly worse than MCI and Intact participants on Faces I and II ($p < .0001$), although there were no significant differences in performance between MCI and Intact participants. MCI and AD participants performed better on Faces I and II than on verbal memory tests. Factor Analysis with Principal Axis Factoring and Varimax Rotation extracted two factors. Faces I and II loaded together on a factor separate from tests of verbal memory and visuospatial perception.

Conclusions: Data suggest that brain areas specialized for face recognition memory may be less affected by MCI and mild AD than brain areas specialized for verbal memory.

Correspondence: *Adriana M. Seelye, B.A, Neurology, Oregon Health and Science University, 3151 S.W. Sam Jackson Park Rd., Portland, OR 97239-3098. E-mail: zann9980@pacificu.edu*

K. SHIN, J. CHEY, H. KIM & M. SHIN. Neuropsychological predictors of dementia : A 7-year follow-up study on elderly population with wide range of education.

Objective: We investigated the neuropsychological predictors of dementia in elderly Koreans over seven years. The study sample consisted of elderly with various educational attainment: 0 to 18 years. Since education is strongly associated with many neuropsychological measures in this population (Chey et al., 1999), we wanted to identify which measures would predict dementia, especially the dementia of the Alzheimer's type (DAT) 3-4 years before diagnosis

Participants and Methods: 243 nondemented elderly subjects participated at baseline and after 7 years of follow-up 136 subjects were evaluated for dementia from whom 13 was diagnosed with dementia. A battery of neuropsychological tests, semi-structured interview, depression scales were used for evaluation and diagnosis. Korean version of the Dementia Rating Scale (Mattis, 1988) examined general cognitive ability, while the Elderly Memory disorder Scale (EMS; Chey, 2006) evaluated

various aspects of episodic memory, working memory, and visuoconstruction and language. Subjects were evaluated four times. In order to identify the neuropsychological predictors of dementia in the preclinical stage, neuropsychological measures collected 3~4 years before diagnosis were analyzed by stepwise discriminant analyses.

Results: Elderlies who developed dementias in the following three years demonstrated poor performance on most of the neuropsychological measures, compared with those who did not. Further, episodic memory measures, such as the Memory subtest of K-DRS and the Delayed Free Recall of the Elderly Verbal Learning Test in the EMS, were sensitive in predicting dementia, especially the DAT. Spatial Span, forward, was also a sensitive measure in predicting dementia.

Conclusions: The best predictors of dementia were measures of episodic memory measures. This is consistent with previous studies (Jason et al., 1995; Backman et al., 2005) on elderly population with moderate and high educational attainment.

Correspondence: *Kyoungmin Shin, Seoul National Univ., Seoul National Univ. Bldg. 16-M428, Seoul 151-742, South Korea. E-mail: rudals0316@yahoo.co.kr*

J.A. STEPANIUK, L. RITCHIE & H. TUOKKO. Neuropsychiatric Impairments as Risk Factors for Mild Cognitive Impairment and Dementia.

Objective: The early identification of those at increased risk for cognitive decline and related dementias is of growing importance as the Canadian population ages. A limited number of research studies report the presence of neuropsychiatric impairments (NI) in persons identified as mildly cognitively impaired and demented (i.e., AD). The purpose of the current study is to identify whether the presence of NI predicts non-normative cognitive decline in a national longitudinal study on aging.

Participants and Methods: To this end, binomial logistic regression was applied to data from the second wave of the Canadian Study of Health and Aging (Time 2; T2). Participants (n = 1015) were categorized as Not Cognitively Impaired (NCI, n = 596) or Cognitively Impaired, No Dementia/Mild Cognitive Impairment (CIND/MCI, n = 419).

Results: Participants with CIND/MCI were six times more likely to exhibit NI than were NCI participants. In addition the presence of NI correctly identified the cognitive status of 68 – 76 % of participants 5 years later.

Conclusions: The results of this study support previous reports of NI among persons with MCI and dementia. The findings that NI predict the future cognitive status of a large number of CIND/MCI and demented participants suggest the potential utility of NI in identifying persons at risk for non-normative cognitive decline.

Correspondence: *Janet A. Stepaniuk, BA (honours), Psychology, University of Victoria, Centre on Aging, Sedgewick Bldg, P.O.Box 1700 STN CSC, Victoria, BC V8W 2Y2, Canada. E-mail: janets@uvic.ca*

J. SUHR, M. KEIL, P. DEMIREVA, M. BUELOW & E. MARK. The Relationship of Verbal and Semantic Fluency to Cognitive Performance in Older Adults.

Objective: Differences in verbal fluency patterns have been suggested as potentially diagnostic of Alzheimer's disease (AD), with semantic worse than phonemic fluency purportedly related more to impairment on tests of memory and language skills, dysfunction of the temporal lobes, and to diagnosis of AD. However, many prior studies have used raw scores on semantic and phonemic fluency tasks, which may be confounded by differences in age, education, or gender.

Participants and Methods: In the present study, we compared phonemic (CFL) and semantic fluency (RBANS) performance using age- and

education-corrected norms in a sample of 68 adult residents of assisted living facilities (ages 63-94, X = 82, years of education 6-20, X = high school, 22 male). The sample was divided into those showing better semantic than phonemic (or equal, n = 45) and those showing worse semantic than phonemic (n = 22) performance.

Results: The two groups were not different in gender or education, but the semantic worse than phonemic group was slightly older. Using age- and education-corrected scores for RBANS indices and TMT, results showed no differences between groups in processing speed, learning, visuospatial/constructional skills, attention, or naming. However, the semantic worse than phonemic fluency group performed significantly worse on RBANS list, story, and figure recall.

Conclusions: Results are consistent with data suggesting that the semantic worse than phonemic fluency pattern is more related to left temporal lobe dysfunction and suggestive of a breakdown in semantic store, rather than executive dysfunction, and further suggest a relation between pattern of verbal fluency performance and AD.

Correspondence: *Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

E. MARK & J. SUHR. Education Moderates the Relation of Cognitive Activity to Performance on Neuropsychological Tests.

Objective: Evidence suggests cognitive activity (CA) in older adulthood contributes to brain health by slowing or preventing cognitive decline and neurodegenerative disease. For example, self-reported CA in older adults has been associated with better performance on global cognitive function, working and semantic memory, visuospatial ability, perceptual speed, as well as reduction in Alzheimer's disease (AD) risk, even when controlling for general intellect (usually estimated by educational level). However, previous studies have only examined education and self-report CA as independent predictors of cognitive performance.

Participants and Methods: In the present study, we examined the potential moderating effects of education on self-reported CA's association with performance on cognitive tests sensitive to AD decline in a sample of 66 healthy, community-dwelling adults (age 45-85, X = 63, education 10-20 yrs, X = 16, 20 males) who participated in a free cognitive screen, which included the RBANS, COWA, and TMT.

Results: Hierarchical regression models showed that, for visuospatial ability, language, verbal fluency, and psychomotor processing speed, the education/CA interaction accounted for significant variation in performance, after controlling for main effects. Further examination of the interaction revealed that adults with lower education (< 12 years) performed worse on some cognitive tests when they reported higher CA—the opposite of prior research findings. Conversely, adults with moderate (13-16 years) and high education (>16 years) who reported higher CA performed better on tests, consistent with prior research.

Conclusions: Results suggest level of education moderates the relation of self-reported CA to performance on cognitive tests most sensitive to AD.

Correspondence: *Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

E. TENG, K.D. TINGUS, P.H. LU & J.L. CUMMINGS. Sensitivity and Stability of Specific Memory Tests in Amnesic Mild Cognitive Impairment.

Objective: To determine which neuropsychological tests most reliably detect memory deficits in mild cognitive impairment (MCI).

Participants and Methods: Participants were drawn from a longitudinal cohort followed through the UCLA Alzheimer's Disease Center. Baseline assessment consisted of physician interview, examination, and neuropsychological testing which included delayed recall for the Logical Memory (LM) and Visual Reproduction (VR) subtests of the Wechs-

sler Memory Scale, California Verbal Learning Test (CVLT), and Rey Complex Figure Test (RCFT). At baseline, 67 subjects were identified as amnesic MCI (27 single-domain, 40 multiple-domain), fulfilling Petersen criteria and performing ≤ 1.5 SD below age/gender norms on ≥ 1 memory test. Subjects were re-assessed after an average interval of 17.5 months.

Results: Sensitivity for memory impairment was highest with CVLT (58.2%) and RCFT (54.5%). Amnesic MCI subjects identified with LM, VR, or CVLT exhibited robust memory deficits at re-assessment (87.2–95.0%). The stability of memory deficits identified with RCFT was much poorer (69.4%). Restricting the criteria for memory impairment to include deficits on ≥ 2 memory tests or an average z -score across all 4 memory tests of ≤ -1.5 resulted in increased stability, but markedly decreased sensitivity. Stepwise logistic regression identified baseline deficits on VR or CVLT as independent predictors of memory impairment at re-assessment.

Conclusions: Specific methods for the identification of memory impairments in MCI have not been standardized. Our findings suggest that variations in the operationalization of criteria for memory impairment across studies may result in significant differences in sensitivity for identifying subjects and determining rates of subsequent progression to dementia.

Correspondence: *Edmond Teng, M.D., Ph.D., Alzheimer's Disease Center, UCLA, 10911 Weyburn Avenue, 2nd Floor, Los Angeles, CA 90095-7226. E-mail: eteng@ucla.edu*

E. TENG, K.D. TINGUS, P.H. LU & J.L. CUMMINGS. Sensitivity and Stability of Neuropsychological Tests for the Diagnosis of Non-Amnesic Mild Cognitive Impairment.

Objective: To determine which neuropsychological tests are most reliable for assessment of non-amnesic mild cognitive impairment (MCI).

Participants and Methods: Participants were drawn from a longitudinal cohort followed through the UCLA Alzheimer's Disease Center. Baseline assessment included physician interview, examination, and neuropsychological testing of memory, attention, language, visuospatial, and executive function. We identified 54 subjects fulfilling Petersen criteria for MCI with impaired performance (≤ 1.5 SD below age/gender norms) on ≥ 1 test of attention, language, visuospatial, or executive function (41 single-domain, 13 multiple-domain) and normal memory function. Subjects were re-assessed after an average interval of 15.9 months.

Results: Executive function (54%) was the most commonly impaired cognitive domain. The sensitivity of individual tests for specific non-amnesic deficits was highly variable. Attentional deficits were most frequently identified with Trail Making Test A (100%), language deficits most frequently identified with the Boston Naming Test (56%), visuospatial deficits most frequently identified with the Rey Complex Figure Copy (90%), and executive deficits most frequently identified with Trail Making Test B (59%). Stability for specific non-amnesic deficits at re-assessment was poor, ranging from 30% (visuospatial) to 59% (executive). Subjects with impaired performance in multiple domains or multiple impaired tests in a single domain at baseline were significantly more likely to exhibit non-amnesic deficits at re-assessment.

Conclusions: The relative instability of baseline neuropsychological deficits in non-amnesic MCI suggests that they may not be indicative of persistent underlying cognitive impairments. Alternatively, such instability may reflect executive abnormalities. Increasing the number of impaired tests necessary for non-amnesic MCI increases diagnostic stability but decreases diagnostic sensitivity.

Correspondence: *Edmond Teng, M.D., Ph.D., Alzheimer's Disease Center, UCLA, 10911 Weyburn Avenue, 2nd Floor, Los Angeles, CA 90095-7226. E-mail: eteng@ucla.edu*

S. TOMASZEWSKI FARIAS, D. MUNGAS, L. HINTON & M. HAAN. Demographic, Neuropsychological and Functional Predictors of Rate of Decline in a Community-based Sample of Spanish and English-Speaking Older Adults.

Objective: We examined which baseline demographic, neuropsychological and functional variables were most strongly associated with longitudinal change.

Participants and Methods: Participants were part of the Sacramento Area Latino Study on Aging (SALSA) (N = 500) and included cognitively normal, mildly impaired, and demented cases. 60.3% were tested in Spanish. Average follow-up was five years. Latent growth modeling of longitudinal data assessed the effects of age, gender, language (Spanish or English-speaking), measures of verbal memory and confrontation naming, and functional status at baseline on rate of change in global cognitive severity over time.

Results: Lower education, Spanish-speaking status, lower scores on the neuropsychological tests and more impaired everyday function at baseline were all associated with greater global cognitive impairment at baseline. Acculturation did not predict baseline cognitive impairment independent of language status. In terms of predicting change, the only baseline demographic variables associated with a faster rate of decline included older age and male gender but not education, language or acculturation. Poorer baseline memory and naming were associated with faster decline but this relationship did not remain significant after including age in the model. More functional impairment at baseline was associated with a faster rate of decline and this effect was independent of age.

Conclusions: Education and language of test administration were associated with baseline cognitive performance but not change over time. Baseline functional status but not neuropsychological variables were independently associated with both baseline and change.

Correspondence: *Sarah Tomaszewski Farias, Ph.D., University of California, Davis, 4860 Y Street, Suite 3700, Sacramento, CA 95817. E-mail: sarah.farias@ucdmc.ucdavis.edu*

G. TREMONT, M.M. SMITH & M. SPITZNAGEL. Relationship Between Living Situation and Awareness of Deficit in Dementia.

Objective: Impaired awareness of cognitive deficit is often found in dementia. However, factors contributing to reduced awareness have not been fully identified. The present study examined whether living arrangement impacts awareness of cognitive impairment in dementia.

Participants and Methods: 99 patients with questionable, mild, or moderate dementia (CDR 0.5, 1, or 2) and their informants completed the Cognitive Difficulties Scale (CDS). Patient-informant discrepancy scores were calculated based on mean difference scores for each item (negative scores indicate informants report worse cognitive functioning than patients). Patients also completed the MMSE as a part of a neuropsychological evaluation.

Results: Accuracy of informant CDS ratings was established by significant correlation of CDS and MMSE ($r = -.27$). Greater informant report of patient cognitive difficulty was associated with poorer cognitive performance. In contrast, patient CDS ratings correlated positively with the MMSE ($r = .20$), indicating that patients who were more cognitively impaired reported fewer cognitive problems. ANCOVA controlling for MMSE scores revealed that patient-informant discrepancy on the CDS was significantly ($p < .001$) higher for patients living alone ($M = -.952$; $SD = .968$) than those living with family ($M = -.117$; $SD = .906$).

Conclusions: Results suggest living alone is associated with less awareness of cognitive deficit than living with family, after controlling for general level of cognitive impairment. Patients living with family may be more aware of impairment because regular interactions provide reminders of cognitive difficulties and enable self-awareness. These results suggest that cognitively impaired older adults living alone are more likely to overestimate their cognitive abilities, possibly creating safety risk.

Correspondence: *Geoffrey Tremont, Ph.D., Psychiatry & Human Behavior, Brown Medical School, Rhode Island Hospital, 593 Eddy Street, Providence, RI 02903. E-mail: gtremont@lifespan.org*

J. TSCHANZ, C. CORCORAN, M.C. NORTON, M. MIELKE, P.V. RABINS, K. TREIBER, K.A. WELSH-BOHMER, J. BREITNER & C.G. LYKETSOS. Rate of Cognitive and Functional Decline in Alzheimer's Disease in the Cache County Population.

Objective: Considerable variability exists in rates of decline in Alzheimer's disease (AD), but few explanatory factors have been identified. In a population study, we examined the rates of cognitive and functional decline, and potential explanatory variables.

Participants and Methods: Individuals with incident AD ($n=229$; mean(sd) age = 85.4(6.5)) were followed for (mean(sd) = 4.9(2.1)) years. The Mini-Mental State Exam (MMSE), Dementia Severity Rating Scale (DSRS) and Clinical Dementia Rating Scale (CDR-SUM) were completed at each visit. Linear mixed models (random slopes, intercepts) were fitted for cognitive and functional trajectories to examine the effects of demographic variables and APOE genotype. Participants were then categorized into decline groups based on tertiles of MMSE slopes, which were entered into separate linear mixed models to examine the association between rate of cognitive decline and functional change.

Results: Compared to males, females exhibited more rapid decline in cognitive ($p<.002$) and functional domains ($p < .048$). Greater onset age and educational attainment were associated with higher baseline MMSE scores only ($p<.02$). Compared to those in the MMSE-slow decline group, more rapid rates of functional decline were exhibited only by those in the MMSE-rapid decline group ($p<.0001$). APOE genotype and other demographic variables had no effect on decline.

Conclusions: In AD, females exhibit more rapid decline in cognitive and functional domains. However, decline in cognitive and functional trajectories were unrelated in those with moderate rates of cognitive decline. Future studies will explore multivariate methods to model relationships between trajectories and other potential mechanisms to predict rate of decline.

Correspondence: *JoAnn Tschanz, Ph.D., Psychology, Utah State University, 4440 Old Main Hill, Logan, UT 84322-4440. E-mail: joannt@cc.usu.edu*

W. VANVOORST, G. SMITH, R. IVNIK & R. PETERSEN. Risk for Progression from Mild Cognitive Impairment to Alzheimer's Disease Depends on How Mild Cognitive Impairment is Operationalized.

Objective: Mild Cognitive Impairment substantially increases the risk for progression to Alzheimer's Disease. However, rates of progression and methods of diagnosing MCI have varied widely across studies. The objective of the present study was to examine the impact of various psychometric methods for assigning an MCI diagnosis on relative risk of AD. These psychometric methods were compared to the risk associated with a clinical diagnosis.

Participants and Methods: Participants were 593 enrollees in the Mayo Alzheimer's Disease Patient Registry. All subjects received a standard battery at enrollment and were re-evaluated at approximately annual intervals. Of these, 455 were clinically normal at initial evaluation and 138 received an MCI diagnosis. Subjects were pooled and reclassified as having 'psychometric MCI' according to different criteria, which involved having either one of 3 versus all 3 memory tests (i.e. 2 conditions) fall more than 1 s.d., 1.5 s.d.s, or 2 s.d.s (3 conditions) below the mean using either immediate or percent retention measures (2 conditions). These conditions generated 12 possible psychometric definitions (2x3x2). Cox hazards models were used to establish risk.

Results: In all, 122 of the 593 participants progressed to AD. The relative risk for AD from the clinical condition was 11.3. Only one psychometric definition produced a higher relative risk. Generally, the more the inclusive the psychometric definition the lower the relative risk.

Conclusions: The risk for progression from MCI to AD varies in expectable ways depending on how the MCI diagnosis is operationalized. Additionally, some of the differences in MCI outcomes reported in the literature are likely attributable to how a MCI diagnosis is operationalized.

Correspondence: *Wendy A. VanVoorst, Mayo Clinic, Rochester, MN, 200 First St SW, Rochester, MN 55905. E-mail: vanvoorst.wendy@mayo.edu*

C. WIERENGA, J.L. STRICKER, W.S. HOUSTON, L.T. EYLER, K.L. LANGE, G.G. BROWN & M.W. BONDI. Functional Connectivity of Learning Differs by APOE Genotype in Nondemented Older Adults.

Objective: Functional MRI evidence suggests that older adults at risk for Alzheimer's disease demonstrate a compensatory response during learning. We used structural equation modeling to examine networks of fMRI brain response during picture encoding as a function of APOE genotype across time.

Participants and Methods: Twenty nondemented older adults were divided into two equal groups based on the presence or absence of the APOE $\epsilon 4$ allele. A blocked design picture-encoding task alternating between novel and familiar items was administered across two runs during scanning. Mirroring Papez' circuitry, we modeled a simple encoding network of cortical afference to the medial temporal lobe that was tested via structural equation modeling.

Results: Results of group BOLD analyses revealed an interaction between APOE genotype and imaging run in the right posterior cingulate. Within-subject analyses showed that the $\epsilon 3$ group had greater brain response during the first compared to the second imaging run, whereas the APOE $\epsilon 4$ group did not show expected reductions in activity over time. Group BOLD comparisons revealed greater brain response, particularly in the right hemisphere, for the $\epsilon 4$ group during the second imaging run. Functional connectivity results demonstrated that the best fitting models differed as a function of APOE genotype and time.

Conclusions: The differential strengths of connection by APOE genotype suggest greater top-down prefrontal modulation and less bilateral connectivity between left and right hippocampi for the $\epsilon 4$ group. Results suggest that not only do at-risk older adults appear to habituate less over time, they rely more heavily on higher cortical modulation to compensate for a declining hippocampal system.

Correspondence: *Christina Wierenga, UCSD, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: cwierenga@ucsd.edu*

J.S. WILSON, M.B. MITCHELL, J.J. BUCCAFUSCO, S. MRUTHINTI, R.F. SCHADE & L. MILLER. Potential Blood Biomarkers for Alzheimer's Disease: Anti-A β and Anti-RAGE Immunoglobulins and Cognitive Functioning.

Objective: Blood-based immunoglobulins (IgGs) may mark the presence of amyloid plaques characterizing the progression of Alzheimer's Disease (AD). Previous studies suggest that anti-RAGE and anti-A β IgGs increase proportionately with accumulation of amyloid-beta (A β) peptides at receptor sites for advanced glycation end products (RAGE), within cortical areas of brain tissue. We assessed the predictive ability of these potential markers for an AD-type cognitive profile. We hypothesized that IgG levels would be positively correlated with Clinical Dementia Rating (CDR) scores as well as index scores on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) in domains associated with cortical function.

Participants and Methods: Participants were 114 older adults (mean age=74, SD=10.5) drawn from the community and local physician referrals. Participants were reassigned into five groups based on Clinical Dementia Rating (CDR). Blood IgG levels were determined through an affinity purification process.

Results: ANCOVA analyses revealed that CDR scores were significantly correlated with anti-RAGE, $f=18.78$, $p<.001$, and anti-A β , $f=20.69$, $p<.001$. Age was not a significant covariate ($p>.05$). Multivariate re-

gressions were performed to determine RBANS domains most related to each IgG. Indices of language, $t=-3.82$, $p<0.01$, and delayed memory, $t=-2.49$, $p<0.05$, were significantly related to anti-RAGE, while language was significant for anti-A β , $t=-4.01$, $p<0.01$. Delayed memory approached significance ($p=0.13$).

Conclusions: These IgGs correlate strongly with global scores of dementia. Furthermore, they are predictive of a profile of deficiency in areas associated with specific cortical function. Results suggest great potential for anti-A β and anti-RAGE IgGs as blood biomarkers for AD. Correspondence: *Jennifer S. Wilson, Psychology, University Of Georgia, 425 Snapfinger Drive, Athens, GA 30605. E-mail: jenniur@uga.edu*

Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)

M. AMICK, K. CHOU, M. GAGNER & J. FREIDMAN. Driving Safety in Parkinson's Disease.

Objective: Patients with Parkinson's disease (PD) are at risk for unsafe driving given the visual, motor, and cognitive changes associated with this disease. It was hypothesized that PD patients involved in a motor vehicle accident (MVA) since their diagnosis (PD-MVA+) compared to PD patients not involved in an MVA (PD-MVA-) would endorse more difficulties on a survey assessing general driving habits and behavior.

Participants and Methods: Forty-nine consecutive patients diagnosed with PD at a Movement Disorders Center completed the driving questionnaire. The questionnaire was primarily composed of the Manchester Driver Behavior Questionnaire (DBQ) and the Driving Habits Questionnaire (DHQ). Additional information about disease status and patient characteristics was also collected. The DBQ assesses three types of poor driving: errors, lapses (attentional failures), and violations (risky driving behaviors). The DHQ assesses driving status, exposure, difficulty driving, and the contribution of visual impairment to driving difficulty.

Results: Eleven (22%) of the respondents indicated that they had been involved in an MVA since their diagnosis with PD. There was no difference between groups with respect to age, gender, age to start driving, or levodopa equivalent medication dose. The two groups responded similarly on the DBQ except that the PD-MVA+ group endorsed more aggressive driving behavior, such as driving especially close to the car ahead as a signal to its driver to go faster or get out of the way. On the DHQ the PD-MVA+ group reported more difficulty driving at night due to visual impairments relative to the PD-MVA- group.

Conclusions: In this pilot study, PD patients involved in MVAs since their diagnosis endorsed more aggressive driving behavior and more difficulty driving at night, which may be related to a disruption in frontal systems functioning and visual perception. Future studies to examine the predictive value of these factors are needed.

Correspondence: *Melissa Amick, Ph.D., Memorial Hospital of Rhode Island, 111 Brewster Street, Pawtucket, RI 02446. E-mail: melissa_amick@mhri.org*

C. CIMINO, L. BUTTERFIELD, L. OELKE, C. BALDERSTON, J. SANCHEZ-RAMOS & R. HAUSER. Rate of Agreement in Ratings of Apathy between PD Patients and their Caregivers.

Objective: The purpose of this study was to investigate the rate of agreement in ratings of apathy symptoms between PD patients and their caregivers across two different measures of apathy.

Participants and Methods: Seventeen idiopathic, nondemented PD patients were administered two self-report measures, the Apathy Evaluation Scale and the FrSBe, as part of a larger ongoing clinical investigation. Caregivers were administered the Informant versions of these same measures.

Results: Results revealed highly significant correlations for caregivers' ratings of patients' apathy symptoms between the informant versions

of the AES-I and FrSBe-I Apathy scale ($r^2 = .90$, $p < .01$). Similarly, PD patients' own ratings of their symptoms of apathy were significant between the AES and FrSBe Apathy scale ($r^2 = .72$, $p < .01$). Moreover, correlations between PD patients' and caregivers' ratings of apathy symptoms were significant for the FrSBe Apathy scale ($r^2 = .66$, $p < .05$) but were slightly lower and only approached significance for the AES ($r^2 = .55$).

Conclusions: These preliminary findings in a relatively small sample of idiopathic PD patients and their caregivers suggest that there may be some variability in rate of agreement between self and informant ratings across various measures of apathy. Item content differences between the AES and FrSBe Apathy scale may, in part, explain the variability in these findings if these effects are replicated with a larger sample size. Analysis of individual items on these scales may also shed light on possible effects underlying these differences. These findings may have significant implications for the extent to which PD patients' self-report of apathy symptoms are considered valid when compared to caregivers' ratings.

Correspondence: *Cynthia Cimino, Ph.D., Psychology, University of South Florida, 4202 E. Fowler Ave PCD411S, Tampa, FL 33620. E-mail: cimino@mail.cas.usf.edu*

P.S. FOSTER, V. DRAGO, G.P. CRUCIAN & K.M. HEILMAN. Executive functioning in Parkinson's disease: The effects of asymmetrical symptom presentation and anxiety.

Objective: Many patients with Parkinson's disease (PD) experience asymmetrical motor symptoms as well as feelings of anxiety. Studies of patients with frontal and basal ganglia dysfunction have suggested that anxiety is more commonly associated with left sided injury. Thus, patients with PD who have heightened anxiety (HA) and predominantly right-sided symptoms might perform worse on measures of left frontal lobe function than patients with low anxiety (LA) and right sided symptoms.

Participants and Methods: To test this hypothesis the Stroop Color-Word Test (SCWT) and the Trail Making Test (TMT) were administered to 16 Parkinson's disease patients with right-sided asymmetrical symptom presentation (RSP) and 14 with left-sided asymmetrical symptom presentation (LSP). The dependent measure consisted of percentile scores on these tests. Patients were equivalent in terms of duration of illness, MMSE score, and estimated IQ.

Results: The results indicated a significant Group (High versus Low Anxiety) x Symptom (Left versus Right) interaction for Color-Word performance on the SCWT (SCWT-CW) as well as performance on Part B of the TMT (TMTB). Subsequent analyses indicated that the HA-RSP group performed significantly worse (TMTB: $M = 12.25$; SCWT-CW: $M = 12.78$) than the HA-LSP group (TMTB: $M = 48.50$; SCWT-CW: $M = 42.71$) as well as the LA-RSP group (TMTB: $M = 38.57$; SCWT-CW: $M = 50.71$).

Conclusions: Thus, the presence of right sided symptoms as well as anxiety appear to indicate an additional risk factor for left frontal dysfunction.

Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 8001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

P.S. FOSTER, V. DRAGO, B. SKOBLAR, D. ANTONIELLO, B. KLUGER, D. FITZGERALD, G.P. CRUCIAN & K.M. HEILMAN. Asymmetrical Parkinson's and dopaminergic enhancement.

Objective: The majority of Parkinson's patients report a lateral hemibody onset of symptoms. Lateralized or asymmetrical symptom presentation is associated with asymmetrical depletion of the dopaminergic system and this asymmetry might continue through the course of the

disease. The dopaminergic system is also asymmetric, with greater dopaminergic innervation to the left hemisphere than to the right hemisphere. Thus, dopaminergic enhancers may have a greater impact on reducing symptoms in patients with right hemibody (left cerebrum) onset of symptoms.

Participants and Methods: To test this hypothesis we examined scores on the Unified Parkinson's Disease Rating Scale (UPDRS) in a group of left ($n = 11$) and right ($n = 7$) hemibody onset (LHO versus RHO) Parkinson's patients, both on and off dopaminergic medication.

Results: The results indicated a significant Group (LHO versus RHO) by Medication (Off versus On) interaction. Subsequent analyses indicated that UPDRS scores significantly improved in both groups of patients. However, the RHO group evidenced greater improvement (Off UPDRS $M = 51.14$; On UPDRS $M = 29.57$) than the LHO group (Off UPDRS $M = 36.46$; On UPDRS $M = 25.55$).

Conclusions: Thus, administration of dopaminergic enhancers is of greater benefit to patients with right hemibody onset. These results may have implications for the potential changes induced by administration of dopaminergic enhancers in the cognitive, behavioral, and emotional functions associated with the dopaminergic system, and hence left hemisphere functioning. Certainly, future research should be conducted to determine the veracity of this hypothesis.

Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 8001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

M. GLISKY & K. OLSON. The Relation Between Perceived Quality of Life, Cognition and Emotion in Parkinson's Disease.

Objective: Both emotional and cognitive changes can occur with Parkinson's disease (PD), and can negatively impact quality of life. The current study was designed to examine the relation between cognition, depression, and perceived quality of life in patients with Parkinson's disease.

Participants and Methods: Participants included a sample of 102 patients with idiopathic Parkinson's disease who were referred for a neuropsychological evaluation to determine their level of cognitive and emotional functioning and to assist with treatment planning. Subjects received a neuropsychological battery, as well as self-report measures of depression (Beck Depression Inventory, BDI), anxiety (Beck Anxiety Inventory, BAI), and overall quality of life (PDQ-39).

Results: Results revealed a significant correlation between both BDI ($r = .57$) and BAI ($r = .76$; both p 's $< .01$) scores and total PDQ score. Regression analyses were performed to determine whether depression (BDI) moderated the relationship between subscales of the PDQ-39 and neuropsychological cognitive variables. Results revealed significant interaction effects between PDQ-39 Mobility, ADLs, and Cognitive subscales and BDI, negatively impacting scores on the Rey Complex Figure Copy test. That is, higher PDQ subscales (indicating worse perceived symptoms) interacted with higher BDI scores to contribute to lower scores on the RCF.

Conclusions: A measure of executive dysfunction and visuospatial ability is significantly impacted by the interaction between perceived quality of life and depression. Treating depression and anxiety can improve quality of life, and targeting both depression and quality of life factors may secondarily improve cognition.

Correspondence: *Martha Glisky, Ph.D., Neuroscience Rehab, Evergreen Medical Center, 12039 NE 128th Ave, Kirkland, WA 98034. E-mail: mglisky@yahoo.com*

M. JEDRZKIEWICZ, J.S. MARTZKE, C.R. HONEY, R.G. LEY & M. SINDEN. Neurobehavioral Outcome Following Subthalamic Deep Brain Stimulation in Parkinson's Disease: A Waitlist Control Study.

Objective: Though subthalamic deep brain stimulation (STN-DBS) is known to improve motor functioning, the neurobehavioral impact of this intervention is less well understood. Most previous studies examin-

ing the neurobehavioral outcome associated with STN-DBS do not control for practice effects and, thus, may be underestimating the cognitive consequences of this surgical intervention. The aim of this study was to examine neurobehavioral outcome of bilateral STN-DBS in advanced PD, while accounting for practice effects.

Participants and Methods: Study participants were randomly assigned to either a Surgical Group ($n=19$) or a waitlist Control Group ($n=16$) and assessed twice. A comprehensive battery of clinical measures was used to evaluate several domains of functioning including learning and memory, mental speed, attention, working memory, executive functioning, verbal fluency, mood, and quality of life. Between assessments, there was a two month interval during which the Surgical Group had STN-DBS surgery, while the waitlist Control Group had no surgery.

Results: ANOVA identified that STN-DBS was associated with decline in executive functioning, verbal delayed memory, verbal working memory, and verbal fluency. Nevertheless, patients undergoing STN-DBS also reported significantly improved health and quality of life in several domains including vitality, mental health, general health, and social functioning.

Conclusions: This study revealed that despite showing significant declines on several cognitive measures, participants who underwent STN-DBS also reported significantly improved quality of life. Results also speak to the participation of subthalamic nuclei within fronto-striatal circuits relevant to cognitive (especially executive) functioning.

Correspondence: *Michelle Jedrzkiewicz, Vancouver General Hospital and Simon Fraser University, 15 Fieldstone Road, Guelph, ON N1L 1A5, Canada. E-mail: mjedrzkiewicz@yahoo.com*

G. JEWELL, J.G. SCOTT, B. MERKER, N. PASTOREK, K.J. BHARUCHA & P. FRANCEL. Behavioral & Affective Changes following Bilateral DBS of the Subthalamic Nucleus in Parkinson's disease.

Objective: Neurobehavioral outcome studies of DBS have often been contradictory. This may in part be because few studies have utilized a repeated measures design comparing DBS and control groups in order to control for history and practice effects.

Participants and Methods: In the current study, DBS participants ($n = 58$) were evaluated both pre and post stimulator implantation on standardized measures of frontal systems behavior (FrSBe patient and family ratings) and affect (GDS & STAI). A control group with Parkinson's disease (PD) who did not receive DBS ($n = 23$) was evaluated over a similar time interval ($M = 6.4$ months). The two groups were equivalent in terms of age ($M = 64$), education ($M = 12$), MMSE ($M = 26$), disease severity, and dopamine equivalents.

Results: Both DBS and control groups indicated improvement over time in apathy, executive dysfunction, disinhibition, and trait anxiety. The DBS group indicated an improvement in state anxiety over time and a trend towards improvement in self-reported depression. For the DBS group, symptoms reported by the family were rated as having improved over time in terms of apathy, executive dysfunction, and disinhibition.

Conclusions: DBS may be associated with improvements in affect and behavior, possibly due to its effects on frontal-subcortical circuits. However, issues are also raised regarding the validity of self-report measures of behavior by patients with advanced PD.

Correspondence: *George Jewell, Ph.D., Psychiatry & Behavioral Sciences, Oklahoma University Health Sciences Center, 817 SW 160th St, Oklahoma City, OK 73170. E-mail: George24709@msn.com*

L. KIRSCH-DARROW, M.S. OKUN, H.H. FERNANDEZ & D. BOWERS. Parkinson's Disease: Relationship Between Apathy and Dopaminergic Medications.

Objective: Post-stroke population studies have shown preliminary support for apathy treatment with dopamine agonists. Many PD patients

are often prescribed dopamine agonists to treat motor symptoms. This study evaluated the relationship between apathy symptoms and dopamine medications in PD and hypothesized: 1) patients on dopamine agonists would have less apathy than those not on agonists; 2) higher total levodopa dosage would be correlated with reduced apathy.

Participants and Methods: 62 consecutive PD patients (68.9±9.3yrs) completed Apathy Evaluation Scale (AES), Frontal Systems of Behavior Scale (FRSBE), Beck Depression Inventory-I (BDI-I). Levodopa equivalent dose (LED), whether taking a dopamine agonist, and disease severity (UPDRS motor) were collected.

Results: AES and BDI cut scores (≥ 14) classified patients. 35% met criteria for apathy alone (22/62), 3% for depression alone (2/62), and 18% for both (11/62). Mean UPDRS-on motor score=29.3 ± 11.1; mean LED=570 ± 322.2. Patients on agonists had significantly lower FRSBE Apathy ($p < .01$, $d = .9$) and lower AES at trend level ($p = .07$, $d = .5$). BDI scores were not significantly different ($p = .21$). However, LED correlated with increasing apathy ($r = .315$, $p = .016$) and correlated at trend with depression ($r = .24$, $p = .06$). Disease severity (UPDRS) was significantly related to LED, apathy, and depression.

Conclusions: Consistent with previous research, our sample showed high frequency of apathy in PD. Patients taking dopamine agonists had lower overall apathy, but not depression, levels. Yet, our results also suggest that higher LED is correlated with higher apathy symptoms. The explanation for LED being correlated to apathy may reflect disease severity and further studies are needed to explore this possibility.

Correspondence: *Lindsey Kirsch-Darrow, M.S., Clinical and Health Psychology, University of Florida, 2238 NW 1st Ave., Gainesville, FL, FL 32603. E-mail: lkirsch@phhp.ufl.edu*

K. CORRADI, C. GARCIA & B. LEAHY. Cognitive Functions and Quality of Life in Individuals with Movement Disorders.

Objective: Quality of life (QOL) is increasingly viewed as a critical component in assessment of treatment outcome in Parkinson's disease and related disorders. In research to date, motor impairment and depression have emerged as the factors most consistently associated with diminished QOL, but cognitive functions have received limited attention. The intent of this study is to investigate the relationship between cognitive functioning and self-reported QOL for individuals with movement disorders.

Participants and Methods: Participants were 52 individuals diagnosed with idiopathic Parkinson's disease or parkinsonism by a neurologist, who were referred for neuropsychological examination. Participants completed the Parkinson's Disease Quality of Life questionnaire, as well as a battery of neurocognitive tests. Relationships between QOL and performance in cognitive domains including language, visuospatial processing, attention, processing speed, executive functions, and memory were examined through a series of multiple regression analyses.

Results: Cognitive measures were not strongly related to overall QOL. However, among QOL subdomains, self-image and outlook were related to basic attention, and self-rated independence was associated with performance on tests of mental processing speed and language. These relationships remained after controlling for demographic factors and neurologist ratings of motor functions. Consistent with previous studies, depression was strongly associated with overall QOL.

Conclusions: Results indicated that cognitive deficits, particularly in attention, mental processing speed, and language have a significant impact on some, though not all, aspects of QOL for individuals with movement disorders. Consequently, assessment and intervention to remediate or compensate for these difficulties is likely to be helpful in optimizing treatment outcomes.

Correspondence: *Brian Leahy, PhD, Alexian Neurosciences Institute, Eberle Building, Suite 610, 800 Biesterfeld Road, Elk Grove Village, IL 60007. E-mail: leahybrian@msn.com*

J.A. OGDEN & M. GUICHERIT. Does Dopamine Improve Visuospatial Ability in Parkinson's Disease?

Objective: Previous studies on Parkinson's Disease (PD) participants have demonstrated impairments on the Ravens Coloured Progressive Matrices (RCPM) and the Complex Figure Test (CFT) when ON L-dopa. This study assesses whether their performance varies when PD participants are ON and OFF L-dopa.

Participants and Methods: Twenty-eight non-depressed, non-demented PD participants (mean age 67.5yrs) in Stage 2-4 of the Modified Hohn and Yahr Scale, were compared with 28 age, education, and occupation case-matched Controls. The mean Unified Parkinson's Disease Rating Scale for motor symptoms (UPDRSm) for the PD gp was 21.95 ON and 30.25 OFF L-dopa. In Session 1 (PD ON), all participants were given the MMSE, the Geriatric Depression Scale, Cognistat (current cognitive functioning), and the Visual Object and Space Perception Battery (ensuring intact basic visuospatial abilities). In Sessions 2 and 3, PD participants were counterbalanced ON and OFF L-dopa, along with their case-matched Controls. The RCPM and the CFT were given in both ON and OFF conditions (2 weeks apart).

Results: Repeated measures ANOVAs on the RCPM and Copy and Delayed Memory trials of the CFT demonstrated significantly lower scores for PD participants than Controls on RCPM Forms Ab, b, and Total only. There were no gender effects, no differences for any scores ON and OFF medication, and no significant correlations between the UPDRSm and the RCPM or CFT scores ON or OFF medication.

Conclusions: This study partially supports previous studies. PD participants are not impaired on tests of visual closure (Form A of RCPM) or on a visuospatial construction task, but are impaired on tasks requiring visuospatial analogies (Forms Ab, b, and Total of RCPM). The finding that L-dopa did not influence the scores suggests that the dopaminergic system plays no role in performance on these tasks.

Correspondence: *Jenni A. Ogden, PhD, Psychology, City campus, University of Auckland, Private bag 92019, Auckland Mail Centre, Auckland 1142, New Zealand. E-mail: ja.ogden@auckland.ac.nz*

K. PATEL, S. CORREIA, J. FOLEY, E. SCHLICHTING, Z. SONG, D. LAIDLAW & S. SALLOWAY. Cognitive Impairment, Hippocampal Volume, and White Matter Integrity in CADASIL.

Objective: To determine the impact of CADASIL (cerebral autosomal dominant arteriopathy with subcortical infarction and leukoencephalopathy) on hippocampal (HC), grey matter (GM), and white matter (WM) volumes; and on diffusion-tensor imaging (DTI) measures of WM integrity and their association with cognition.

Participants and Methods: Eight CADASIL patients (age=51.2±7.3) and ten healthy controls (age=58.9±11.2) underwent MRI with DTI and cognitive testing. Volumetric measures were obtained for the HC bilaterally corrected for intracranial volume (ICV) and for total GM and WM. DTI measurements were mean fractional anisotropy (FA) and trace for the left and right temporal stem (TS), and the length of transcallosal white matter fibers weighted for linear anisotropy and corrected for ICV. Statistical tests included ANOVA ($\alpha = .01$), chi-square, and Pearson bivariate correlation.

Results: There were no significant group differences in age, education, or sex, nor in left or right HC volume or in GM or WM volumes. The CADASIL group had significantly lower FA bilaterally in the TS ($p < .004$) and shorter length of transcallosal fibers ($p = .01$). The CADASIL group achieved significantly lower scores on tests of processing speed and executive function ($p < .007$) but not on tests of verbal declarative memory, working memory, or confrontational naming. Processing speed and executive function were significantly correlated with FA in the TS and with transcallosal fiber length but not with volumetric variables.

Conclusions: CADASIL is associated with reduced WM integrity on DTI without hippocampal volume or of total GM or WM volume loss. The WM changes correlate with processing speed and executive function.

Correspondence: *Stephen Correia, Ph.D., Brown Medical School, Butler Hospital Memory & Aging Program, 345 Blackstone Blvd., Providence, RI 02906. E-mail: Stephen_Correia@Brown.edu*

K.L. POSSIN & J. FILOTEO. Spatial and Object Working Memory Deficits in Parkinson's Disease are Due to Impairment in Different Underlying Processes.

Objective: Recent evidence suggests that Parkinson's disease (PD) may be associated with greater impairment in visuospatial working memory as compared to visual object working memory. The nature of this selective impairment is not well understood, however, in part because successful performance on working memory tasks requires numerous cognitive processes. It was hypothesized that the selective spatial impairment is limited to encoding processes.

Participants and Methods: The present study compared the performance of 18 nondemented patients with PD and 18 normal control participants on two experiments that were designed to evaluate perceptual, encoding, and maintenance processes independently for visuospatial and visual object information. Experiment 1 was composed of working memory conditions that differed only in what the participant was instructed to remember: locations or shapes. Encoding and maintenance aspects of performance were investigated by measuring accuracy over variable delays. Experiment 2 was composed of analogous location and shape discrimination conditions to investigate perceptual processes.

Results: Group differences were analyzed using repeated measures ANOVA designs. In Experiment 1, the patients demonstrated impairment in the encoding of spatial-based information, but were able to normally maintain that information over a 10-second delay. The reverse pattern was observed for object working memory in that only maintenance processes were impaired. The results of Experiment 2 revealed that visual discrimination for locations was not more impaired than for shapes.

Conclusions: These results suggest that the selective deficit in spatial working memory is due to an impairment in encoding, but not perceptual or maintenance processes. Further, PD patients can show impairment in object working memory due to a disruption in maintenance processes.

Correspondence: *Katherine L. Possin, M.S., Psychiatry, UCSF, University Of California, 401 Parnassus Ave, Rm A212, San Francisco, CA 94143-0984. E-mail: kpossin@memory.ucsf.edu*

K.L. POSSIN & J. FILOTEO. Spatial-Based but not Object-Based Components of Inhibition of Return are Impaired in Parkinson's Disease.

Objective: Impairments in inhibitory attention have frequently been reported in Parkinson's disease (PD), including reduced inhibition of return (IOR). Previous studies of IOR in PD have emphasized spatial components of attention. Although recent evidence suggests IOR can be directed at objects as well as locations, it is unknown if PD patients would perform differently on object-based versus spatial-based components of an IOR task. Numerous studies have identified altered spatial attention in PD, whereas other work suggests that PD patients are unimpaired on some purely object-based attentional tasks. Therefore, it was hypothesized that PD patients would show reduced spatial-based IOR, but intact object-based IOR.

Participants and Methods: The present study compared the performance of 18 nondemented patients with PD and 18 normal controls on an IOR task with two conditions. In the "object-present" condition, objects surround the cues and targets, and so attention is cued to both a spatial location and a specific object. In the "object-absent" condition, surrounding objects are not present, and so attention is cued only to a spatial location.

Results: Group differences were analyzed using a repeated measures ANOVA design. As predicted, when objects were absent from the display and the participants had to rely on spatial-based attentional processes, the patients demonstrated a reduction in IOR. In contrast, when objects were present in the display and the participants could rely on object-based attentional processes, the patients demonstrated normal IOR.

Conclusions: These results suggest that PD patients are impaired in spatial-based inhibitory attention, but that they are able to bypass this impairment when their attention can be directed at object-based frames of reference. In addition, these results provide the first demonstration that these reference frames of IOR can be dissociated in a patient group, and further support for the view that spatial-based and object-based components of attention involve distinct processes.

Correspondence: *Katherine L. Possin, M.S., Psychiatry, UCSF, University Of California, 401 Parnassus Ave, Rm A212, San Francisco, CA 94143-0984. E-mail: kpossin@memory.ucsf.edu*

K. RASCOVSKY, J.H. KRAMER, A. BOXER & B.L. MILLER. Cognitive and Behavioral Features of Early Progressive Supranuclear Palsy (PSP) and Frontotemporal Dementia (FTD).

Objective: Although recent studies demonstrate clinical, genetic and pathological associations between PSP and FTD, no prospective studies have directly compared the behavioral and neuropsychological characteristics of these disorders.

Participants and Methods: We compared the cognitive and Neuropsychiatric Inventory (NPI) profiles of 30 PSP, 30 FTD and 30 AD patients matched on MMSE (mean=25) and education.

Results: Scores on the NPI revealed that FTD patients had higher levels of anxiety, euphoria, apathy, disinhibition, aberrant motor behavior and eating changes compared to PSP and AD subjects. However, PSP patients exhibited higher levels of apathy compared to AD, and higher levels of depression than FTD and AD as measured by the Geriatric Depression Scale. As expected, AD patients performed worse on tests of verbal (CVLT-SF delayed recall) and visual memory (Modified Rey Figure recall) compared to FTD and PSP. In contrast, PSP patients performed at lower levels on letter fluency compared to FTD subjects, and both FTD and PSP performed less well than AD. Error analyses revealed that FTD and AD patients produced more intrusions and false positives on the CVLT-SF than PSP patients. FTD patients also made more errors on a test of design fluency compared to other patient groups, and produced more errors on the modified version of the Trail Making Test compared to AD subjects.

Conclusions: These results demonstrate specific areas of behavioral and neuropsychological convergence and divergence in PSP and FTD. Both disorders are characterized by prominent apathy and initiation deficits with relative preservation of memory. FTD differs from PSP by a higher prevalence of neuropsychiatric symptoms and a high error rate in neuropsychological tests. PSP patients present with lower word generation and more depressive symptoms compared to FTD subjects. These results suggest dorsolateral and anterior-cingulate circuit dysfunction in PSP, with relative sparing of orbitofrontal circuits early in the disease course.

Correspondence: *Katya Rascofsky, Ph.D., Memory and Aging Center, University of California, San Francisco, 350 Parnassus Ave, Suite 706, San Francisco, CA 94117. E-mail: krascovsky@memory.ucsf.edu*

B.K. SCANLON, H.L. KATZEN, D.A. NATION, R.A. RODRIGUEZ, S. PAPAPETROPOULOS, C. SINGER, B.V. GALLO & B.E. LEVIN. Neuropsychological Predictors of All-Cause Mortality in Parkinson's Disease.

Objective: Parkinson's Disease (PD) is the 14th leading cause of death in the United States. Despite advances in treatment, mortality remains unchanged. We investigated whether baseline neuropsychological performance is predictive of all-cause mortality in PD.

Participants and Methods: As part of a prospective study of idiopathic PD initiated in 1985, 273 participants underwent neuropsychological assessment and a neurological exam. Mortality data was available for 101 participants. At evaluation, mean age was 68.8 years (SD=8.4), mean Hoehn and Yahr stage was 2.5 (SD=.97), mean PD disease duration was 7.5 years (SD=5.9), and mean MMSE score was 25.1 (SD=4.2); 62% of participants were male. Mean age at death was 77.8 years (SD=7.8) and mean years from diagnosis to death was 16.1 (SD=6.8). Stepwise linear regressions predicting age at death were performed for each of the following neuropsychological domains: language, visuospatial, attention/memory, executive, and mood.

Results: While age at exam, age of onset, duration and PD stage were all independently correlated with age at death, age at exam and PD stage emerged as the most salient predictors of mortality. Controlling for these variables, as well as education, decreased semantic fluency and delayed verbal recall were independently predictive of earlier death. Although other studies have shown depression to be associated with mortality in PD, depressed mood did not predict age at death in our sample.

Conclusions: These findings indicate that poorer performance on select verbal and memory tasks early in the course of the disease may be associated with all-cause mortality in PD.

Correspondence: *Blake K. Scanlon, B.S., Neurology, University of Miami, 1150 NW 14th St., Suite 715, Miami, FL 33136. E-mail: blake@miami.edu*

D.M. SCHIEHSER, K.L. POSSIN, L.B. FEFFER, D.P. SALMON, D.C. DELIS, D.D. SONG, J. COREY-BLOOM, G. PEAVY & J. FILOTEO. Retrieval Deficits in Patients with Parkinson's disease or Huntington's disease.

Objective: The memory profile of patients with subcortical pathology is often characterized by an improvement in recognition memory compared to free recall, suggesting retrieval deficits. Recent work, however, suggests that not all patients with primarily subcortical pathology demonstrate a retrieval deficit profile. This past work indicates that Parkinson's disease (PD) patients are less likely to show a retrieval deficit as compared to Huntington's disease (HD) patients, and that this difference may be due to PD patients committing a high number of false positive recognition errors. The present study further examined this issue in PD and HD using the California Verbal Learning Test-second edition.

Participants and Methods: Participants included 25 HD and 25 PD patients matched on level of global cognitive impairment using age-standardized scores from the Mattis Dementia Rating Scale.

Results: HD patients demonstrated a greater improvement than PD patients in recognition memory as compared to free recall. PD patients scored significantly higher on free recall than HD patients. The two groups, however, did not differ in their recognition memory performances, including overall recognition discriminability or number of false positive errors.

Conclusions: The findings suggest that HD patients display a retrieval deficit profile not evident in PD patients, and this difference is due to HD patients acquiring less information during learning than the PD patients. These results are somewhat in contrast to past studies showing that differences in a retrieval deficit profile are due to PD patients' poorer recognition memory. Possible explanations of these discrepancies will be discussed.

Correspondence: *Dawn M. Schiehser, Ph.D., Neurosurgery & Psychiatry, UCSD, Mailbox 116-B, c/o Filoteo Lab, VA San Diego, 3350 La Jolla Village Drive, La Jolla, CA 92161. E-mail: dschiehser@ucsd.edu*

D.R. SEICHEPINE, S. DAVIDSDOTTIR & A. CRONIN-COLOMB. Clock Drawing Test as a Measure of Visuospatial Impairment in Parkinson's Disease.

Objective: The Clock Drawing Test (CDT) is often used as a measure of visuoconstructional impairment in individuals with Parkinson's disease

(PD). The potential sensitivity of the test to visuospatial impairment is limited, however, in that currently available scoring systems emphasize deficits in semantic memory, which is relatively intact in PD. We aimed to develop a CDT scoring system that would be more sensitive to visuospatial deficits.

Participants and Methods: Twenty-six non-demented patients with PD (13 LPD; left-side motor symptom onset; 13 RPD, right-side onset) and thirteen healthy control participants matched for age and education (HC) were tested. Errors included the placement of numbers too close to the previous number or to the left of midline for the number twelve.

Results: The LPD but not the RPD group performed significantly more poorly than the HC on this test. PD scores significantly correlated with scores on other measures of visuospatial ability (e.g., Rey-Osterrieth Complex Figure; Money Road Map Test).

Conclusions: These findings indicate that a visuospatial-based CDT scoring system can differentiate performance of non-demented PD patients and HC. The findings also document PD subgroup differences, as the results were driven by impairment in the LPD group, consistent with compromise of right-hemisphere visuospatial function.

Correspondence: *Daniel R. Seichepine, M.A. Psychology, Clinical Psychology, Boston University, 14 marion Street #3, Brookline, MA 02246. E-mail: daniel13@bu.edu*

B.M. SKOBLAR, G.P. CRUCIAN, A.M. ANDERSON, P.S. FOSTER, V. DRAGO & K.M. HEILMAN. Neuropsychological Prediction of Memory Function in Parkinson's Disease.

Objective: Subtle changes in cognition and memory are common in patients with Parkinson's disease (PD). Significant memory dysfunction, however, may represent more extensive neuropathology, and memory impairment is considered by many to be the defining feature of dementia. The goal of this study was to determine which neurocognitive tests and abilities were most associated with verbal memory performance in a well-defined sample of PD patients.

Participants and Methods: We examined the neuropsychological test data of 147 patients with idiopathic PD. Cluster analysis was used to distill natural groupings of patients with similar memory profiles based on the Hopkins Verbal Learning Test (HVLT). Patients' scores on 14 other neuropsychological measures were then entered into a discriminant function analysis as predictor variables with memory cluster membership as the outcome variable.

Results: The cluster analysis yielded two distinct memory groups, one with impaired HVLT performance and another without such impairment. In the discriminant analysis, the Digit Span Backwards test, the Dementia Rating Scale-2 (DRS-2) Total Score, and Part B of the Trail Making Test best discriminated memory group membership.

Conclusions: These results demonstrate good clinical utility of the DRS-2 for distinguishing individuals with memory impairment in a PD population. Further, these findings provide evidence that memory function in PD is more highly associated with performance on tests of executive abilities (i.e., working memory and speeded set-shifting) than with other neurocognitive functions.

Correspondence: *Barry M. Skoblar, Psy.D., Clinical and Health Psychology, University of Florida, 333 NW 45th Blvd., Gainesville, FL 32607. E-mail: bskoblar@phhp.ufl.edu*

S. STERN, S. REICH, A.N. CERNICH, P. SHORT, L. SHULMAN, K. ANDERSON, L. GRATAN, J. KENT, W. WEINER, L. WULFF, E. BERCAW & R.L. KANE. Automated Neuropsychological Assessment Metrics (ANAM) Motor Tasks Demonstrate Group Differences in Parkinson's Disease.

Objective: Computerized motor tasks may offer more sensitive measurement of motor and reaction time changes in Parkinson's Disease (PD)

due to refined timing. Our aim was to determine if performance on motor tasks from the Automated Neuropsychological Assessment Metrics (ANAM) test system differed between controls and PD subjects and if performance differed between PD patients with and without cognitive impairment.

Participants and Methods: Patients and controls were recruited from the University of Maryland Parkinson's Disease Center and completed ANAM (PD, N=91; Control, N=42) and a traditional neurocognitive assessment battery (PD = 49). Those subjects with complete data were used in each analysis. Computerized motor tasks included a finger tapping task (TPL and TPR), horizontal tracking (HOR), and square wave tracking (SQR). Independent groups t-tests were used to detect group differences on the measures between PD patients and controls. The PD group was dichotomized into those with cognitive impairment (IPD) and those without (NPD) using a comprehensive impairment index computed from performance on traditional measures and group differences were analyzed via t-test.

Results: Group differences between PD subjects and healthy controls were detected across three computerized motor measures (TPL mean taps, $t = -3.5$, $p < .01$; TPR mean RT, $t = -2.736$) with trends noted on tracking tasks. Performance on TPL differed between PD groups (TPL mean taps, $t = 2.335$, $p < .05$; TPL mean RT, $t = -2.397$, $p < .05$).

Conclusions: Computerized measures of motor performance may yield greater sensitivity to motor impairment in PD patients. Potential covariates that may affect performance, including lateralization of tremor, should be investigated in future studies.

Correspondence: *Alison N. Cernich, Ph.D., Psychology, VA Maryland Health Care System, BT/116/MH, 10 North Greene Street, Baltimore, MD 21201. E-mail: alison.cernich@va.gov*

K. WELDON, N.L. DENBURG, D. TRANEL, R.L. RODNITZKY, M. HOWARD & E.Y. UC. Comparison of Neuropsychological Profiles of Patients with Normal Pressure Hydrocephalus and Parkinson's Disease with Dementia.

Objective: To compare the neuropsychological profiles of patients with normal pressure hydrocephalus (NPH) and Parkinson's disease with dementia (PDD), given that both syndromes involve subcortical brain pathology. These findings will aid clinicians faced with such a differential diagnosis. It was hypothesized that visuospatial tasks would be best at discriminating patients with NPH from patients with PDD, with NPH outperforming PDD. Group differences in the same direction on tests of executive functioning and anterograde memory were also predicted.

Participants and Methods: A retrospective chart review was conducted to identify patients diagnosed as either idiopathic NPH ($n = 55$) or PDD ($n = 55$), per clinical evaluation at the Benton Neuropsychology Laboratory, Department of Neurology, University of Iowa Hospitals and Clinics, during the last 20 years. A non-neurological older adult comparison sample ($n = 40$) was also included to evaluate the degree of deficit exhibited by the two patient samples.

Results: Analysis of neuropsychological performances indicated that the NPH group outperformed the PDD group on all measures of motor/praxis and executive function (all p values $< .05$). The NPH group also outperformed PDD on several measures of attention/concentration and visuospatial/visuoconstruction. Using discriminate function analysis, we were able to determine that two cognitive predictors, namely psychomotor speed and visual constructional praxis, correctly classified 71 percent of the patients into their respective clinical group (i.e., NPH or PDD).

Conclusions: Despite apparent overlap of behavioral presentation and cerebral involvement in NPH and PDD, the present study indicated a clear cognitive differentiation such that patients with PDD demonstrated greater severity of impairments than patients with NPH.

Correspondence: *Kija M. Weldon, BS, Neurology, University of Iowa College of Medicine, 2007 RCP, UIHC, 200 Hawkins Drive, Iowa City, IA 52242-1053. E-mail: kija-heintz@uiowa.edu*

L.L. WULFF, S. REICH, P. SHORT, L. SHULMAN, K. ANDERSON, L. GRATTAN, J. KENT, W. WEINER, A. CERNICH, E.L. BERCAW & R. KANE. Validation of the Automated Neuropsychological Assessment Metrics (ANAM) for Parkinson's Disease (PD).

Objective: Participants from the University of Maryland Parkinson's Disease Center were recruited to investigate the sensitivity of select measures from the ANAM test system to detect neurocognitive changes in mild PD.

Participants and Methods: ANAM sensitivity was assessed by comparing test findings with those derived from a longer traditional neuropsychological battery. ANAM is a brief computerized battery of neurocognitive measures that has shown sensitivity to the effects of neurological injury and disease. 61 participants with PD completed ANAM and a traditional neurocognitive battery; 54 controls completed ANAM. Performance on traditional measures was used to compute a comprehensive impairment index in order to distinguish PD patients evidencing impairment (IPD) from those who were cognitively-intact (NPD).

Results: From the PD sample, 13 were impaired (21%) and the remaining were cognitively-intact. Significant gender and age differences were found and controlled for in the remaining analyses. A series of linear regression analyses showed that IPD patients demonstrated poorer cognitive efficiency on nine ANAM tasks compared with NPD and controls ($p < .01$). NPD and controls did not differ with respect to ANAM performance. These scores were weighted so that each of the tasks contributed equally to an index score of cognitive efficiency. Linear regression analyses demonstrated that the battery as a whole was sensitive to cognitive impairment in patients with PD ($F(3, 93) = 18.95$, $p = .000$). **Conclusions:** Findings demonstrate that ANAM is sensitive to cognitive changes in PD. More importantly, individuals experiencing cognitive impairment perform differently on ANAM than do PD individuals who are cognitively-intact and controls.

Correspondence: *Laura L. Wulff, M.S., VA Maryland Healthcare System, 10 N. Greene St., Baltimore, MD 21202. E-mail: laura.wulff@gmail.com*

S.A. WYLIE, V. POWELL & C. MANNING. Flanker Effects in Parkinson's disease.

Objective: The flanker task measures the slowing of reaction time to a target stimulus when distractors signal a conflicting response. Some studies have found larger flanker effects in Parkinson's disease (PD) patients consistent with the view that the basal ganglia play a role in the inhibition of competing actions. However, not all studies find larger effects in PD. The current study examined the flanker effect in a much larger sample of PD patients to determine individual differences that might account for the discrepant findings.

Participants and Methods: Fifty PD patients with mild to moderate disease severity and 25 healthy elderly controls (HEC) similar in age completed an arrow version of the flanker task in which a target arrow was flanked by distractor arrows that corresponded to a congruent or an incongruent response.

Results: The PD group showed a significantly larger flanker effect than the HEC group, with about half of the PD patients showing flanker effects that exceeded the distribution of HEC effects. Distributional analyses implicated poorer inhibition of the conflicting response in PD patients with larger flanker effects. Clinical ratings of PD, disease duration/onset age, and mental status were poor predictors of flanker effects.

Conclusions: A subset of PD patients experience less efficient inhibition of conflicting responses that are signaled by distractors, but clinical ratings of key PD features do not appear to predict this effect. Additional factors that may offer better prediction of poor response inhibition in PD are discussed.

Correspondence: *Scott A. Wylie, Ph.D., Neurology, University of Virginia, 500 Ray C. Hunt Drive, Charlottesville, VA 22908. E-mail: saw6n@virginia.edu*

Dementia: Other (e.g., Semantic Dementia, FTD, VaD)

S. BANKS & S. WEINTRAUB. Insight in Behavioral Variant Frontotemporal Dementia, and Primary Progressive Aphasia.

Objective: The behavioral variant of frontotemporal dementia (bvFTD) and primary progressive aphasia (PPA) are two related forms of dementia. Whereas loss of insight is a core diagnostic criterion for bvFTD, according to research diagnostic criteria, in PPA insight is considered to be intact early in the illness, but to be lost progressively. In other forms of dementia, such as Alzheimer's disease (AD), insight into disease-related processes has been extensively studied and found to be a complex phenomenon. For example, insight can be lost for some symptoms (e.g. disinhibition), but be intact for others (e.g. memory loss). To date, there have been few studies of insight in bvFTD and PPA.

Participants and Methods: The present study used the Clinician's Insight Rating (CIR) scale to assess insight in bvFTD, PPA and probable AD patients. The CIR measures 4 aspects of dementia, awareness of situation (why the patient is seeing a clinician), specific awareness of cognitive or behavioral change, awareness of impairments in activities of daily living, and awareness of progression of the deficit.

Results: Results indicate that, predictably, insight is significantly more intact in PPA than in bvFTD patients, but interestingly there is a wide range in the degree of loss of insight in bvFTD patients. Loss of insight correlated with extent of naming difficulty as well as score on a measure of neuropsychiatric symptoms, suggesting that more severe deficits are seen in patients with less insight into their disease.

Conclusions: Overall, this study suggests that loss of insight in bvFTD and PPA is a complex phenomenon worthy of further investigation.

Correspondence: Sarah Banks, BSc, Cognitive Neurology and Alzheimer's Disease Center, Northwestern University, 320 E. Superior, Searle 11-569, Chicago, IL 60613. E-mail: s-banks2@northwestern.edu

B.M. BETTCHER, L. MACMULLEN, T. GIOVANNETTI & D. LIBON. Error Detection and Correction Patterns in Dementia.

Objective: Rapid error detection and correction is an important issue for neurologically impaired populations, as the inability to recognize and correct behaviors that deviate from established task parameters may impact an individual's ability to function autonomously. The study purports to clarify error detection and correction processes in dementia and determine neuropsychological correlates of error monitoring, specifically within the service of naturalistic activity.

Participants and Methods: Fifty-three participants were administered a neuropsychological protocol and the Naturalistic Action Test, which requires performance of three everyday tasks. Mean rates of error detection, correction, and error detection without correction were calculated for overall performance and individual error types. Correlations between error monitoring processes and neuropsychological tests of general cognitive capacity, executive functioning, visuoconstructional abilities, working memory, and episodic memory were also performed.

Results: Dementia patients detected 25% of their errors and corrected 16.12%. Dementia patients also detected 9% of their errors without subsequently correcting the error. Errors with stronger environmental feedback resulted in higher detection and correction rates (27-38% error correction). Error correction significantly correlated only with measures of executive ($r = .41, p = .003$) and visuoconstructional abilities ($r = -.31, p = .026$). In contrast, error detection (without correction) was not significantly correlated with neuropsychological tests.

Conclusions: Dementia patients detect and correct a small percentage of their errors; however, the results indicate that error monitoring may vary as a function of environmental feedback. Moreover, error correction, but not detection, necessitates preserved executive functioning and constructional abilities.

Correspondence: Brianne Magouirk Bettcher, Psychology, Temple University, 1701 N 13th Street, Weiss Hall, Philadelphia, PA 19122. E-mail: bettcher@temple.edu

A.J. BRAATEN, C.S. WILLIAMS, R. ELLAJOSYULA, S. ZIMMERMAN, P.D. SLOANE & D.I. KAUFER. Cognitive Screening in Assisted Living.

Objective: Compare diagnostic characteristics of brief cognitive screening tests in assisted living (AL) facility residents.

Participants and Methods: Participants: 146 subjects, aged 65 years or older, who did not have a dementia diagnosis, were recruited from 14 AL facilities in North Carolina.

Design: Prospective study using a structured medical and psychiatric history, neuropsychological test battery, and neurological examination to ascertain a consensus diagnosis of mild cognitive impairment (MCI), probable dementia, or no significant cognitive impairment.

Measurements: Diagnostic characteristics of the Mini-Cog, the standard Mini-Mental State Exam (MMSE), and a novel 20-point set of expanded MMSE items (MX-20) were compared.

Results: Overall, 55 of 146 (38%) participants were diagnosed with probable dementia, and 76 of 146 (52%) met criteria for MCI. Both the Mini-Cog and the MMSE showed high sensitivity for dementia, but had relatively low sensitivity for MCI. Preliminary reliability and validity data for the MX-20 were satisfactory. The Mini-Cog was reasonably good but somewhat less accurate as a dementia screen than either the MMSE or MX-20, whereas the MX-20 performed better as a screening test for MCI than either the MMSE or Mini-Cog.

Conclusions: The Mini-Cog may provide a useful cognitive screening test in AL settings based on its fairly high sensitivity and relative ease of administration. Preliminary data on the MX-20 suggest it may improve screening for MCI compared to the Mini-Cog and MMSE.

Correspondence: Alyssa J. Braaten, MS, Department of Rehabilitation Medicine, Emory University, 1013 Briarcliff Way, Atlanta, GA 30329. E-mail: alyssabraaten@hotmail.com

L. BRENNAN, T. GIOVANNETTI, B. BETTCHER, D.J. LIBON, K. DUEY & A.M. DISIMONE. The Impact of Goal Cues on Everyday Action Performance in Dementia.

Objective: There is little research on strategies to improve everyday action performance in dementia. Thus, two experiments were conducted to examine the benefit of goal reminders/cues on everyday action.

Participants and Methods: Study 1: 33 dementia participants (M MMSE = 22.2) were administered the Naturalistic Action Test (NAT), which requires performance of three everyday tasks. Task accomplishment and errors were coded. After indicating that they had finished a task, participants were presented a written/auditory cue of the task's goals and were allowed additional time to work (POST-TASK CUES). The number of additional task steps accomplished and number of errors corrected following the cues was recorded. A neuropsychological protocol was also administered. Study 2: 12 dementia participants (M MMSE = 22.7) were instructed to refer to a cue-card listing the task goal(s) while performing the NAT tasks (CONCURRENT CUES). Performance of CONCURRENT CUE participants was compared to a MMSE-matched group of POST-TASK CUE participants.

Results: Study 1: 72% of participants checked their work following POST-TASK CUES, but only 30% accomplished additional steps or corrected errors. Participants who obtained lower memory test scores corrected more errors following the POST-TASK CUES ($r = .40, p = .05$). Moreover, significantly more participants accomplished additional components (24% vs. 3%, $p < .01$) and corrected errors (0% vs. 15%, $p <$

.05) on NAT tasks that required completion of more than one goal (toast & coffee) versus a single goal (wrap a gift). Study 2: CONCURRENT CUE participants made significantly fewer errors than POST-TASK CUE participants (9.3 vs. 16.5; $z = 2.2$, $p < .05$); the groups did not differ on accomplishment scores.

Conclusions: Everyday action performance in dementia is impaired, in part, from forgetfulness/decay of the task goal, particularly on more complex tasks. The benefits of goal cues are maximized when they are available during the online planning and execution of everyday tasks.

Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

A.K. LAMARRE, B.J. HALLAM & H.H. FELDMAN. Cognitive and Personality Profiles of Individuals At-Risk for Frontotemporal Lobar Dementia with Tau-Negative, Ubiquitin-Immunoreactive Inclusions (FTLD-U).

Objective: Recent studies have identified a prodromal period of progressive cognitive dysfunction that precedes dementia diagnosis by 5-7 years. FTLD is a degenerative disorder characterized by insidious and progressive personality and behavioural disturbances such as loss of empathy and disinhibition, as well as cognitive deficits in attention and executive function. The current research seeks to characterize cognitive and personality markers in individuals who are genetically at-risk, but currently asymptomatic for an autosomal dominant form of FTLD-U.

Participants and Methods: Nine asymptomatic individuals having an affected family member with autopsy proven FTLD-U or clinically affected parent, underwent neuropsychological testing and completed the Psychopathic Personality Inventory-Revised (PPI-R). Cognitive performances falling -1 SD below the mean were considered clinically significant for presence of cognitive dysfunction. Elevations on subscales of the PPI-R falling above +1 SD above the mean were considered clinically significant.

Results: Descriptive statistics for neuropsychological measures revealed poor auditory attention span performance, $z = -1.11$ (California Verbal Learning Test - II, Trial 1). Measures of problem solving, $z = -0.99$ (Wisconsin Card Sorting Task-64, Nonperseverative Errors) and visuoconstruction, $z = -0.96$ (Rey Modified Figure) were also lower than expected. A scatter plot of PPI-R profiles revealed 5/9 individuals had elevations on such subscales as Nonconformity, Stress Immunity, Social Influence, Non-planfulness, Coldheartedness and Fearlessness.

Conclusions: Our data suggest the presence of a cognitive and behavioural prodromal phase of FTLD-U, which may aid in the early diagnosis and treatment of this disorder. Future analysis between mutation and non-mutation carriers will help further delineate an early disease phenotype for this disorder.

Correspondence: *Amanda K. LaMarre, MA, Psychology, University of British Columbia, 2136 West Mall, Vancouver, BC V6T 1Z4, Canada. E-mail: amanda@psych.ubc.ca*

J. LEVY, G.C. CHELUNE, E. ZAMRINI, J.M. HOFFMAN, A.Y. WANG & N.L. FOSTER. Pattern of Impaired Word Generation Differs in Frontotemporal Dementia and Alzheimer's Disease.

Objective: It is often difficult to clinically distinguish frontotemporal dementia (FTD) and Alzheimer's disease (AD). While previous studies have shown differences between FTD and AD on measures of new learning and executive functioning, we hypothesized that patients with FTD and AD perform differently on word generation tasks associated respectively with anterior and posterior temporal lobe pathology. We expected FTD patients to perform better on semantic/posterior word generation, and AD patients on phonemic/anterior word generation.

Participants and Methods: Four FTD patients (3M, 1F) and 6 AD patients (1M, 5F) participated in this study. All FTD patients had FDG-PET scans showing the expected pattern of glucose hypometabolism.

FTD and AD groups did not differ on age (Mean = 73), years of education (Mean = 13.3), or on global dementia severity (MMSE Mean Score = 20.5). The letters CFL were used for phonemic fluency and the categories animals, fruits, vegetables for phonemic and semantic fluency. Additional neuropsychological tests were used to assess five additional cognitive domains, including GENERALIZED INTELLIGENCE, OTHER LANGUAGE, MEMORY (recall & recognition), VISUOSPATIAL, and EXECUTIVE. Mixed plot ANOVA was used to analyze verbal fluency; t tests were employed for all other measures.

Results: Although the overall number of words generated did not differ by DIAGNOSIS ($p = .66$), there was a significant interaction between DIAGNOSIS and FLUENCY TYPE ($p < .01$), with AD showing better phonemic fluency and FTD demonstrating better semantic fluency. There were no additional significant findings on other study variables.

Conclusions: Differences in verbal and semantic fluency impairment are particularly robust in FTD when compared to AD. They were evident in our small group of subjects who had commensurate levels of amnesic memory loss, visuospatial impairment, and executive dysfunction. These differences in fluency correspond to known differences in anatomic distribution of pathology and may aid diagnosis.

Correspondence: *James Levy, Ph.D., Neurology, University of Utah, 650 Komas, #106A, Salt Lake City, UT 84108. E-mail: james.levy@hsc.utah.edu*

B.I. MILLER, J.K. HUERKAMP, J.A. SCHUMACHER & J.R. O'JILE. SSRIs and Cognitive Performance in Patients with Dementia.

Objective: The relationship between cognitive functioning and SSRI has been inconclusive. For example, in some studies, impairment in memory functioning with SSRI treatment has been implicated in both healthy and affective disordered participants (Wadsworth et al., 2005; Goldstein et al., 1998), whereas other research has reported improvement in working memory in depressed patients treated with SSRIs (Egashira et al., 2006; Zobel et al., 2004), even after controlling for improvement in depression (Levkovitch et al., 2002). Importantly, relatively few studies have examined the relationship between memory and SSRI use in demented patients (Deakin et al., 2004). The objective of this study was to assess memory functioning among non-depressed demented patients on SSRIs and patients not on psychotropic medications.

Participants and Methods: Fifty nine adults (33 on SSRI; 26 not on SSRI) with a diagnosis of dementia (i.e., vascular, due to medical cause, frontal, NOS) completed the WAIS-III, Dementia Rating Scale-2, Trail Making Test A and B, Logical Memory and Visual Reproduction subtests of WMS-III, BDI-II, and State-Trait Anxiety Inventory as part of a larger neuropsychological battery.

Results: Results of a series of independent t-tests revealed that patients on SSRIs performed significantly better than patients not on SSRIs on Trail Making Test B ($t(41) = 2.55$, $p = .01$) and Logical Memory II ($t(43) = 2.10$, $p < .05$). No other significant differences emerged between groups.

Conclusions: To date, SSRI use has been correlated with both improvement and impairment in memory. Results from the present study suggest SSRI use with demented non-depressed patients, may selectively improve various aspects of memory function with no impairments observed. Moreover, these results provide additional support for SSRI use with memory dysfunction and the role of serotonin in memory functioning.

Correspondence: *Brian I. Miller, M.S., Psychiatry, University of Mississippi Medical Center, 2500 North State Street, Jackson, MS 39216. E-mail: brian.i.miller@okstate.edu*

E. MORGAN, T.J. FERMAN, J.A. LUCAS & N.R. GRAFF-RADFORD. Perceptual Errors on the Boston Naming Test in Dementia with Lewy Bodies.

Objective: Visual disturbance and visual impairments may be seen in Dementia with Lewy Bodies (DLB). The present study compared performance of patients with DLB and Alzheimer's disease (AD) on the Boston Naming Test (Goodglass & Kaplan, 1983).

Participants and Methods: The sample consisted of 40 patients with DLB and 44 patients with AD. Naming errors were classified as perceptual, semantic, and other (phonemic, circumlocution, etc.). Error scores were calculated for perceptual errors and semantic errors as a proportion (percentage) of total number of errors. Independent t-tests were used to compare the groups.

Results: The groups did not differ significantly on number of semantic errors or total BNT score. However, LBD patients made significantly more perceptual errors than AD patients.

Conclusions: The results suggest that patients with DLB demonstrate greater impairment in visual perception than patients with AD.

Correspondence: *Elizabeth Morgan, Ph.D., Mayo Clinic Jacksonville, 784 Bonaire Circle, Jacksonville Beach, FL 32250. E-mail: emorgan55@yahoo.com*

A. NEWMAN. The Role of Neuropsychology in the Diagnosis of Depression vs. Dementia: Three Variations on a Theme.

Objective: Depression and dementia may be easily confused in older individuals because of overlapping symptoms. Furthermore, there is increasing empirical evidence of a biological relationship between the disorders. Three cases are described which illustrate the role of neuropsychological evaluations in understanding different facets of this complex relationship.

Participants and Methods: Case 1 describes a 57 year old male who was diagnosed and unsuccessfully treated for depression for 1 year prior to the neuropsychological assessment which suggested a frontotemporal dementia. Case 2 describes an 87 year old male who was referred for an evaluation of dementia and showed evidence of a primary diagnosis of depression. Case 3 describes a 76 year old female whose evaluation showed evidence of both dementia and depression.

Results: The history and neuropsychological data are presented in each case. In Case 1, there was significant executive and memory dysfunction as well as behavioral and personality changes but no evidence of depressed mood. In Case 2, the patient described depression and showed multiple signs of poor effort and apathy but no significant cognitive deficits, although research suggests that he is at risk for eventually developing dementia. In Case 3, the patient showed cognitive deficits independent of poor effort and psychomotor slowing as well as symptoms of a mood disorder.

Conclusions: In each case, neuropsychological assessments were helpful in clarifying the clinical picture and guiding treatment. These cases are described in the context of a growing body of research that suggests a complex biological and cognitive-behavioral relationship between the two disorders.

Correspondence: *Anne Newman, Ph.D., Private Practice, 4701 Willard Ave., Suite 233, Chevy Chase, MD 20815. E-mail: acn2@erols.com*

C. ORIETA-BARBALACE, J. WONG, R. CASAS & J. RAZANI. Neuropsychological and Functional Impairment Measures as Correlates of Caregiver's Burden.

Objective: Past research has demonstrated that caregivers of patients with dementia experience significant stress and psychological distress (e.g., increased levels of depression; Clyburn et al., 2000). The aim of this project was to understand how neuropsychological and functional impairment in dementia patients correlates with the levels of burden and psychological distress experienced by their caregivers.

Participants and Methods: Thirty-five dyads of dementia patients and caregivers participated. Patients with Alzheimer's disease, Vascular dementia and frontotemporal dementia performed an observation-based functional task, the Direct Assessment of Functional Ability (DAFS), along with tasks of memory (California Verbal Learning Test, Rey-O

Complex Figure Drawing), executive functioning (Wisconsin Sorting Card Test), information processing (Trail making Part A, Stroop Reading, Stroop Color) and language (verbal and category fluency). Caregivers completed the Caregiver Burden Inventory and the Brief Symptom Inventory.

Results: Patients' neuropsychological test scores were transformed into z-scores and then averaged so that one composite score was obtained for each of the following cognitive domains: memory, executive skills, language, and information processing. The results of bivariate correlations revealed that caregivers' scores of psychological distress correlated best with patients' functional abilities (e.g., the poorer the patients financial skills the greater the caregiver's hostility), but not with the neuropsychological composite scores. Additionally, caregivers' scores on the Caregiver Burden Inventory correlated positively with their level of reported psychological distress (e.g., as caregiver burden increased so did depression and hostility).

Conclusions: These results suggest that level of functional impairment in dementia patients may better predict caregiver burden and psychological distress, than their neuropsychological test scores.

Correspondence: *Carla Orieta-Barbalace, CalState University Northridge, 20544 Gresham St, Winnetka, CA 91306. E-mail: carla.barbalace.17@csun.edu*

J. OSHER & N. JOHNSON. Tracking Disease Progression in Behavioral Variant Frontotemporal Dementia and Primary Progressive Aphasia.

Objective: The Mini Mental State Examination (MMSE) and measures of activities of daily living are commonly used to track disease severity and progression in Alzheimer's disease (AD). However, there is little information regarding the usefulness of these measures in non-AD dementias. Behavioral variant Frontotemporal Dementia (bvFTD) and Primary Progressive Aphasia (PPA) are two non-amnesic clinical syndromes characterized by comporment/executive function and language deficits, respectively. The current study was carried out to determine: 1) if the MMSE and Activities of Daily Living Questionnaire (ADLQ; a caregiver-completed survey of functional impairment) measure similar levels of dementia severity/progression in bvFTD and PPA and, 2) how functional impairments in specific activities of daily living differ in these two disorders.

Participants and Methods: Retrospective data from 34 bvFTD patients and 28 PPA patients were analyzed. Scores were converted to change scores (difference between final and baseline visits divided by years between evaluations) for correlational analysis.

Results: Changes in bvFTD patients' MMSE and ADLQ scores over time were significantly correlated while PPA patients' MMSE scores showed a greater change over time than their ADLQ scores. Except in measures of baseline communication abilities, bvFTD patients were more impaired in all ADLQ subtests at baseline and final visit than PPA patients and the patient groups showed differing patterns of decline on ADLQ subtests.

Conclusions: MMSE items may be more sensitive to language decline in patients with PPA but may not reflect their functional capacity. In contrast, executive dysfunction in bvFTD likely interferes with both MMSE performance and functional ability measured by the ADLQ equally.

Correspondence: *Jason Osher, Northwestern University, 320 E. Superior St, Searle 11-447, Chicago, IL 60611. E-mail: jason-osher@northwestern.edu*

L. QUITANIA, D. CAHN-WEINER, V. BECKMAN, K. FREEMAN, D. DEAN, C. HALABI, B.L. MILLER & J.H. KRAMER. Frontal Lobe Correlates of Functional Decline in AD and FTLT.

Objective: Executive impairment has been shown to be an important predictor of functional impairment in dementia. To address this issue,

we examined the MRI correlates of functional impairment in two neuroanatomically distinct patient groups, Alzheimer's Disease (AD) and Frontotemporal Lobar Degeneration (FTLD). Because of the importance of the right frontal region in behavioral regulation and executive functioning, we hypothesized that this region would significantly predict functional impairment in both groups.

Participants and Methods: Participants included 55 FTLD (age=61.88, MMSE=25.27) and 33 AD subjects (age=63.148, MMSE=22.76). The Functional Activities Questionnaire (FAQ) was our index for functional decline. MRI images were processed using BRAINS2 software to yield left and right frontal, temporal, and parietal lobar volumes.

Using hierarchical multiple regressions, we constructed separate models for each group with total intracranial volume (TIV), MMSE, and age entered in the first step, temporal, parietal and left frontal lobes in the second, and right frontal was entered in the final step.

Results: After controlling for TIV, age, MMSE, and other brain regions, right frontal volume explained an additional 20.0% of the variance ($p<.05$) in FAQ in AD, and an additional 10.5% of the variance ($p<.05$) in FTLD.

Conclusions: In two neuroanatomically distinct patient groups of FTLD and AD, right frontal volumes significantly predicts functional impairment even after accounting for MMSE, age, and other lobar volumes. Our findings suggest that functional decline relates to cortical atrophy in the right frontal lobe, and not global deterioration. Lastly, our findings support use of structural imaging when correlating tissue loss with real world function.

Correspondence: *Lovingly Quitania, MA, Neurology, UCSF Memory and Aging Center, 350 Parnassus Ave. Suite 706, San Francisco, CA 94143-1207. E-mail: lquitania@memory.ucsf.edu*

C.A. RACINE, G.D. RABINOVICI, A.J. FURST, J.H. KRAMER, H.J. ROSEN, W. JAGUST & B.L. MILLER. Neuropsychological Profiles of Patients with Clinical Diagnoses of Frontotemporal Lobar Degeneration and Positive Findings on Amyloid PET Imaging with Pittsburgh Compound-B.

Objective: Differential diagnosis of frontotemporal lobar degeneration (FTLD) and Alzheimer's Disease (AD) remains difficult due to overlapping clinical features. 11C-PIB is a new PET tracer that enables in vivo imaging of A β amyloid deposits associated with AD. Some clinically-diagnosed FTLD patients have been found to demonstrate elevated cortical 11C-PIB retention (FTLD/PIB+), which suggests these patients may be atypical presentations of AD. To test this hypothesis, we examined neuropsychological profiles in FTLD/PIB+ patients.

Participants and Methods: Patients meeting research criteria for AD (N = 7) and FTLD (N = 12) underwent PET imaging with 11C-PIB. Elevated cortical 11C-PIB retention was observed in all seven AD and 4/12 FTLD patients (N=2 Semantic Dementia (SD+), N=2 Fronto-temporal Dementia (FTD+)).

Results: One SD+ had restricted semantic loss, consistent with clinical SD, while the other SD+ had semantic loss and verbal memory deficits, consistent with either SD or AD. One FTD+ had deficits in executive function, naming and memory, consistent with either FTD or AD. The other FTD+ was dominated by behavioral symptoms; however, he was also impaired on memory and visual-spatial skills, a pattern suggestive of AD.

Conclusions: Of the four FTLD/PIB+ patients, one had a neuropsychological profile more consistent with AD, one had a classic profile for SD, and two had neuropsychological profiles potentially consistent with FTLD or AD. These results suggest that a number of the FTLD/PIB+ patients may represent atypical presentations of AD; however, pathological diagnosis will be required to determine the specificity of 11C-PIB PET in the differential diagnosis of FTLD and AD.

Correspondence: *Caroline A. Racine, Ph.D., Neurology, University of California San Francisco, 350 Parnassus Ave., Suite 706, San Francisco, CA 94143. E-mail: caroline.racine@gmail.com*

B.J. RAUDABAUGH, S. GLENN, C.M. STANLEY, J.H. KRAMER, B.L. MILLER & K.P. RANKIN. Self-Concept and Insight in FTLD, AD, CBD and PSP.

Objective: Though loss of self-awareness is suspected to result from some dementias, this has not been well-characterized. In particular, psychometrically validated measures have never been used to assess self-concept and insight in atypical dementias like semantic dementia (SD), corticobasal degeneration (CBD), and progressive supranuclear palsy (PSP). Because previous research suggests frontotemporal dementia (FTD) causes poorer self-awareness of personality than Alzheimer's (AD), we hypothesized that dementias causing predominantly frontal damage would cause the most inaccurate self-concept.

Participants and Methods: Sixty-six subjects (13 FTD, 18 AD, 10 SD, 5 CBD, 5 PSP, 15 normal controls [NC]) completed the Tennessee Self Concept Scale (TSCS-2) describing physical, moral, personal, family, and social self-concept. First-degree relative informants also rated subjects on the TSCS-2 to provide an objective behavioral assessment. GLMs and Dunnett-Hsu post-hoc procedures, controlling for age, sex, and education, were performed comparing patients to NCs on (Informant-Subject) difference scores.

Results: FTDs showed abnormal insight ($p<.05$) on all 5 self-concept subscales (Diff: FTD:-24.9 \pm 13.8, NC:3.5 \pm 7.3), while SDs showed abnormal insight into moral, personal, and social behavior. PSPs and CBDs showed abnormal insight into personal behavior ($p<.05$) because they positively endorsed "I solve my problems quite easily" while informants disagreed. ADs' insight did not differ from NCs. Patients rated themselves more favorably than did their informants, while NCs' ratings were more negative.

Conclusions: We found objective evidence of inaccurate self-concept in FTD and SD. Lack of insight in PSP/CBD may be limited to overestimating problem-solving ability. This suggests medial frontal areas damaged in FTD/SD but more spared in PSP/CBD may mediate insight.

Correspondence: *Benjamin J. Raudabaugh, Neurology, University of California, San Francisco, 350 Parnassus Ave, Suite 706, San Francisco, CA, CA 94117. E-mail: braudabaugh@memory.ucsf.edu*

V. WILLIAMS, H. WESTERVELT & S. RIZVI. Intact Odor Identification in a Patient with Creutzfeldt- Jakob Disease.

Objective: Odor identification deficits are common across a variety of neurodegenerative conditions. Additionally, there are reports that the abnormal prion protein in sporadic Creutzfeldt-Jakob Disease (sCJD) is found in the olfactory epithelium and central olfactory pathways. These factors suggest that olfactory deficits would be expected in CJD. We present the first case of odor identification performance in a patient with likely CJD.

Participants and Methods: A 68-year-old woman presented with a rapidly progressive dementia, positive 14-3-3 protein, abnormal cortical diffusion on diffusion-weighted MRI, and abnormal but nonspecific EEG findings. Other work-up included a normal neurologic examination, negative paraneoplastic panel, and mostly normal cerebrospinal fluid chemistries.

Results: The Brief Smell Identification Test (BSIT) was given during a comprehensive neuropsychological evaluation approximately four months into the course of her illness. She correctly identified 10 of 12 items, performing in the average range (38th %ile). She demonstrated mild impairment in executive functioning, pronounced deficits in aspects of language, learning, and free recall as well as mood lability. Her cognition continued to rapidly decline, and she progressed to a state of akinetic mutism within two months, and died three months following evaluation.

Conclusions: Odor identification may be helpful in distinguishing early CJD from other neurodegenerative conditions, in which olfactory deficits are common.

Correspondence: *Vanessa G. Williams, PhD, Psychiatry, Brown Medical School, 67 Ring Street, Apt 1, Providence, RI 02909. E-mail: vanessa_williams@brown.edu*

V.G. WILLIAMS, H. WESTERVELT, J.M. BRUCE, J.D. DAVIS, P. MALLOY, J. GRACE & G. TREMONT. Error Type on the Boston Naming Test Distinguishes Between Dementia with Lewy Bodies and Alzheimer's Disease.

Objective: Impaired naming is common among persons with dementia. However, little is known about how specific error types may differentiate common causes of dementia. Recent research has suggested that persons with dementia with Lewy bodies (DLB) have more visuospatial dysfunction than those with Alzheimer's disease (AD). These deficits may impact their ability to correctly perceive and name stimuli. The current retrospective study evaluated the presence and frequency of error types among patients with DLB and AD on the Boston Naming Test (BNT).

Participants and Methods: Errors on the BNT were classified into four types (i.e., visuospatial, semantic, phonemic, and no response), and performance was compared among 31 patients with probable DLB and 31 probable AD patients matched for age, gender, education, and overall level of cognitive functioning.

Results: AD patients performed significantly worse on the BNT than DLB patients ($p < .05$). Analysis of error type revealed significant group differences in number of visuospatial and semantic errors. DLB patients made significantly more visuospatial errors ($p < .05$) while AD patients made significantly more semantic errors ($p < .001$). Logistic regression revealed that number and percentage of visuospatial and semantic errors significantly predicted group membership ($p < .005$), with an accuracy of up to 85%.

Conclusions: Results suggest that an error analysis of the BNT may be useful in distinguishing between patients with DLB and AD.

Correspondence: *Vanessa G. Williams, PhD, Psychiatry, Brown Medical School, 67 Ring Street, Apt 1, Providence, RI 02909. E-mail: vanessa_williams@brown.edu*

Genetic Disorders

N. CARLOZZI, J.C. STOUT, S. QUELLER, A. SOLOMON, K. DUFF, L. BEGLINGER, D. LANGBEHN & J. PAULSEN. Assessment of Intellectual Functioning in Pre-diagnostic Huntington's Disease.

Objective: Intelligence is related to performance on many cognitive tests. Controlling for IQ in neurodegenerative populations is thought to differentiate disease-related effects from those due to preexisting intellectual ability. However, IQ measures may also be sensitive to disease processes, which could bias against detecting disease-related effects. We examined whether IQ estimates were related to estimates of proximity to disease diagnosis and motor signs in pre-diagnostic Huntington's disease (pre-HD).

Participants and Methods: 531 CAG-expanded pre-HD and 71 CAG-normal participants from the Predict-HD study completed the American National Adult Reading Test (AMNART), as an estimate of pre-morbid IQ (PMIQ), and the two subtest version of the Wechsler Abbreviated Scale of Intelligence (WASI) as an estimate of current IQ.

Results: Closer proximity to disease diagnosis (based on CAG repeat length, age, and difference from parent age at onset) was associated with lower AMNART and WASI IQ estimates ($p < .02$), after controlling for age, education and gender. However, proximity to disease onset only accounted for a small portion of the variance in IQ estimates (partial $R^2 = .05$ and $.07$, for AMNART and WASI respectively).

Conclusions: Estimates of current and pre-morbid intelligence are sensitive to disease-related changes in pre-HD and may underestimate true intellectual abilities, particularly for individuals who are closer to diagnosis. Thus, caution may be warranted when using these estimates to control for IQ in research settings. However, given the small effect size, additional work is needed to determine whether the influence of disease processes on IQ estimates is clinically significant.

Correspondence: *Noelle Carlozzi, Ph.D., Department of Psychological and Brain Sciences, Indiana University, 2784 N Andy Way, Bloomington, IN 47404. E-mail: ncarlozz@indiana.edu*

J.C. STOUT, S. QUELLER, D.R. LANGBEHN, S.A. JOHNSON, N. CARLOZZI, T.K. MIURA, A.C. SOLOMON, C.B. CRUCE, L. BEGLINGER, K. DUFF, E.H. AYLWARD & J.S. PAULSEN. Detecting Cognitive Changes in Pre-Diagnosis HD in the Predict-HD Study.

Objective: Huntington's disease (HD) is a mid-life onset, genetic neurodegenerative disease that causes decline in motor, cognitive, and psychiatric function and premature death. To test candidate compounds' abilities to delay clinical onset and slow disease progression, markers are needed that reliably track the earliest signs of disease pathology. We report cross-sectional and longitudinal sensitivity to disease progression for 18 cognitive measures from Predict-HD, a longitudinal, prospective study aimed at validating markers of disease progression in the pre-diagnosis period of HD.

Participants and Methods: For 601 CAG-expanded individuals, we related baseline values of each measure to probability of disease onset within 5 years (based on age and CAG expansion; Langbehn et al., 2004) and to volumetric measures of the striatum. Additionally, repeated measures analyses assessed change over 2 years in 189 CAG-expanded individuals versus 32 controls.

Results: At baseline, most of the cognitive measures were significantly related to probability of onset within 5 years (partial r^2 up to $.17$); some were also related to striatal volumes. Importantly, several of these measures also revealed different patterns of change over a two year period in individuals who were estimated to be within 10 years of onset as compared to controls.

Conclusions: At baseline, motor and psychomotor measures showed the greatest sensitivity to disease progression. Measures of executive function, learning and memory, emotion recognition, and olfactory processing also were associated with estimated proximity to onset and striatal volumes. Longitudinal analyses corroborate these findings, suggesting that cognitive measures may be useful markers of treatment effectiveness in clinical trials.

Correspondence: *Sarah Queller, Ph. D., Psychological and Brain Sciences, Indiana University, 1101 E. 10th St, Bloomington, IN 47401. E-mail: queller@indiana.edu*

A.B. TOMUSK, S. QUELLER, J.S. STOUT, S. HASTINGS & B. WALKER. Sensitivity of the UHDRS Cognitive Tests in Pre-Diagnosis and Early Huntington's Disease (HD).

Objective: The cognitive component of the Unified Huntington's Disease Rating Scale (UHDRS), which includes the Stroop, Letter Fluency, and Symbol Digit Modalities Tests, was developed and validated on patients with moderate to severe HD (Huntington Study Group, 1996). Because of growing attention to cognitive changes in pre-diagnosis and early HD, we examined the relative sensitivity of each of the UHDRS cognitive tasks in earlier phases of HD.

Participants and Methods: We conducted a systematic review of the literature published since 1993 (advent of PCR genetic analysis) to identify studies that: 1] compared pre-diagnosis or early HD (<5 years since diagnosis) to a gene-negative control group and 2] contained sufficient data on a UHDRS cognitive test to compute effect sizes (ESs).

Results: Using meta-analysis to estimate ESs (reported as standard difference in the means, or d) we found, as expected, the largest ESs in early HD (d ranging from -0.86 to -2.22 ; $p < 0.05$ across all UHDRS cognitive tests) in both cross-sectional and longitudinal studies. Cross-sectional studies in pre-diagnosis HD indicated statistically significant ESs for the Word and Color conditions of the Stroop ($d = -0.36$; $p = 0.05$, and $d = -0.31$; $p = 0.01$, respectively), as well as Letter Fluency ($d = -0.59$;

$p=0.01$). In the small number of longitudinal studies, however, the Interference condition of the Stroop, along with Letter Fluency, had ESs that approached significance in pre-diagnosis HD. Symbol Digit ESs were not significant in longitudinal or cross-sectional studies of pre-diagnosis HD.

Conclusions: All UHDRS cognitive tests were sensitive during early HD but heterogeneity in proximity to onset may complicate the quantification of test sensitivity in pre-diagnosis HD.

Correspondence: *Allison B. Tomusk, Ph.D., Department of Psychological and Brain Sciences, Indiana University, 1101 E. 10th Street, Bloomington, IN 47405. E-mail: atomusk@indiana.edu*

Symposium 4

1:30–3:00 p.m.

Neuropsychological Research in Late Life Mental Disorders: Innovative Directions and Opportunities

Chair: Jovier Evans

J.D. EVANS, F. GUNNING-DIXON, G.N. SAVLA, B.T. MAST, E.W. TWAMLEY & R.K. BHALLA. Neuropsychological Research in Late Life Mental Disorders: Innovative Directions and Opportunities.

Symposium Description: This symposium will highlight current work and future directions in behavioral science and clinical neuroscience research for their relevance in understanding late-life mental disorders. Presentation topics will include: (1) Neuropsychological aspects of vascular depression syndrome; (2) Cognitive rehabilitation and remediation research in older schizophrenia participants; (3) Stability of cognitive deficits in late life bipolar disorder; and (4) Profiles of cognitive outcome following treatment of late life major depression. In addition, an overview of the National Institute of Mental Health (NIMH) Geriatrics Research branch structure and its priorities for research will be reviewed. An integrative discussion will provide synthesis of this work in relation to other aspects of imaging and treatment response research. Correspondence: *Jovier D. Evans, Ph.D., NIMH, 6001 Executive Blvd, Room 7160 MSC 9635, Bethesda, MD 20892-9635. E-mail: jevans1@mail.nih.gov*

G.N. SAVLA, C.A. DEPP, D.V. JESTE & B.W. PALMER. Stability of Neurocognitive Deficits in Middle-Aged and Older Adults with Bipolar Disorder.

Objective: Cross-sectional studies of bipolar disorder (BD) suggest worsening of neuropsychological deficits, as opposed to the generally stable deficits associated with schizophrenia (SC). However, there have been few published longitudinal studies of cognitive function in BD, and none in older adults.

Participants and Methods: We compared the 1-3 year longitudinal course of cognitive functioning among middle-aged and older (>40 years) outpatients with BD (N=42), SC (N=42), or healthy comparison participants (HCs; N=42). Samples were matched on age (total M=58.9, SD=10.1), and test-retest interval (total M=16.5 months, SD=7.0). Patient groups had mild levels of affective or psychotic symptoms at baseline. A comprehensive neuropsychological (NP) battery was administered that included measures of verbal skills, attention/working memory, verbal and visual memory, processing speed, and executive functioning. Test-retest demographically-corrected T-scores for each index were examined using naïve analysis, in which average slopes for the groups were compared using ANOVAs.

Results: At baseline, people with BD performed significantly worse [global NP index T-score=42.3 (6.2)] than the HCs [T-score=49.5 (5.0); $p<.001$]. They were not significantly different than the SC group [T-score=39.2 (7.9); $p=.13$]. The slopes of outpatients with BD were stable on the global index and all six domains, similar to age-comparable rates of change in HCs and outpatients with SC (p values=.211-.769). There was no effect observed of duration of illness, or baseline psychopathology on course of cognitive functioning.

Conclusions: In conclusion, cognitive deficits in BD were generally stable over a 1-3 year period, and thus appear to be a persistent feature of later-life BD.

Correspondence: *Jovier D. Evans, Ph.D., NIMH, 6001 Executive Blvd, Room 7160 MSC 9635, Bethesda, MD 20892-9635. E-mail: jevans1@mail.nih.gov*

R.K. BHALLA, M.A. BUTTERS, J.T. BECKER, S.T. DEKOSKY & C.F. REYNOLDS. Prevalence and Classification of Cognitive Outcomes Following Remission of Depression in the Elderly.

Objective: In non-depressed elderly, epidemiologic and case-control studies in MCI report varying rates of MCI subtypes and differential dementia risk. Late-life depression (LLD) is a risk factor for persistent cognitive impairment and future dementia, although knowledge about underlying linking pathways is limited. This study examines rates and types of cognitive diagnoses among LLD patients following depression remission.

Participants and Methods: We compared cognitive diagnoses in 90 subjects age 60+, meeting criteria for current episode of unipolar major depression, without formal dementia diagnosis, following successful depression treatment and 26 never-depressed, age-and-education-equated elderly comparison subjects. Cognitive diagnoses were independently adjudicated by the University of Pittsburgh ADRC according to NACC guidelines.

Results: Relative to comparison subjects, more remitted patients were adjudicated with a cognitive disorder ($\chi^2(1, N=116)=6.12, p<.05$). Of 90 patients, 41(46%) had no cognitive disorder, 38(42%) had MCI, and 11(12%) had dementia (9/11 with possible or probable AD). Further breakdown by MCI subtype revealed 3(8%) patients met criteria for MCI-amnesic single domain, 16(42%) for MCI-amnesic multiple domain, 8(21%) for MCI-non-amnesic single domain, and 11(29%) for MCI-non-amnesic multiple domain. Of 26 comparison subjects, 19(73%) had no cognitive disorder, 6(23%) had MCI, and 1(4%) had dementia (probable AD).

Conclusions: Despite depression remission, 54% of patients were adjudicated with a cognitive disorder. Of MCI patients, only half had memory impairment, typically in conjunction with additional impaired domains. These impaired patients are likely at increased risk for further cognitive deterioration and eventual dementia. Further longitudinal follow-up is required to characterize dementia risk and subtypes in LLD. Correspondence: *Jovier D. Evans, Ph.D., NIMH, 6001 Executive Blvd, Room 7160 MSC 9635, Bethesda, MD 20892-9635. E-mail: jevans1@mail.nih.gov*

E.W. TWAMLEY, D.I. SITZER, T.L. PATTERSON & D.V. JESTE.
Can Old Dogs Learn New Tricks? Neuropsychological Status and Cognitive Training Outcomes in Psychosis.

Objective: Individuals with schizophrenia experience neuropsychological and functional impairments, which may be improved with psychosocial treatments. Cognitive Training (CT) is a manualized, 12-week program focusing on prospective memory, attention, learning and memory, and executive functioning. We examined age and initial neuropsychological status as predictors of improvement with CT compared to standard pharmacotherapy alone. We hypothesized that better neuropsychological functioning at baseline, but not age, would predict CT-associated improvement.

Participants and Methods: 35 outpatients with schizophrenia or related psychotic disorders participated in a 6-month randomized controlled trial (71% male, 66% Caucasian, mean age=49, mean years of education=13). Measures, administered at baseline, 3 months, and 6 months, included neuropsychological performance (forward digit span; Hopkins Verbal Learning Test; Wisconsin Card Sorting Test; Memory for Intentions Screening Test) and everyday functioning capacity (UCSD Performance-Based Skills Assessment; UPSA). Repeated measures ANOVA and Pearson correlations were used to analyze the data.

Results: CT participants improved differentially in verbal delayed memory ($F=6.5$, $p=.007$) and UPSA performance ($F=6.2$, $p=.005$). Global neuropsychological performance at baseline was not associated with any change measure. All correlations between age and cognitive or functional improvement were positive; the correlation between age and forward digit span improvement was significant at 3 months ($r=.78$, $p=.037$).

Conclusions: CT led to improvements in verbal delayed memory and everyday functioning capacity. Neuropsychological and functional capacity improvements were not associated with initial neuropsychological functioning or age, except that older participants improved more in attention. CT appears to improve cognition and functional capacity regardless of age or initial neuropsychological impairment.

Correspondence: *Jovier D. Evans, Ph.D., NIMH, 6001 Executive Blvd, Room 7160 MSC 9635, Bethesda, MD 20892-9635. E-mail: jevans1@mail.nih.gov*

B.T. MAST. Vascular Risk, Executive Dysfunction and Geriatric Depression: A Review.

Objective: The concept of vascular depression has received considerable research attention over the past several years and has been defined as a potential subtype of geriatric depression characterized by cerebrovascular disease particularly within the frontal-subcortical brain structures. This presentation will review the literature concerning the link between vascular disease and depression in late life, and the potential role of executive functioning and other frontal syndromes in vascular depression.

Participants and Methods: A review of cross-sectional and longitudinal studies concerning the link between vascular risk, depression and executive dysfunction will be presented. Several study samples will be utilized including community dwelling elders, primary care and geriatric rehabilitation patients

Results: Across diverse samples there was a significant link between vascular risk and depressive symptoms. Executive dysfunction appears to co-occur with vascular risk factors and depression in some older adults.

Conclusions: Results across a variety of study samples support the vascular depression construct. Executive dysfunction and other frontal syndromes may be an important aspect of the vascular depression syndrome. This syndrome may be useful in predicting subsequent cognitive decline and dementia among individuals with depression.

Correspondence: *Jovier D. Evans, Ph.D., NIMH, 6001 Executive Blvd, Room 7160 MSC 9635, Bethesda, MD 20892-9635. E-mail: jevans1@mail.nih.gov*

Poster Session 5: Intervention and Assessment

2:15–3:45 p.m.

Assessment/Psychometrics

A.M. ANDERSON, B.M. SKOBLAR, T. WHITE, C. JACOBSON, I.H. FERNANDEZ, K.D. FOOTE, M.S. OKUN & D. BOWERS. Selection of Normative Reference Data Influences Clinical Considerations.

Objective: Clinical assessment of neuropsychological functioning fundamentally relies on the comparison of patient data to normative data collected from healthy individuals. Normative reference groups are selected to minimize the effects of factors known to influence neuropsychological test performance, such as age, education, sex, and race. This study sought to determine whether normative data from two widely published sources applied to the same clinical sample would result in significantly different standard scores and, subsequently, disparate inferences of impairment.

Participants and Methods: We examined test data from 379 neuropsychological evaluations conducted within the Movement Disorders Center at Shands Hospital at the University of Florida. Patients' raw test scores on the Boston Naming Test, Controlled Oral Word Association test, Animal Naming test, and Trail Making Test Parts A and B were converted to demographically adjusted T-scores according to normative data published in (1) Revised Comprehensive Norms for an Expanded Halstead-Reitan Battery (Heaton et al., 2004) and (2) A Compendium of Neuropsychological Tests, 2nd Edition (Spren & Strauss, 1998). Paired samples t-tests were used to determine whether the T-scores derived from the two sources differed significantly.

Results: The two normative data sets yielded significantly different T-scores for all measures except Part B of the Trail Making Test. Utilizing the Heaton norms, a significantly greater number of cases produced scores in the impaired range ($T \leq 35$) on the COWA, Animal Naming, and Part A of the Trail Making Test.

Conclusions: In this clinical population of 379 cases, the application of different normative data yielded significantly different T scores. Thus, the clinician's selection of a normative reference group has important clinical implications.

Correspondence: *Ashton M. Anderson, Psy.D., Clinical and Health Psychology, University of Florida, 333 NW 48th Blvd., Gainesville, FL 32607. E-mail: ashpsyc@hotmail.com*

L. ASHENDORF, A.L. JEFFERSON, R.C. GREEN & R.A. STERN. Grooved Pegboard Test Performance Among Cognitively Normal Elders and Individuals with MCI.

Objective: The Grooved Pegboard Test (GPT) is a measure of manual dexterity and motor speed. To date, older adults have been underrepresented in the test's normative literature despite the strong relationship between advancing age and slowing GPT performance. Our objective was to provide elderly normative GPT data and to examine GPT performances among cognitively intact participants and individuals with mild cognitive impairment (MCI).

Participants and Methods: Participants were enrolled through the Boston University Alzheimer's Disease Core Center patient/control registry. The sample ranged from 50–89 years (71.5±8.1 years, 61.6% female) and included cognitively normal elders (n=155) and individuals with MCI (n=139). Consensus diagnoses were made by a multidisciplinary diagnostic team. GPT performance was recorded in seconds for dominant and non-dominant hands.

Results: Age and education, but not gender, were found to be related to GPT performance among the cognitively intact sample; therefore,

normative data for dominant and non-dominant hand performance are presented by age (56-69, 70-79, and 80-89) and education (<16 years and college graduates). An ANCOVA (controlling for age, education, and sex) revealed diagnostic group differences in the expected direction (i.e., cognitively normal elders > MCI) for both dominant and non-dominant hands.

Conclusions: Among cognitively normal elders, GPT performance is related to age and education. As expected, cognitively normal elders outperform MCI participants. This finding is likely related to reduced dexterity with evolving cognitive decline.

Supported by NIH grants P30-AG13846 and M01-RR00533

Correspondence: *Lee Ashendorf, Ph.D., Psychology; Edith Nourse Rogers Memorial Veterans Hospital, 200 Springs Road, 116B, Bedford, MA 01730. E-mail: lash@bu.edu*

B.L. BROOKS, G.L. IVERSON & T. WHITE. Low Neuropsychological Test Scores are Common in Healthy Older Adults.

Objective: Neuropsychological assessment of older adults is often focused on finding "impaired" test scores. However, little is known about how often healthy older adults obtain low scores when administered a battery of neurocognitive tests. The purpose of this study was to examine whether low test scores are common in healthy older adults.

Participants and Methods: Participants were the older adults, divided into two age groups (55-74, $n=586$ and 75-97 years, $n=335$), who comprised the normative sample from the Neuropsychological Assessment Battery (NAB; Stern & White, 2003). The NAB is a comprehensive modular battery of tests that provides 36 demographically-corrected T scores, five domain indexes (i.e., Attention, Language, Memory, Spatial, and Executive Functions), and a Total index score.

Results: When the 5 Index scores were considered simultaneously, 34% of 55-74 year-olds had 1 or more low Index scores (i.e., <1SD below the mean), compared with 42% of 75-97 year-olds ($\chi^2=4.62$, $p=.03$). When the 36 T scores were considered simultaneously, 43% of the 55-74 year-olds had at least 5 low scores, compared with 52% of 75-97 year-olds ($\chi^2=6.63$, $p=.01$). Low scores were also more common with lower intellectual abilities. In those with low average intellectual abilities, 68% had 5 or more low scores, compared with 24% of those with high average intellectual abilities ($\chi^2=77.34$ $p<.001$).

Conclusions: Low test scores are common in healthy older adults, they increase with higher age and lower intellectual abilities, and they must be taken into consideration when interpreting a battery of neurocognitive tests. Tables with varying cutoff scores are provided for clinical use. Correspondence: *Brian L. Brooks, Ph.D., North Lawn Psychology; Riverview Hospital, 2601 Lougheed Highway, Coquitlam, BC BC, Canada. E-mail: blbrooks@bcmhs.bc.ca*

B.L. BROOKS, G.L. IVERSON & T. WHITE. Reliable Change Scores for Older Adults' Performances on the Neuropsychological Assessment Battery (NAB).

Objective: Neuropsychologists often retest patients to determine if performance on cognitive measures improves, remains stable, or worsens over time. However, clinicians often rely on clinical judgment, rather than a psychometrically sophisticated method, for determining whether a meaningful change in test performance has occurred. The purpose of this study was to provide statistically reliable change scores for older adults on the Neuropsychological Assessment Battery (NAB; Stern & White, 2003).

Participants and Methods: The NAB provides 36 demographically-corrected T scores, five domain indexes (i.e., Attention, Language, Memory, Spatial, and Executive Functions), and a Total index score.

Participants were 42 healthy older adults over the age of 55 years ($M=67.3$, $SD=8.3$) from the normative sample who were retested after approximately 6.7 months ($SD=0.71$). Reliable change scores (70, 80, and 90% confidence intervals) for the Indexes and all 36 tests were calculated.

Results: To be 80% certain that a patient has improved or declined, performance on the NAB Indexes would need to change by 9.86 (Attention; Total), 13.06 (Spatial), 14.11 (Executive Functions), 14.60 (Memory), or 15.30 (Language) points. On the individual NAB tests, reliable change scores at the 80% confidence interval ranged from 6.23 (Numbers & Letters A Efficiency) to 14.20 (Visual Discrimination).

Conclusions: Using reliable change scores for the NAB, in conjunction with clinical judgment, is a psychometrically sophisticated method for determining whether a change in an older adult's test performance is statistically meaningful. Tables are provided with reliable change scores at 70, 80, and 90% confidence intervals for clinical use in everyday practice.

Correspondence: *Brian L. Brooks, Ph.D., North Lawn Psychology; Riverview Hospital, 2601 Lougheed Highway, Coquitlam, BC BC, Canada. E-mail: blbrooks@bcmhs.bc.ca*

C.L. BURROWS, M. HISCOCK, J.S. CAROSELLI & R.S. SCHEIBEL. Predicting Individual Differences in Performance on the Iowa Gambling Task.

Objective: Maia and McClelland (2004) found that, contrary to Damasio's somatic marker theory, people who perform the Iowa Gambling Task (GT) are aware of the consequences associated with their decisions. In light of this finding, it is especially difficult to explain evidence that normal young adults tend to make a high number of disadvantageous decisions on the GT (Caroselli et al., in press). The present study examines the performance of college students and relates individual differences to (1) their evaluations of different decks and (2) selected personality characteristics.

Participants and Methods: We used a personal computer to administer a 100-trial version of the GT to 150 university undergraduates (75 females, 75 males). Participants rated their feelings about each of the four decks after trials 20, 40, 60, 80, and 100. The participants also completed the Barratt Impulsivity Scale, the Strathman et al. Consideration of Future Consequences Scale, and the Zuckerman Sensation Seeking Scale.

Results: Overall, 73% of students made advantageous deck choices on no more than 50 of the 100 trials. While the deck selected most often was the disadvantageous Deck B, participants rated advantageous decks more positively than disadvantageous decks. Deck D, an advantageous deck, received the highest ratings. Correlations between deck ratings and actual deck selections did not exceed .31. Questionnaire scores were not associated with either deck ratings or selections.

Conclusions: University students, on average, performed poorly on the GT. They frequently selected disadvantageous decks even while rating advantageous decks more positively. Thus, although they demonstrated some awareness of the consequences of their choices, they often did not act in accordance with that awareness. Despite a superficial similarity between our results and those of Maia and McClelland (2004), our findings reveal a high degree of dissociation between an individual's knowledge and his or her actual behavior.

Correspondence: *Merrill Hiscock, Ph.D., Psychology; University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu*

T. CAROTHERS, M. DANIEL, S. KOUE, L. HOSKINS, K. GILLIS, S. REYNOLDS & K. BROCKWOOD. Executive Functions in Adolescent Arsonists.

Objective: Although past studies suggest adolescents with conduct disorder may have specific deficits in executive functions, there is limited

research regarding the cognitive functioning of adolescents with specific types of behavior disturbance. In particular, there is little empirical information regarding the neuropsychological functioning of juvenile delinquents with a history of arson. The present study compared performance on tests of executive function for three groups: juvenile delinquents with and without a history of arson and normal controls.

Participants and Methods: Participants were 72 adolescent boys: 24 juvenile delinquents with a history of arson, 24 juvenile delinquents without a history of arson, and 24 normal community dwelling controls. Subjects were matched on age and had FSIQ > 80. Juvenile delinquents resided in either a state youth corrections facility or a court mandated secure residential treatment facility. Participants were assessed using Vocabulary and Block Design subtests from the Wechsler Abbreviated Scale of Intelligence and the Delis-Kaplan Executive Function System.

Results: There were statistically significant differences between both groups of juvenile delinquents and controls on executive function measures. However, there were no significant differences between the two juvenile delinquent groups. Differences in intellectual functioning appeared to account for the differences between controls and delinquents in performance on measures of executive function.

Conclusions: Results suggest there are no unique patterns of executive function deficits among adolescent arsonists. While juvenile delinquents with and without a history of arson perform lower on executive function tests than controls, this appears related to differences in overall intellectual ability and not to selective executive function deficits.

Correspondence: *Tracy Carothers, MS, Pacific University, 20756 SW Kinnaman Rd, Aloha, OR 97007. E-mail: tcarothers@pacificu.edu*

G.J. CHELUNE, D. ATIX & T. STORY. How Reliable Are Reliable Change Methods Across Multiple Time Points.

Objective: Standardized regression-based (SRB) methods for assessing reliable test-retest change have become increasingly commonplace in outcomes research. However, there have been few attempts to apply these methods across multiple time points. We explore the utility of the SRB method to predict serial retest performance on the Symbol Digit Modalities Test (SDMT) across 22 months.

Participants and Methods: Subjects were 177 healthy participants enrolled in a study of the effects of toxic exposure to estuarine *Pfiesteria*. Each subject (baseline mean age=44.1; mean education=12.6) received the SDMT 5 times every 5-6 months over a 2 year period. Separate SRB equations were calculated for each retest, entering age, education, sex, test-retest interval, and previous SDMT scores as predictors.

Results: As expected, repeated measure ANOVA indicated a significant practice effect ($p < .000$). SRB equations to predict retest performance that take into account measurement error, regression to the mean, and differential practice effects at Times 2,3,4, and 5 yielded highly significant multiple Rs (.861, .868, .921, and .884, respectively).

Conclusions: SRB methods of predicting cognitive performance across multiple time points appears to be an effective method for controlling practice effects in a reliable manner, and can be applied to identify abnormal trajectories of change at the level of the individual in outcomes research.

Correspondence: *Gordon J. Chelune, Ph.D., Neurology, University of Utah, Center of Alzheimer's Care, 650 Komar Dr., Ste 106a, Salt Lake City, UT 84108. E-mail: gordon.chelune@hsc.utah.edu*

J. CHONG, M. DANIEL & K. BROCKWOOD. Cross-Validation in a Non-Litigating Clinical Population of Mittenberg's WAIS-III Regression Formula for Identifying Malingering.

Objective: Mittenberg et al. (2001) examined two approaches to analyzing Wechsler Adult Intelligence Scale-III (WAIS-III) subtest scores

for identifying malingering: (1.) discriminant function analysis (DF) and (2.) Vocabulary - Digit Span discrepancy (VD). The present study examined the specificity of these approaches for identifying malingered cognitive performance in a non-litigating, non-neurological clinical population.

Participants and Methods: One hundred eighty-six subjects underwent neuropsychological testing; many subjects were referred for evaluation of Attention Deficit Hyperactivity Disorder (ADHD) or Learning Disorder. Subjects were classified as "probable malingerers" or non-malingerers based on both DF and VD. Groups were compared on WAIS-III scores and Axis I diagnoses.

Results: Application of DF and VD classified 30.8% and 31.5% of subjects respectively as "probable malingerers." Since other data was not consistent with malingering, these likely represent false positive designations. Subjects classified as "probable malingerers" using the VD method had higher scores on all WAIS-III IQ and index measures. Subjects classified as "probable malingerers" using the DF method had higher WMI index scores. There were no differences in the rates of Axis I disorders for the groups.

Conclusions: There was a very low likelihood that the subjects in this study were malingering. However, application of the DF and VD resulted in relatively high rates of "probable malingering" classification, suggesting these methods have limited usefulness for identifying malingered cognitive performance in similar clinical populations. The majority of those classified as "probable malingerers" had a significant discrepancy between their verbal/spatial skills and working memory abilities. This discrepancy may occur when working memory is compromised secondary to a psychological disorder or ADHD in patients with average or above average IQ and these subjects are the most likely to be misclassified as malingering when using these methods.

Correspondence: *Jason Chong, M.S., School of Professional Psychology, Pacific University, 7655 sw 89th avenue, Portland, OR 97223. E-mail: jaychong77@comcast.net*

B.B. CONNOR, T. MCMANUS, J.A. MINOW, W. RIEMAN, L. SPINA & N. BELFOR. Standardization of the Rivermead Behavioural Memory Test II-Story Immediate and Delayed (RBMT-II-Story) for Serial Administrations.

Objective: The RBMT-II was developed as an ecologically valid objective measure of everyday memory problems reported and observed in patients with memory difficulties. For both clinical and research application, standardization of individual item scoring is essential. However, published guidelines provided for scoring Story Memory lack sufficient differentiation to allow standardization of raw scores. For a multi-center randomized controlled study of cognitive enhancement in normal aging, the RBMT-II Story scoring developed by Brandt, et al. for the ADAPT study was further refined, with permission, to reduce the need for clinical interpretation when comparing memory performance longitudinally.

Participants and Methods: 227 RBMT-II Stories (Immediate and Delayed) were scored by test administrators and rescored by independent reviewers using published scoring criteria. Each was subsequently rescored using the revised ADAPT scoring method. Additionally, 471 Stories were scored and rescored by test administrators and independent reviewers, respectively, using only the revised ADAPT method.

Results: Using published guidelines, 69% (157/227) of Stories had inter-rater discordance in assigning individual item scores; mean score change = 0.484 points (stdev = 0.866; range = 0-3.5). Using revised ADAPT scoring, 12% (58/471) had inter-rater discordance; mean score change = 0.066 points (stdev = -0.239; range = 0-2). Change score differences between the two methods of scoring was significant at $p < .001$.

Conclusions: Inter-rater reliability is significantly improved by reducing the need for clinical interpretation of individual item responses to the RBMT-II Story scoring.

Correspondence: *Bonnie B. Connor, PhD, Research & Outcomes, Posit Science, 225 Bush Street, 7th Floor, San Francisco, CA 94104. E-mail: bbconnor@gmail.com*

M. DUX, J.L. WOODARD, A.A. PICA, K. MORDECAI, E. DORSETT & D. CHARLES. The Factor Structure of Post Concussive Symptom Ratings in Male and Female High School Athletes.

Objective: The sensitivity of neuropsychological testing to detection of post-concussive cognitive symptoms has recently been called into question (Randolph et al., 2005). Changes from baseline in post-concussive symptom ratings have been documented and shown to persist after the resolution of cognitive symptoms. This study aimed to identify underlying dimensions tapped by a 25-item inventory of post-concussive symptom (PCS) ratings in male and female high school athletes separately.

Participants and Methods: 512 high school athletes (M age= 15.6 years, females, n= 120, males, n= 392) completed a PCS questionnaire requiring subjects to rate 25 symptoms on 0-6 scale. Subjects also completed a baseline neuropsychological assessment of attention, memory and information processing speed.

Results: PCS total score did not differ significantly by gender (male M=14.6, SD=14.7, female M=16.2, SD=16.8, $p=.318$). Principal components analyses (PCA) were conducted on the PCS separately for males and females and parallel analysis was used to determine the number of retained components. The PCA for males retained three components accounting for 42.4% of the variance; these components were labeled mental/emotional, physical, and fatigue. The PCA for females retained only one component accounting for 37.2% of the total variance, on which 24 of the 25 symptoms loaded significantly.

Conclusions: The observed gender differences in the PCS component structure suggest that patterns of symptom report are not invariant across male and female athletes. Males and females may also differ in the evolution and resolution of concussive symptom clusters associated with concussive injury. The implications of gender differences in baseline symptom reporting will be discussed.

Correspondence: *Maira Dux, Psychology, Rosalind Franklin University of Medicine and Science, 4837 N. Claremont, Chicago, IL 60625. E-mail: maira.dux@rfums.org*

J. HOLDNACK. A New Method for Comparing Performance on Two Cognitive Variables: WMS-III General Memory Performance Controlling for WAIS-III General Ability Index.

Objective: The current study proposes an alternate method for comparing performance on two cognitive variables. Toward this end, the WAIS-III General Ability Index (GAI) and the WMS-III General Memory Index (GMI) were used. The adjusted norms were applied to clinical samples comprised of neurological, neuropsychiatric and developmental disorders.

Participants and Methods: The weighted WAIS-III/WMS-III standardization sample (n=1250) was used to derive the IQ-adjusted memory scores. The new norms were applied to clinical samples of Korsakoff's Syndrome, Alzheimer's Disease, Huntington's Disease, Schizophrenia and Reading Disorder that were collected as part of the WAIS-III/WMS-III standardization.

IQ adjusted memory scores were derived by dividing the "control" variable (e.g. GAI) into discreet groups and within each group the "dependent" measure (e.g. GMI) was converted into a normed scaled score using normalized z-transformation. This method does not require a linear association between the two variables or homogeneity of variances and skewness.

Results: The new normative data were developed and applied to the clinical samples. The results are expressed in scaled score units for each group: Korsakoff's (1.3); Alzheimer's (2.3); Huntington's (5.4); Schizophrenia (6.3), and Reading Disorder (8.4). The Korsakoff's group has the most impaired memory relative to their general intellectual ability.

Conclusions: This study demonstrated a new method for adjusting performance on a neuropsychological test by general cognitive abil-

ity. The adjusted score facilitates comparison of performance across measures and groups by creating a common metric. The procedure can be applied to controlling for demographics, test versus retest scores, immediate versus delayed memory, and comparing learning trials.

Correspondence: *James Holdnack, Ph.D., PMG, Harcourt Assessment Inc, 5 Rose Hill Drive, Bear, DE 19701. E-mail: James_Holdnack@Harcourt.com*

J. HOLDNACK, D.C. DELIS & J.H. KRAMER. Development of Education Adjusted Norms for D-KEFS Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests.

Objective: The goal of the current study is to develop education adjusted norms for the Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests from the Delis-Kaplan Executive Function System (D-KEFS).

Participants and Methods: The sample consisted of 875 cases ages 20 to 89 years from the D-KEFS standardization sample. The sample is stratified by 5 education levels: 8 years or less; 9-11 years, 12 years, 13-15 years, 16 or more years. These were stratified based on the 2000 census data.

Education corrected norms were derived using normalized z-transformation of age corrected scaled scores within education group. This model does not require a linear relationship between the control variable (e.g. education) and the dependent measure (e.g. D-KEFS measure). Additionally, violations of homogeneity of variance and non-normality are controlled.

Results: In general, education had a low correlation with D-KEFS scores across tests. There was considerable variability between tests and on measures within a test. The correlation between education and D-KEFS tests ranged as follows: Trail-Making from .1 (scanning) to .23 (switching trial); Verbal Fluency, .04 (switching) to .36 (letter fluency); Design Fluency from .04 (set loss errors) to .16 (attempted designs); Color-Word Interference from .13 (color naming) to .29 (inhibition/switching errors); Sorting from .01 (sorting accuracy) to .30 (attempted sorts); and Tower -.07 (move accuracy) to .14 (total).

Conclusions: Education level has low to moderate correlation with D-KEFS tests. Education adjusted norms are provided to improve the sensitivity and specificity of the D-KEFS tests in adult clinical populations. Correspondence: *James Holdnack, Ph.D., PMG, Harcourt Assessment Inc, 5 Rose Hill Drive, Bear, DE 19701. E-mail: James_Holdnack@Harcourt.com*

J. HOLDNACK, D.C. DELIS & J.H. KRAMER. Development of IQ Adjusted Norms for D-KEFS Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests.

Objective: The goal of the current study is to develop IQ adjusted norms for the Trail-Making, Verbal Fluency, Design Fluency, Color-Word Interference, Sorting and Tower Tests from the Delis-Kaplan Executive Function System (D-KEFS).

Participants and Methods: The sample consisted of 1190 cases ages 8 to 89 years from the D-KEFS standardization sample. These subjects also completed the Wechsler Abbreviated Scale of Intelligence (WASI) as part of the D-KEFS standardization.

IQ corrected norms were derived using normalized z-transformation of age corrected scaled scores within IQ group (e.g. 80-85). This model does not require a linear relationship between the control variable (e.g. IQ) and the dependent measure (e.g. D-KEFS measure). Additionally, violations of homogeneity of variance and non-normality are controlled.

Results: In general, IQ had a low to moderate correlation with D-KEFS scores across tests. There was considerable variability between tests and on measures within a test. The correlation between IQ and D-KEFS tests ranged as follows: Trail-Making from .13 (scanning) to .41 (switching

time); Verbal Fluency .04 (set loss errors) to .47 (letter fluency); Design Fluency from .1 (set loss errors) to .31 (switching); Color-Word Interference from .21 (word reading) to .31 (switching errors); Sorting from -.04 (incorrect descriptions) to .54 (recognition description); and Tower from -.15 (move accuracy) to .29 (total).

Conclusions: IQ has low to moderate correlation with D-KEFS tests. IQ adjusted norms are provided to enable the clinician to determine if D-KEFS scores are significantly below expected levels relative to current general cognitive ability.

Correspondence: *James Holdnack, Ph.D., PMG, Harcourt Assessment Inc, 5 Rose Hill Drive, Bear, DE 19701. E-mail: James_Holdnack@Harcourt.com*

J. HUMPHREYS, S.E. O'BRYANT, F.B. WILLIS, G.E. SMITH, R.J. IVNIK, N.R. GRAFF-RADFORD, R.C. PETERSEN & J.A. LUCAS. Evaluation of the Mini-Mental State Examination Adjusted Score.

Objective: The MMSE is commonly used in clinical dementia evaluations. Mungas et al. (1996) derived a demographic adjustment for MMSE scores (MMSEadj) that eliminated group differences between Hispanic and Caucasian elders, with preliminary evidence suggesting generalizability to other minority populations, including African Americans. This study evaluated the utility of MMSEadj scores in samples of Caucasian and African American elders.

Participants and Methods: Archival data of 3255 individuals (2809 Caucasians, 446 African Americans) evaluated through the Mayo Clinic ADRC were reviewed. The sample's mean age and education were 76 (SD = 7.30) and 13 (SD = 3.26) years, respectively. There were 2049 individuals classified as non-demented and 1206 with dementia. MMSE scores were converted to MMSEadj scores following procedures described by Mungas.

Results: A cut score of 23 on the standard MMSE yielded optimal positive and negative predictive values (97%, 86%), compared to a score of 22 on the MMSEadj (97%, 83%). Using a cut score of 23 on the standard MMSE, 71.1% of cases and 98.6% of controls were correctly identified. With a cut score of 22 on the MMSEadj, 60.9% of cases and 99.5% of controls were correctly identified. Significant ethnic group differences on raw MMSE scores ($t = 8.68, p < .001$) were not attenuated by use of MMSEadj scores ($t = 7.31, p < .001$).

Conclusions: MMSEadj scores did not improve estimates of sensitivity, specificity, or predictive power as compared to traditional MMSE scores in this sample. Potential reasons for the lack of support for the MMSEadj are discussed.

Correspondence: *Joy D. Humphreys, M.A., Psychology, Texas Tech University, 2735 Genoa Ave Apt SD, Lubbock, TX 79407. E-mail: jd.humphreys@ttu.edu*

G.J. LARRABEE, S.R. MILLIS & J.E. MEYERS. Sensitivity to Brain Dysfunction of the Halstead Reitan vs. an Ability-Focused Neuropsychological Battery.

Objective: Sweet et al. (2006) showed that 76% of neuropsychologists used a flexible core battery, 18% used a totally flexible assessment, and only 7% used a standardized battery such as the Halstead-Reitan (HRB). By contrast, Russell et al. (2005) recommend use of standardized batteries only for forensic neuropsychology. Consequently, we compared the sensitivity to brain dysfunction of both the HRB and an ability-focused battery (AFB) designed to represent a core flexible assessment.

Participants and Methods: Fifty four patients with brain dysfunction (primarily TBI and CVA) and 69 non-neurologically-impaired patient controls, naturally matched on age, education and gender, were compared on the HRB (Category Test, TPT Time, Memory and Location, Finger Tapping, Seashore Rhythm, and Speech Sounds Perception), and on the AFB (H-Words, Grooved Pegboard, WMS Logical Memory Delay and Visual Reproduction Delay, WAIS-R Arithmetic, Digit Symbol, Similarities and Block Design).

Results: The ROC area under curve was .859 for the AFB, and .804 for the HRB, $p < .238$. Bayesian model averaging, applied to select the most diagnostically sensitive AFB and HRB subtests, plus Trail Making B, found consistent statistical support (with posterior probabilities of model inclusion) for only Finger Tapping (100%), Grooved Pegboard (100%), H-Words (100%), and Trail Making B (57%).

Conclusions: These data support the validity of an AFB that assesses core functions of language (H-Words), fine motor speed (Grooved Pegboard), working memory and psychomotor processing speed (WAIS-R Arithmetic, Digit Symbol), memory (Logical Memory and Visual Reproduction), and verbal and visual abstraction and problem solving (WAIS-R Similarities and Block Design). The equal and slightly superior sensitivity of the AFB in contrast to the HRB replicates Rohling et al. (2003) who found a core flexible battery was equivalent to an expanded HRB in sensitivity to TBI. These data support the validity of flexible batteries for clinical and forensic assessment.

Correspondence: *Glenn J. Larrabee, Ph.D., Independent Practice, 630 South Orange Ave., Suite 202, Sarasota, FL 34236. E-mail: GLarrabee@aol.com*

L.M. LUTON, T.G. BURNS & D. BODIN. Theoretical and Utility-Based Development of a Short Form of the WISC-IV.

Objective: Time constraints are common barriers to conducting comprehensive neuropsychological evaluations. Subsequently, decreasing the administration time of individual measures would allow neuropsychologists the opportunity to include additional assessment measures. Donders' (1997) frequently cited and well-validated WISC-III Short Form (WISC-III SF) accomplishes this goal. Given the utility of the WISC-III SF and the significant revisions from the WISC-III to the WISC-IV, the development of a WISC-IV Short Form (WISC-IV SF) is warranted.

Participants and Methods: Eight subtests were selected from the WISC-IV based on theoretical and clinical standards to create a short form yielding the four factor indices. Using data from the WISC-IV standardization sample ($n = 2200$), reliability estimates for the modified Verbal Comprehension (VCI), Perceptual Reasoning (PRI), and Full Scale IQ (FSIQ) indices of the WISC-IV SF were determined and compared with those of the WISC-IV. Because the same Processing Speed and Working Memory subtests as those of the WISC-IV were used, determining these reliability values was unnecessary. Principle axis factor analysis with oblique rotation was conducted using two, three, and four factors to determine which model could best describe intelligence.

Results: Findings suggest satisfactory reliability for the VCI, PRI, and FSIQ index ($r = .960, r = .934, r = .969$, respectively). Additionally, the four factor model provided the best fit for the WISC-IV SF data.

Conclusions: Thus, the WISC-IV SF appears to have utility as a substitution for the WISC-IV under most clinical conditions. Future studies comparing performance on the WISC-IV versus the WISC-IV SF in independent, matched samples are warranted.

Correspondence: *Lindsay M. Luton, M.A., Children's Healthcare of Atlanta-Scottish Rite, 3650 Ashford-Dunwoody Road, #127, Atlanta, GA 30319. E-mail: lindsayluton@hotmail.com*

S.M. MEYER, B. GORDON & D.J. SCHRETLEN. Preliminary Results of Measures Designed to Increase the Accuracy and Range of Premorbid IQ Estimates.

Objective: The revised National Adult Reading Test (NART-R) is a 61-item word-reading test used to estimate "premorbid" IQ. While quite useful for this purpose, it was validated on only 66 subjects. It also is constrained by floor effects (i.e., the lowest possible estimate of FSIQ is 80), and it can be frustrating and time consuming for poor readers. The aim of this study was to develop a shorter word reading test with broader predictive power.

Participants and Methods: We first added two letters and seven simple words to the NART-R, bringing the total number of items to 70. We then administered this Hopkins Adult Reading Test (HART) to 346

healthy adults and 262 adults with medical or psychiatric conditions. The individual words were then rearranged in order of difficulty and two parallel forms (A and B) with 35 words each were created using odd- and even-numbered items. Finally, we regressed 7-subtest WAIS-R/WAIS-III Verbal and Full Scale IQs on age, sex, race, education, WAIS version, and HART scores in the 346 healthy participants.

Results: The demographic variables and HART Form A yielded highly significant models for the prediction of concurrent Verbal ($R = .315$) and Full Scale ($R = .773$) IQ. The demographic variables and HART Form B yielded nearly identical models for the prediction of concurrent Verbal ($R = .821$) and Full Scale ($R = .781$) IQ. Further, the range of estimated IQs that were “predicted” by the resulting models was broadened substantially beyond the original NART-R (Form A: VIQ range = 72 – 130, FSIQ range = 74 – 129; Form B: VIQ range = 75 – 131, FSIQ range = 77 – 130).

Conclusions: These findings demonstrate that two 35-item word reading tests in combination with demographic variables predict a broader range of IQ with better accuracy than the original NART-R alone.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 21S, Baltimore, MD 21287-721S. E-mail: dschret@jhmi.edu*

S.R. MILLIS, R. HANKS, N. FICHTENBERG & B. AXELROD. Rasch Analysis of the PCSQ: Measuring the Core Construct of Head Injury Symptomatology.

Objective: The Postconcussive Symptom Questionnaire (PCSQ; Axelrod et al, 1998) appears to measure up to 4 constructs. The aim of this study was to revise the PCSQ to derive a symptom checklist that targeted the core construct of symptomatology following moderate to severe traumatic brain injury.

Participants and Methods: 133 persons with moderate to severe traumatic brain injuries completed the 45-item PCSQ. Items were scored dichotomously, as symptom present or absent. Rasch analysis, based on the mathematical model formulated by Rasch (1960) was used to derive this core checklist. Rasch analysis compares the response patterns of individuals to the entire sample to estimate person “impairment” and item “difficulty” (i.e., how frequently the symptom was endorsed). The Rasch model is a stochastic model that converts the ordinal scores derived by summing item scores into interval measures.

Results: The initial analysis of all 45 items revealed that over half of the items did not fit with model expectations: some items added unmodelled noise while others were redundant. Those items were eliminated and a second model containing the remaining 19 items was fitted. This core checklist had superior psychometric characteristics. The person reliability (Cronbach’s alpha) was 0.81 and the item separation index was 3.83. All item mean-square fit statistics were within 0.61 to 1.58. 69% of the variance was explained by the 19-item checklist. Unexplained variance explained by the first contrast was minimal, 3%. Items came from the previously identified Psychological (62%), Cognitive (80%), and Somatic (47%) factors.

Conclusions: The 19-item PCSQ provides a more targeted or unidimensional measurement of symptoms following moderate to severe traumatic brain injury. The most common symptom reported was memory difficulty. The least common symptom was nausea.

Correspondence: *Scott R. Millis, PhD, Physical Medicine & Rehabilitation, Wayne State University; RIM - Rm 552, 261 Mack Blvd, Detroit, MI 48201. E-mail: aa3379@wayne.edu*

A. SCHAFER & P. LICHTENBERG. Validity Of A Direct Assessment Of Financial Skill In Older Adults.

Objective: The objective of this study is to examine the construct validity of an everyday cognition measure, specifically the Financial subtest from the Direct Assessment of Functional Status (DAFS).

Participants and Methods: Eighty-two participants over the age of 60 were recruited from the city of Detroit, the majority of whom were African American. Participants were administered a battery of measures, including multiple executive function tests (e.g., WAIS-III Letter-Number Sequencing and Similarities, COWAT, Animal Naming, Coloured Progressive Matrices and Trail Making Test-B), the WRAT, the GDS-15 and the MMSE, and were also interviewed regarding demographics and health history. In an effort to establish convergent and divergent validity, we examined the correlation that each measure of interest had with the DAFS-Financial and compared these to what would be expected empirically and theoretically.

Results: Significant convergent validity for the DAFS-Financial was found with all executive function measures, a measure of overall cognition, educational attainment and a measure of educational quality. Divergent validity for the was found with the GDS-15, a comorbidity index and participant age.

Conclusions: As the DAFS-Financial can be used clinically to aid in assessment of financial capacity, it is important that such a measure be well validated. One way of doing this is by examining the relationships a measure has with other variables. While the DAFS-Financial corresponded with most measures as predicted, some relationships were unexpected and implications of such findings are discussed.

Correspondence: *Amanda Schafer, MA, Wayne State University, 87 E. Ferry St., Detroit, MI 48202. E-mail: ak7070@wayne.edu*

A.L. SHANDERA, S. HALL, J.W. DENBOER & E.M. CROUSE. Clinician’s Confidence in Measures of Effort.

Objective: The goal of the present study was to obtain a more representative picture of the current use of measures of effort than previous research. The frequency of test use, confidence in test accuracy, factors affecting test selection, and situational usage aspects were examined.

Participants and Methods: Members of the International Neuropsychological Society (INS) and the National Academy of Neuropsychology (NAN) were contacted via e-mail. A total of 216 members responded to the survey. This large sample provides data that is more representative of general practice than earlier surveys that have focused on a relatively small amount of data from experts in malingering detection.

Results: Most respondents reported using measures to detect feigning in their evaluations (87.1%). Of those who used such tests, they were employed in 54.3% of adult cases and 6.79% of child cases. The Test of Memory Malingering (TOMM) was the most commonly used test of effort (61.6%). Additional measures that were used frequently were the Rey 15-Item Memory Test (Rey 15; 36.1%), the Word Memory Test (WMT; 28.7%), the Validity Index Profile (VIP; 17.6%), the Computerized Assessment of Response Bias (CARB; 13.4%), the Victoria Symptom Validity Test (VSVT; 17.6%), the California Verbal Learning Test-Second Edition (CVLT-2; 9.3%), and the Portland Digit Recognition Test (PDRT; 9.3%). A wide range of confidence ratings were reported, with the WMT, TOMM, VIP, and VSVT rated highest. Although the Rey-15 was the second most commonly used malingering test, it received the lowest confidence rating.

Conclusions: Additional characteristics of current practices of detecting malingering are reported and discussed.

Correspondence: *Anne L. Shandera, B.A., Psychology, University of Kentucky, Department of Psychology, 111-C Kastle Hall, Lexington, KY 40506. E-mail: a.shandera@uky.edu*

R.J. SPENCER, S. RICE, P.P. GIGCEY, S.L. SELIGER, L.I. KATZEL & S.R. WALDSTEIN. Timed Alphabet-Writing as Measures of Complex Attention: Preliminary Findings.

Objective: Prior evidence supports timed alphabet-writing as a brief, easily administered measure of simple psychomotor speed. However, little data exist examining the association between timed backward alphabet writing and neuropsychological tests of complex attention.

Participants and Methods: The present study investigated the relations of both forward and backward alphabet-writing tasks to measures of psychomotor speed and complex attention in a sample of 58 community-dwelling volunteers (mean age = 68.3 years, mean education = 15.4 years) participating in a study of either hypertension or chronic kidney disease. We measured the time required to write the 26 letters of the English alphabet, as well as the time required to write the first 13 letters in backwards order.

Results: Forward alphabet (FA) performance was recorded as seconds to completion ($M=23.7$, $SD=13.3$), and because backward alphabet (BA) was discontinued at 60 seconds, BA performance was calculated as number of items completed per second ($M=.39$, $SD=.31$). We then compared these scores with performance on two tests of simple motor speed, Grooved Pegboard, and Trails-A, and tests requiring greater complex attention, Trails-B and the Stroop Color-Word Test (SCWT). FA was correlated significantly with Grooved Pegboard: $r=.63$, $p<.001$; Trails-A: $r=.72$, $p<.001$; Trails-B: $r=.63$, $p<.001$; and SCWT: $r=.56$, $p<.001$. Performance on BA was not related to Grooved Pegboard but, similar to FA, correlated highly with Trails-A: $r=-.52$, $p<.001$; Trails-B: $r=-.50$, $p<.001$, and SCWT: $r=-.55$, $p<.001$.

Conclusions: These results suggest that BA is largely independent of fine motor control, and both tasks are associated with performance on established tests of complex attention.

Correspondence: *Robert J. Spencer, M.S., Psychology; UMBC, 1000 Hilltop Circle, Baltimore, MD 21250. E-mail: rspencer@umbc.edu*

R.M. BOWLER, S. NAKAGAWA & H. TRAN. Sensitivity and Specificity of Different Neuropsychological Methods of Malingering in Neurotoxicant Exposed workers.

Objective: The present study examines the efficacy of neuropsychological methods that identify possible malingering or low effort by comparing the malingered profiles using the TOMM (Test of Memory Malingering).

Participants and Methods: Sensitivity and specificity for previously proposed neuropsychological test criteria were computed in 371 neurotoxin exposed samples consisting of 205 welders exposed to Manganese (Mn) and 166 hazardous waste clean-up workers exposed to Ethylene dichloride (EDC). The TOMM identified total of 8.6% ($n=32$) [EDC: 13.3% ($n=22$), and Mn: 4.9% ($n=10$)] as suspected malingering. Neuropsychological criteria evaluated included the Rey15 (cutoff scores of both <7 and <9), the difference of the age scaled scores for the WAIS III Vocabulary and the Digit Span (≥ 6 ; Iverson, 2000), the Digit Span age scaled scores (≤ 4), the Trail Making A&B errors (≥ 4 , or errors on A ≥ 2 or B ≥ 3), and the difference between actual and expected Finger Tapping scores (predicted by regression equation using the RCFT Copy, Digit Symbol and Block Design <-10 ; Meyers & Vollbrecht, 2003).

Results: Results indicated the expected and actual Finger Tapping scores difference obtained the highest sensitivity at 43% (with specificity at 83%). The Rey15 obtained a poor sensitivity at 0% using a cutoff of <7 or at 10% using <9 (specificity 96% and 91% respectively) and the difference of the WAIS-III Vocabulary and the Digit Span showed the lowest sensitivity at 0% (with specificity at 98%). The criteria on the Trail Making errors and Digit Span suggested moderately low sensitivity ranging from 7% to 14%. Similar results were obtained in both groups.

Conclusions: The results of this study suggests that when indexed with the TOMM, the expected and actual Finger Tapping scores difference equation is the most accurate in identifying possible malingerers.

Correspondence: *Rosemarie M. Bowler, Ph.D., Psychology; San Francisco State University; S371 Kent Drive, El Cerrito, CA 94530. E-mail: rbowl@sfsu.edu*

M.D. ADRIANCE, L.A. TELLIER & C.L. TRASK. The Clinical Utility of the Cancellation Subtest of the WISC-IV.

Objective: The WISC-IV was substantially revised in 2003 and includes Cancellation, a new supplemental measure hypothesized to measure pro-

cessing speed, visual selective attention, and vigilance; however, little research has been done to confirm the nature of this subtest. Historically, processing speed subtests have been found to be sensitive to neurological conditions such as traumatic brain injuries. As part of the standardization studies for the WISC-IV, Cancellation was reported to be significantly lower in children with closed head injuries, in comparison to matched controls. We hypothesized that Cancellation would be strongly related to the other two Processing Speed subtests, as well as Visual Scanning of the Trail Making Test of the D-KEFS, reading fluency and math fluency from the WJ-III, and Finger Windows of the WRAML2.

Participants and Methods: This correlational study utilized data from 63 children who were administered the Cancellation subtest of the WISC-IV as part of a standard neuropsychological assessment (age range 6 to 16 years; 62% male, 38% female; 71% Caucasian). Other subtest scores from the WISC-IV, as well as scores from the D-KEFS, WJ-III, and WRAML2 were utilized.

Results: Performance on the Cancellation subtest was significantly correlated with Symbol Search and Coding from the WISC-IV, Finger Window from the WRAML2, and Reading Fluency and Math Fluency from the WJ-III, as well as FSIQ. It was not correlated with other measures of verbal attention or Visual Scanning from the D-KEFS. In a step-wise linear regression, after entering Full Scale IQ to control for overall ability level, Cancellation was found to be associated with scores on Symbol Search alone.

Conclusions: As theorized, the Cancellation subtest appears to capture visual selective attention and processing speed. As a result, it may warrant further investigation for its sensitivity to neurological conditions, including recovering from traumatic brain injuries.

Correspondence: *Christine L. Trask, PhD, Neuropsychology, Rhode Island Hospital/Brown University; 593 Eddy Street, POB Suite 430, Providence, RI 02903. E-mail: ctrask@lifespan.org*

B. UTTL & A.L. SIEGENTHALER. Measurement IS the Foundation of Science and Clinical Practice.

Objective: Reliable and valid measurement is critical for both research and making decisions about individuals in clinical practice. Surprisingly, a review of research and clinical measurement tools reveal that ceiling effects (CEs) render many findings uninterpretable and many memory tests unsuitable for their intended use. We surveyed the literature to determine how prevalent CEs are and conducted Monte Carlo simulations to dispel the frequently believed myth that only perfect or near perfect test scores are signs of the ceiling-afflicted data.

Participants and Methods: First, we surveyed published case studies to examine the prevalence and adverse consequences of using ceiling-limited tests in making decisions about individuals. Second, we conducted a meta-analysis of memory tests to examine the prevalence of CEs in normative data sets. Third, we conducted Monte Carlo simulations to determine the adverse impact of ceiling effects as a function of their severity for both continuous and dichotomous test measures.

Results: Meta-analyses of memory measures and case studies demonstrate that CEs afflict a large portion of research findings and decisions about individuals. Monte Carlo simulations dispel the frequently believed myth that only perfect or near perfect test performance is a sign of ceiling-afflicted data.

Conclusions: Research conclusions and clinical decisions based on ceiling-afflicted data are very common, suggesting that many researchers and clinicians are unaware of what CEs are. We provide concrete guidelines on how to detect CEs and how to avoid inappropriate conclusions based on such ceiling-limited data in research and in making decisions about individuals.

Correspondence: *Bob Uttl, Private, 33 Scenic Glen Mews, Calgary, AB T1L3L1, Canada. E-mail: uttlbob@gmail.com*

D.J. SCHRETLEN, E.J. VAN DER HULST, G.D. PEARLSON & B. GORDON. Development and Psychometric Properties of Two Equivalent Short Forms of the Beery VMI.

Objective: The Developmental Test of Visual-Motor Integration (VMI) is a design copying task that is frequently used to assess neurodevelopmental disorders in children. Recent studies indicate that it is sensitive to mild cognitive impairment and dementia, but the VMI is quite lengthy, and it has never been standardized for use with adults. The aim of this study was to develop and standardize two equivalent short forms of the VMI for use with adults.

Participants and Methods: After constructing two, 12-item versions (Forms A and B) using alternate items of the VMI, we administered one form (A or B) to 249 reasonably healthy adults aged 18–93 years who were participating in a study of normal aging. Each subject also completed a comprehensive battery of neuropsychological tests and a brain MRI scan.

Results: Altogether, 119 participants completed Form A, and 127 completed Form B. The two groups did not differ in age, education, sex, or race/ethnicity (all $p > .31$), and they produced nearly identical VMI scores (Form A: $M = 10.8$, $SD = 1.3$; Form B: $M = 10.9$, $SD = 1.2$). Pooled across forms, VMI scores correlated with age ($r = -.26$; $p < .001$) and education ($r = .31$; $p < .001$). VMI scores did not differ by sex ($p > .21$), but whites slightly outperformed blacks (10.9 ± 1.2 vs. 10.3 ± 1.3 ; $p < .003$). Further, VMI scores correlated more strongly ($r_s > .45$) with performance on tests of matrix reasoning, visual-construction, and visual memory than on tests of verbal fluency, verbal memory, and executive functioning ($r_s < .25$). Finally, VMI performance correlated with total cerebral gray matter volume ($r = .38$; $p < .001$) derived from MRI.

Conclusions: These two short forms of the VMI appear to be equivalent in most respects. They show good convergent and discriminant construct validity. VMI performance correlates as expected with demographic characteristics, and is sensitive to individual differences in cerebral gray matter volume.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 21S, Baltimore, MD 21287-721S. E-mail: dschret@jhmi.edu*

T. WADE, N. BELFOR, S.C. CHAN, J.L. HARDY, D. TINKER, M.S. TRUJILLO, H.W. MAHNCKE & M.M. MERZENICH. Novel Threshold-Based Assessments of Speed of Processing and Memory in the Elderly: Validation and Norms.

Objective: Five computer administered tests were developed to measure auditory spectral and temporal integration, speed of auditory processing, perception of temporally compressed speech, and recognition and recall span for spoken words and syllables in older adults. Tests were designed to improve on the the precision and efficiency of traditional neuropsychological measures by using Bayesian adaptive psychophysical procedures and minimizing interaction with human administrators. This study establishes age norms for these measures for healthy adults ages 60+ and cross-validation with the Repeatable Battery for Neuropsychological Functioning (RBANS).

Participants and Methods: Data from 156 participants (ranging in age from 60 to 90) was analyzed to establish cross validation and age norms. Individual measures were correlated with raw data subtests of RBANS and with age.

Results: Significant correlations were seen between the measures introduced and several subtests from the cross-validation battery. Briefly, working memory and speed of processing tests showed the strongest correlations ($r^2 \geq 0.3$) with List learning, Coding and forward digit span, and correlated more closely with age than these measures. All measures showed decline with age. Age norms were compiled.

Conclusions: The measures developed are valid and reliable tests of working memory and auditory processing in healthy elderly adults. Since scores correlate closely with age, age-corrected norms may be useful in research and clinical practice with the elderly.

Correspondence: *Travis Wade, Posit Science Corporation, 225 Bush St, 7th floor, San Francisco, CA 94104. E-mail: wade.travis@gmail.com*

J.M. WINICKI, B. GORDON, E.J. VAN DER HULST & D.J. SCHRETLEN. Psychometric Properties and Initial Validation of the Mental Status Exam–Telephone Version (MSE-TV).

Objective: We describe the psychometric properties of a newly developed cognitive screening test that can be administered via telephone in 10 minutes. The MSE-TV consists of eight subtests that assess temporal orientation, word list learning/memory, attention, vocabulary, mental arithmetic, and fund of knowledge. Scores can range from 0 to 50.

Participants and Methods: We administered the MSE-TV and other neuropsychological tests to 234 healthy adults aged 18–91 years, and 134 adults receiving Social Security disability benefits for a neuropsychiatric disorder.

Results: The MSE-TV showed acceptable internal consistency ($\alpha = 0.71$). Scores ranged from 19–50 ($M = 39.1$; $SD = 5.4$) with minimal skewness (-0.3) and kurtosis (0.09). MSE-TV performance correlated significantly with education ($r = .48$; $p < .001$) but not age ($r = -.11$; ns). Men and women did not differ significantly, but whites outperformed blacks ($t = 6.3$; $p < .001$). A factor analysis yielded three factors that explained 65.4% of the variance. The factors appear to assess general ability, word list learning/memory, and temporal orientation, respectively. MSE-TV overall and factor scores showed convergent validity with measures of similar constructs and good discriminant validity in relation to measures of different constructs. Finally, the MSE-TV demonstrated excellent diagnostic validity: Healthy controls outperformed 20 adults with mental retardation ($t = 13.9$; $p < .001$), 18 with dementia ($t = 8.7$; $p < .001$), 36 with schizophrenia ($t = 9.9$; $p < .001$), and 60 with affective disorder ($t = 8.8$; $p < .001$).

Conclusions: The MSE-TV is a brief screening test that can be administered via telephone. It has adequate internal consistency, yields scores that are normally distributed, and shows good construct and diagnostic validity. It can be used to estimate general intellectual ability, but it also is sensitive to various neuropsychiatric disorders.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 21S, Baltimore, MD 21287-721S. E-mail: dschret@jhmi.edu*

Child - Assessment

C.S. BLOSS & E.B. FENNELL. Neuropsychological Assessment and Developmental Comorbidities: A Case Study.

Objective: To illustrate the contribution of a multidimensional neuropsychological evaluation to clarify differential diagnoses in comorbid developmental disorders.

Participants and Methods: D.E., a 10-year 8-month-old African American male, had a history of refusing to speak, repetitive movements, few friends, and slowed performance on all academic tasks. Family history was significant for epilepsy, tic disorder, and autism.

Results: D.E.'s responses to test items requiring an oral response of one or more words were characterized by sparse or no verbal output. He insisted on writing out or orally spelling his responses. Although this was a nonstandardized procedure, his responses were generally within normal limits. D.E. also exhibited simple phonic and motor tics, complex motor tics, extreme slowed responding to test items, perfectionistic behaviors, brief staring episodes, and variable eye contact. Objective test results were consistent with impaired expressive language skills and psychomotor slowing within the context of strengths in verbal memory and abstraction skills, and average visual memory and auditory attention skills. Parent questionnaires emphasized social problems.

Conclusions: While the developmental and family history suggested that High Functioning Autism and Selective Mutism might explain D.E.'s symptom presentation, detailed neuropsychological testing was consistent with developmental motor apraxia of speech and Tourette's Disorder, with rule-outs for Pervasive Developmental Disorder Not Otherwise Specified, Obsessive-Compulsive Disorder, and Cognitive Disorder Not Otherwise Specified. Neuropsychological testing may be useful in clarifying diagnoses in children with unusual symptom presentations and who may have several comorbid disorders.

Correspondence: *Cinnamon S. Bloss, M.S., SDSU/UCSD Joint Doctoral Program in Clinical Psychology, University of California, San Diego, VA San Diego Healthcare System, 3350 La Jolla Village Drive, MC 116B, San Diego, CA 92161. E-mail: cinnamon@ucsd.edu*

I. BUJOREANU & K. HOLLER. Developmental and Neuropsychological Perspectives on the Wisconsin Card Sorting Test in Normal Children.

Objective: Wisconsin Card Sorting Test is a renowned measure of executive function for children. Normative studies revealed inconsistent WCST performance for six-year old children and research warned about the test's possible lack of developmental sensitivity. Research also suggests that WCST is likely to involve multiple cognitive skills, rendering the interpretation of test results as equivocal. This study explored the impact of number as a sorting criterion on test performance. Number, an abstract concept involving higher cognitive processes (versus shape and color), was conceptualized in this study as not readily available for young children.

Participants and Methods: One hundred and ninety eight participants (ages 6, 11-12, and 18-19 years old) were administered either the standard or modified versions of WCST in which the position of number as a sorting criterion the test was changed. A between-subjects MANOVA was used to analyze data followed by planned post hoc Tukey HSD tests.

Results: Findings show that: (1) number is harder to sort by for younger children in comparison to older children and adolescents, based on higher number of errors and more trials to complete first category; (2) all age groups make more errors in attempting the number category if number is the second or third category in the test, in comparison to the error score when number holds the first position; (3) younger children are less able to conceptualize the WCST task and became less efficient in solving it, when compared to older children and adolescents.

Conclusions: When conceptualizing the WCST sorting criteria as visual-type stimuli (color and shape) versus language-based (number), the current findings support theories suggesting that WCST requires a range of higher cognitive functions (visual-spatial and short-term verbal memory), in addition to executive function. Clinical and diagnostic implications for the use of test with young children are discussed while considering neurobehavioral, cognitive, and developmental perspectives. Correspondence: *I. Simona Bujoreanu, MA, Psychology, University of Rhode Island, 20 Exeter St., Providence, RI 02906. E-mail: ibuj0442@postoffice.uri.edu*

M.C. CAMPBELL, H.M. LAMONICA, E.M. CAREY & E. KAPLAN. Clock Drawing and Telling Time in Clinical and Non-clinical Children: A Multifactorial Measure.

Objective: Clock drawing tests have traditionally been used to assess neurologic disorders, cognitive decline, and dementia in adults. Clock drawing tests target executive functions such as planning and organization, visuospatial, graphomotor, and constructional abilities, as well as the overall conception of time. This study investigates the developmental progression of clock drawing skills and the ability to tell time in typically developing children and children with clinical diagnoses with an assessment measure and scoring system designed specifically for this study.

Participants and Methods: Participants included 13 children with a clinical diagnosis, ages 6-17 years, and 17 without a history of clinical disorders, ages 7-11 years. Assessment for both groups included: Cognitive assessment (WASI, WISC-IV, WAIS, or WPPSI), WISC-IV Arithmetic, Elizabeth Wieg Test of Temporal Relationships, and Clock Stimuli (Drawing to Command, Digital to Analogue, Clock Reading, and Clock Copy).

Results: Results from the normal control children indicate a significant positive correlation between age and the ability to accurately perform all clock drawing and reading tasks. Further qualitative analyses of the individual clock components, such as the perimeter and the numbers, also reveal age effects. Additionally, children with a clinical diagnosis perform worse on all clock drawing and clock reading tasks as compared to the non-clinical group. Specific areas of deficit identified in the clinical group included poor spacing of numbers and inaccurate placement of hands during clock drawing tasks. While both groups display significant developmental trends across all tasks, the clinical group tends to lag behind in the development of all skills.

Conclusions: Used in conjunction with other neuropsychological assessments for children, the clock drawing tasks can help pinpoint specific areas of dysfunction such as visuospatial deficits or executive dysfunction, as is done with adults.

Correspondence: *Megan C. Campbell, M.A., Psychology Department, Suffolk University, 42 South Russell St. #2, Boston, MA 02114. E-mail: megan.campbell@suffolk.edu*

L. CHAPIESKI, K. EVANKOVICH, R. COLLINS & M. HISCOCK. Development of Child and Parent Report Measures of Subjective Memory.

Objective: Results of studies of the relationship between self-report of memory ability and actual performance on tests of memory with adult neurological patients have been inconsistent. There have been few studies, however, in the pediatric population for which both child and parent could serve as reporters. The current project is an effort to develop and evaluate a new subjective memory scale for use in a pediatric setting.

Participants and Methods: Twenty-four items addressing situations requiring verbal memory were created using a Likert scale and adapted for parent and child report measures. Forty-five patients between the ages of 8 and 17 with a variety of neurological disorders and Verbal IQ's >79, and their mothers, completed the questionnaires. The children were also administered objective measures of verbal memory (WRAML-2-Story Memory and Verbal Learning subtests) and academic skills (K-TEA Reading and Math Composites). In addition, teachers completed a scale concerning academic performance.

Results: Coefficient alpha for the child and parent report were .91 and .82, respectively. Inter-rater reliability between parent and child was high, $r=.61$. Parent report was significantly correlated with verbal memory, reading and math skills and teacher report of academic performance ($p<.01$). Child report was significantly correlated with verbal memory, reading and math skills ($p<.01$) but not teacher report of academic performance. Multiple regression analyses revealed that parent report was a stronger predictor of reading skill and teacher report of academic performance than the child's performance on either verbal memory test.

Conclusions: These preliminary data provide evidence for reliability and construct validity of the parent and child subjective memory questionnaires. Parent report, in particular, may improve prediction of academic outcomes for a clinical population of children.

Correspondence: *Lynn Chapieski, Ph.D., Baylor College of Medicine, 6621 Fannin St.-CC-1250, Houston, TX 77005. E-mail: mlchapie@texaschildrenshospital.org*

D. CHASE. The Underlying Structures of the Stanford-Binet Intelligence Scales - Fifth Edition.

Objective: To evaluate the validity of Gale Roid's confirmatory factor analysis of the Stanford-Binet Intelligence Scales - Fifth Edition.

Participants and Methods: The data of 78 cases were included in this analysis with 52 males and 26 females that were included in the study. The minimum age was 2 and the maximum age was 19.

An exploratory factor analysis was conducted to examine the underlying factor structure of the SB5, based on the 10 scales that are included in the measure. The principal components method of extraction was used (Joreskog & Lawley, 1968; Pedhazur, 1982). To determine the number of factors to retain and analyze, Cattell's (1966) scree test, a weighted, reduced correlation matrix, and the interpretability of the Oblimin rotation of factors, were used. The exploratory factor analysis was then re-run, splitting the male and female cases to evaluate the hypothesis that the gender of the subjects will influence the underlying factor structure of the SB5. Furthermore, post hoc regression analyses were conducted to address the question of whether or not the SB5 can predict specific diagnoses. To ensure that our data were valid and that the factors measured the constructs that we indicated that they did, the correlations between the SB5 and various other measures were explored.

Results: The exploratory factor analysis of this study revealed a two-factor model, that is in fact different from the five-factor model that the author of the SB5 found using a confirmatory factor analysis.

Conclusions: Both confirmatory and exploratory factor analysis should be considered when constructing an intellectual measure. Furthermore, the SB5 should be interpreted with caution, as Roid's five-factor model does not appear to be replicable and therefore, may not be generalizable. Correspondence: *Danielle Chase, Ph.D., UCLA, 624 Boccaccio Avenue, Venice, CA 90291. E-mail: daniellechase@gmail.com*

G. CHRISTOPHER, M. SEMRUD-CLIKEMAN, A. CHENG & J. WALKOWIAK. Using Screening Interviews to Predict Scores on a Social Perception Task.

Objective: Children with social competence disorders have difficulty understanding the perspectives of others and sharing experiences with others (Gutstein and Whitney, 2002). The relation between difficulties with social perception from parent report and those from a direct measure have not been carefully studied. The purpose of this research was to evaluate the relation between a parent interview and a measure of social perception involving perception of nonverbal cues and emotional cues.

Participants and Methods: Scores were obtained for 119 children aged 6 to 16 with diagnoses of Attention-Deficit/Hyperactivity Disorder, Nonverbal Learning Disability, Asperger's Syndrome, Pervasive Developmental Disorders and controls. They all completed a direct measure of social perception as well as an interview with their main caretaker. There were 73 boys and 46 girls. All children had an IQ above 85 and achievement within expectations of their ability.

Results: Data was analyzed using multiple regression analysis. Two separate multiple regressions were run for the two scores produced by the CASP. The results showed that the screening interview accounted for 25% ($p < 0.001$) of the variance in CASP emotion scores, and 20% ($p < 0.001$) of the variance in of CASP nonverbal cues scores.

Conclusions: These findings suggest that parental reports are consistent with findings from a direct measure of social perception. Social competence is an important task for children and difficulties understanding emotional cues and nonverbal information likely impair social functioning in children.

Correspondence: *Gina Christopher, BA, University of Texas at Austin, 1221 South Congress Ave, Apt. 913, Austin, TX 78704. E-mail: ginabc81@yahoo.com*

P. CIRINO, J.M. FLETCHER, M. DENNIS & A. WALKER. Predictors of Math in Spina Bifida Myelomeningocele.

Objective: Individuals with Spina Bifida Myelomeningocele (SBMM) are at risk for difficulties in math. Cognitive skills associated with math include phonology, semantic retrieval of math facts, visuospatial skills, and executive skills. This study examined these predictors simultaneously, and determined if predictors differ in SBMM and Controls.

Participants and Methods: The sample was comprised of 217 individuals with SBMM, and 56 Controls whose mean age was 11.6 (3.0) years. Math outcomes included the WJ-R Calculations and Quantitative Concepts, and the Quantitative subscale of the Stanford-Binet. Predictor measures were phonology (auditory analysis and WJ-R Word Attack), semantic retrieval (rapid naming and CVLT variables), executive functions (SNAP-IV and BRIEF, WJ-R Concept Formation and Numbers Reversed), and visual spatial (Beery VMI, WJ-R Spatial Relations, JLO). Raw scores were residualized based on age, standardized, and combined into composites. Regression analyses explored the impact of the cognitive tasks.

Results: First, group (SBMM and Control) and SES were entered into models, with both significantly predictive (all $p < .05$) of each type of math performance, accounting for 20% to 33% of the variance. In the second step, the five cognitive variables accounted for an additional 25% to 43% variance (all $p < .05$). Predictors included phonology (for the WJ-R subtests), EF (for all tasks), and spatial skills (for WJ-R Calculations and SB Quantitative). SES was a significant contributor for WJ-R Quantitative Concepts. Group differences were no longer significant in the final models, and group did not moderate the cognitive predictors.

Conclusions: The present study suggested significant contributions for each of the general areas examined, including phonology, executive skills, and spatial skills; semantic retrieval was not found to be a significant predictor. Parent ratings of executive skills were less predictive than executive cognitive tasks, and predictors did not differ in the two populations.

Correspondence: *Paul Cirino, Ph.D., University of Houston, Dept. of Psychology TMC Annex, 2151 W. Holcombe Blvd., Ste 224a, Houston, TX 77204. E-mail: pcirino@uh.edu*

A.S. DAVIS, M.K. SCHNEIDER, A.R. SLONAKER, T.J. NEAL, R.S. DEAN, R.W. WOODCOCK & B.A. HUDSON. Descriptive Discriminant Analysis of Basic Auditory and Visual Acuity and Subcortical Motor Processes between Individuals with ADHD and TBI.

Objective: Many symptoms of Traumatic Brain Injury (TBI) mimic the presentation of Attention-Deficit/Hyperactivity Disorder (ADHD). Both disorders present similar deficits in higher-order cortical functions such as attention, inhibition, impulsivity, and memory. These similarities may complicate differential diagnosis, especially when the TBI is mild or suspected. The current study presents the results of a Descriptive Discriminant Analysis (DDA) that was used as a multivariate post-hoc measure to investigate the differential performance of individuals with either a TBI or ADHD in regard to visual and auditory sensory acuity and subcortical motor deficits.

Participants and Methods: This study examined differences between 40 individuals diagnosed with ADHD (mean age = 17.5 years; SD = 6.16) and 40 individuals with a diagnosis of TBI (mean age = 20.9 years; SD = 11.2). All participants were administered the Dean-Woodcock Sensory Motor Battery (DWSMB) as part of a complete neuropsychological assessment.

Results: Because the MANOVA tested significant, the first (and only) corresponding DDA linear function is also significant. Based on the structure r values, the group with TBI performed markedly worse on measures of Right Auditory Acuity (.807), Gait and Station (.805), Romberg (.688), and measures of auditory acuity.

Conclusions: The group with TBI demonstrated worse subcortical motor impairment and perturbations in auditory acuity. The results suggest that measures of subcortical motor skills and auditory acuity should be included in the assessment of these groups for differential diagnosis and treatment planning. The results will be discussed in terms of implications for researchers and practitioners.

Correspondence: *Andrew S. Davis, Ph.D., Ball State University and Indiana Neuroscience Institute, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

A.S. DAVIS, T.J. NEAL, A.R. SLONAKER, R.S. DEAN, R.W. WOODCOCK & B.A. HUDSON. Can Agraphesthesia and Astereognosis Predict Academic Deficits in Children with ADHD?

Objective: In addition to the neurocognitive problems of attentional control, arousal, activation, vigilance, and executive dysfunction, children with Attention-Deficit/Hyperactivity Disorder (ADHD) tend to struggle with academic tasks. Although the aforementioned deficits are synergistic, recent research has revealed that children with ADHD exhibit impairment with basic sensory processes such as graphesthesia and stereognosis. Determining if agraphesthesia and astereognosis are predictive of academic dysfunction in a group of children with ADHD was the purpose of this study.

Participants and Methods: This study used multivariate regression to predict academic deficits using standardized measures of agraphesthesia and astereognosis in a group of 108 children with ADHD (mean age = 10.78 years; SD = 3.21 years). All participants were administered the Dean-Woodcock Sensory-Motor Battery (DWSMB) and academic subtests from the Woodcock-Johnson Psycho-Educational Battery-Revised as part of a complete neuropsychological assessment.

Results: Regression analysis showed a moderate to large association (R^2 ranged from .306 to .549) between standardized measures of astereognosis and agraphesthesia and academic measures of Letter-Word Identification, Reading Comprehension, and Calculation. Individual analysis of variance measures revealed that the tactile tasks predicted a significant proportion of the variance for each academic ability.

Conclusions: This finding is important since the vast majority of investigations link higher-order cognitive processing and behavioral deficits to the academic problems exhibited by children with ADHD, while limited research exists regarding the connection between tactile discrimination and academic performance. This poster will discuss the implications of these findings for researchers and practitioners.

Correspondence: *Andrew S. Davis, Ph.D., Ball State University and Indiana Neuroscience Institute, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

A.S. DAVIS, A.R. SLONAKER, T.J. NEAL, R.S. DEAN, R.W. WOODCOCK & B.A. HUDSON. Evaluating the Presence of Agraphesthesia and Astereognosis in Children with ADHD.

Objective: Recent research increasingly reveals that, in addition to higher-order cognitive processing problems, children with Attention-Deficit/Hyperactivity Disorder (ADHD) demonstrate sensory and motor processing deficits. Tests for agraphesthesia and astereognosis are classic measures of tactile discrimination, often related to clumsiness and problems with dexterity. Comparing a group of children with ADHD with normal controls for the presence of agraphesthesia and astereognosis was the purpose of this study.

Participants and Methods: This sample consisted of 105 children diagnosed with ADHD (mean age = 11.38 years; standard deviation = 2.94 years) and 235 children with no history of neurological or psychiatric impairment (mean age = 11.36 years; standard deviation = 2.86 years). As part of a comprehensive battery, each participant received the Palm Writing and Object Identification subtests from the Dean-Woodcock Sensory Motor Battery (DWSMB).

Results: The MANOVA revealed that the change in the combined dependent variable of the tests for group participants was significantly related to diagnosis, Wilks' Lambda = .919, $F(4, 335) = 7.365$, $p > .000$. Subsequent univariate tests indicated that individuals with ADHD performed significantly worse on measures of right and left Palm Writing and right and left Object Identification.

Conclusions: The group of patients with ADHD demonstrated incidences of bilateral agraphesthesia and astereognosis significantly greater than normal age-matched controls. This is a significant finding since the academic difficulties associated with tactile discrimination can be profound. Implications will be reviewed in regard to practitioners and researchers.

Correspondence: *Andrew S. Davis, Ph.D., Ball State University and Indiana Neuroscience Institute, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

A.N. DAVIS & M.Y. KIBBY. Is There a Relationship Between Self-Esteem and Executive Functioning?

Objective: Self-esteem (SE) is often linked with depression and anxiety, and there have been many studies focused on the relationship between depression/anxiety and executive functioning (EF). However, few studies have examined the relationship between SE and EF.

Participants and Methods: Participants included 20 children with dyslexia, 26 with ADHD, and 28 controls, ages 8-12 years. Those with co-morbid dyslexia and ADHD were excluded. The groups differed in IQ and gender but were comparable in age. Measures of EF, SE, and mood were administered as part of a larger study (R03 HD048752-01). SE was measured with the Self-Esteem Index (SEI), which includes the Familial Acceptance (FA), Academic Competence (AC), and Peer Popularity (PP) subscales. Mood was measured with the parent BASC, RC-MAS, and CDI.

Results: Using IQ and gender as covariates, groups were comparable in SE and mood, except for BASC anxiety and depression. As groups were comparable in SE, the total sample was used for the remaining analyses. FA was correlated with WCST Failure to Maintain Set, NEPSY Tower, RCMAS Total Anxiety, and CDI Total Depression. AC was correlated with gender, WJ-III Decision Speed, Tower Rule Violations, CMS Sequences, FSIQ, Total Anxiety, and Total Depression. Peer Popularity was not related to EF or mood measures. Total Anxiety approached significance with Sequences and Tower RV. Total Depression was not correlated with the EF measures.

Conclusions: While anxiety may serve as a mediator for some of the relationships, self-esteem is related to executive functioning. Hence, it is important to consider both mood and self-esteem in neuropsychological assessment.

Correspondence: *Amy N. Davis, Southern Illinois University Carbondale, 1033 Neely Hall, Carbondale, IL 62901. E-mail: andavis55@yahoo.com*

C. DEMOPOULOS, H. BAE & A. DAVIS. Evaluation of Social Deficits in Nonverbal Learning Disability in Comparison to Attention Deficit Hyperactivity Disorder.

Objective: Children with Nonverbal Learning Disabilities (NLD) and Attention Deficit Hyperactivity Disorder (ADHD) have been shown to struggle in their social interactions. This may be due to either the lack of social comprehension skills and/or social execution skills. Social deficits are one of the core deficits in children with NLD. Such deficits are likely due to poor social comprehension and resulting execution difficulties. Children with ADHD also struggle socially, mainly with execution.

Participants and Methods: The Diagnostic Accuracy of Nonverbal Accuracy – Second Edition (DANVA-2) is a computer measure developed to assess an individual's ability to read affect (with faces and tone of voice). The Behavior Assessment System for Children – Second Edition (BASC-2) is a rating scale that includes two scales specific to socialization: Social Skills and Leadership Skills scales. This study will ascertain if there are any group differences among measures as well as examine DANVA-2 performance relative to parental report of social skills on the BASC-2. The sample included 35 children with diagnoses of either NLD (n=10) or ADHD, Combined Type (n=25).

Results: No significant group differences were found on the BASC-2 scales or on the DANVA-2. Results indicated a trend towards the ADHD group to show worse performance on adult tone of voice judgments relative to parent report of poor social skills ($r=0.358$), but no relationships were found in the NLD group.

Conclusions: Findings are discussed in terms of the potential dissociability of social comprehension skills relative to parent report of social execution skills.

Correspondence: Amy Davis, Ph.D., Alexian Neurosciences Institute, 800 Biesterfeld Rd. Ste. 610, Eberle Building, Elk Grove Village, IL 60007. E-mail: amy.davis@abbhh.net

C. DEMOPOULOS, H. BAE & A. DAVIS. Evaluation of Executive Functioning Across Parent Report and Test Performance in Attention Deficit Hyperactivity Disorder and Nonverbal Learning Disability.

Objective: Children with Attention Deficit Hyperactivity Disorder (ADHD) and Nonverbal Learning Disabilities (NLD) have both been shown to exhibit executive dysfunction. Recent studies examining the clinical validation of the Behavior Rating Inventory of Executive Functioning (BRIEF) have shown good sensitivity in differentiating children with ADHD from a normal comparison sample of children. Fewer studies have assessed the BRIEF's sensitivity in differentiating across neurobehavioral groups. Studies that have looked at the concurrent validity of the BRIEF in relationship to executive functioning measures have been more inconclusive.

Participants and Methods: The purpose of this study is twofold: 1) to assess the validity of the BRIEF in distinguishing executive functioning deficits in children with ADHD versus NLD and, 2) to evaluate executive functioning performance on the Delis-Kaplan Executive Function System (D-KEFS) Tower subtest in relationship to parent ratings on the BRIEF in these two groups. The sample included 31 children with either a diagnosis of NLD (n=9) or ADHD (n=22).

Results: While no significant group differences were found on the measures across groups, results indicated significant correlations between BRIEF Monitor and Tower Accuracy ($r=-.44$) and BRIEF Shift and Tower Achievement ($r=-.44$) in the ADHD group. The NLD group presented differently, with correlations between BRIEF Global Executive Composite and Tower Rule Violations ($r=-.79$), BRIEF Metacognition Index and Tower Rule Violations ($r=-.77$), BRIEF Plan/Organize and Tower Rule Violations ($r=-.82$), and BRIEF Working Memory and Tower Rule Violations ($r=-.75$).

Conclusions: Findings are discussed in regards to how executive dysfunction might present differently across diagnostic groups in relationship to performance on measures of executive functioning and parent report.

Correspondence: Amy Davis, Ph.D., Alexian Neurosciences Institute, 800 Biesterfeld Rd. Ste. 610, Eberle Building, Elk Grove Village, IL 60007. E-mail: amy.davis@abbhh.net

J. DORFLINGER, M. MARLOW-O'CONNOR, M.N. PAVULURI & L.D. STANFORD. Neuropsychological Profiles of Children with Bipolar Disorder versus Subtypes of ADHD.

Objective: Attention Deficit/Hyperactivity Disorder (ADHD) and Pediatric Bipolar Disorder (PBD) have detrimental effects on a child's learning and behavior. Few studies have directly compared these groups on neuropsychological measures. It was hypothesized that all groups would show different patterns and severity of deficits on measures of executive, behavioral, and emotional functioning.

Participants and Methods: The study is currently recruiting consecutive clinic referrals for completion of a standard neuropsychological battery, and thus far includes children with ADHD-Combined Type (ADHD-C; n=31), ADHD-Inattentive Type (ADHD-I; n=24), and PBD (n=6). Performances will be compared to normative data and each other.

Results: Preliminary use of ANOVAs showed that the ADHD-C and PBD had more impulsivity than the ADHD-I group but all had significant difficulty sustaining attention. PBD children differed on phonemic, but not semantic fluency, and on parent ratings of their emotions and behaviors. There were no group differences on visual memory, working memory, visual perception, or motor skills. PBD were rated as more oppositional, hyperactive, aggressive, and socially inept than both ADHD groups.

Conclusions: Consistent with previous studies, the results suggest that children with ADHD and PBD have difficulties with sustained attention but different patterns of executive deficits. This developing dataset links unique cognitive deficits with parent reported behavioral difficulties in these three diagnostic groups, and can be used to guide future interventions.

Correspondence: Jill Dorflinger, Ph.D., Psychiatry, University of Illinois Medical Center, 912 S Wood St, M/C 913, Chicago, IL 60612. E-mail: jdorflinger@psych.uic.edu

J. FRIEND, J. UNDERHILL, Y. YOKOYAMA & L. KONOPKA. Use of Cognitive Assessment to Differentially Diagnose Between Bipolar and ADHD in Pediatric Populations.

Objective: Presently, the ability to differentially diagnose between bipolar and ADHD in children is insufficient. Current standards, which focus upon reported behavior, frequently lead to inaccurate assessment, misdiagnosis, and poor treatment outcome. Neuropsychological and behavioral presentation of bipolar and ADHD share common characteristics. However, objective cognitive testing is likely to reveal unique features of these disorders, and to assist in differential diagnosis.

Participants and Methods: This study included 32 participants, ages 8 to 13, who were hospitalized for aggressive behavior. Subjects were diagnosed by a board certified psychiatrist based upon DSM-IV-TR symptom presentation and family history. Each participant was administered a WISC-IV within two days of hospital admission. Three groups were then created by diagnosis: ADHD group (7), bipolar group (7), and other psychiatric conditions (18). Using SPSS 6.0, normalized verbal comprehension indices of the three groups were compared using Mann-Whitney nonparametric test and an independent t-test.

Results: Significant differences were found between the ADHD group and bipolar group ($p = .03$). Significant differences were also found between the ADHD group and the psychiatric control group ($p = .01$).

Conclusions: Despite small group sizes, results remain significant. Of the groups tested, the ADHD group achieved lowest scores in verbal fluency, knowledge, and expression. These results differed significantly from the bipolar group, who achieved medial scores, and from the control group, who attained the highest scores. This outcome indicates that cognitive testing, particularly in areas of verbal reasoning and concept formation, may enhance methods of objectively differentiating between ADHD, bipolar, and other disorders in pediatric populations.

Correspondence: Julia Friend, MA, Atascadero State Hospital, 9301 Bocina Ln. Apt. E, Atascadero, CA 93422. E-mail: jules290@hotmail.com

C.L. WOLFSON, V. WOLFSON & H. GOMES. The Impact of Expressive Formulation Skills on Vocabulary Definitions in Children.

Objective: The ability to precisely and succinctly express one's ideas is critical for effective communication. Some children evidence difficulties in this area producing imprecise and tangential responses to questions which often fail to capture the most salient or critical point. To examine the contribution of formulation abilities to response quality on verbal intelligence tasks, this study compared the quality of responses on the Vocabulary subtest of the Wechsler Abbreviated Scale of Intelligence to performance on the Formulated Sentences (FS) subtest of the Clinical Evaluation of Language Fundamentals.

Participants and Methods: 102 participants (68 males) took part in this NIDCD funded study (M= 8 y, 5 m; SD=10 m). To characterize response quality independent of vocabulary level, we calculated the proportion of 0-, 1- and 2-point responses to the total number of responses (up to the last scoreable item). Since WASI Vocabulary words increase in difficulty, typically developing children would be expected to give mainly 2-point responses with a few 1-point responses at the limit of their vocabulary knowledge.

Results: We calculated partial correlations controlling for age and PIQ as both were found to correlate with the ratios. Performance on FS was

significantly positively correlated with the proportion of 2-point Vocabulary responses ($r^2 = .264$, $p < .01$) and significantly negatively correlated with the proportion of 0-point Vocabulary responses ($r^2 = -.335$, $p < .001$), but not significantly correlated with the proportion of 1-point Vocabulary responses ($r^2 = -.022$, $p = .832$).

Conclusions: Formulation abilities contribute to both good and poor quality responses.

Correspondence: *Hilary Gomes, Ph.D., Psychology, City College of NY, 37 Gristmill Drive, Kings Park, NY 11754. E-mail: hgomes@earthlink.net*

S. OOI, K. LINDSTEDT, D. NAVARRO & A. HEFFELFINGER. Attention and Executive Impairment in Early Neurological Injury.

Objective: Children with early neurological injury are at risk for significant attention and executive dysfunction. Rapid brain development in the first years of life and optimal neurological recovery six months to one year post-injury underscore the importance of early identification of attention and executive dysfunctions. However, limited methods are available to identify early neuropsychological impairments. The purpose of this study is to 1) demonstrate inter-individual variability on attention and executive measures and 2) to compare attention and executive functioning in children with early neurological injury to controls. We hypothesize that the early neurological injury group (NEURO, $n=3$) will be more distracted, have less focused attention, and increased perseverations compared to a control group (CONTROL, $n=5$) using Mann Whitney U statistics.

Participants and Methods: Eight children (75% male; mean age=30 months, $SD=6.8$; $IQ=94.3$, $SD=30$) completed the Early Attention Task assessing focused attention versus distractibility. Subjects were presented with single and multiple toys amidst distracters and coded at five second intervals. Delayed Alternation (DA), involving hiding rewards alternately in two wells, assessed perseverations.

Results: 1) Adequate variability was evident in the range of scores for each variable. 2) The NEURO group was significantly more distracted than CONTROLS when multiple toys were present ($p < 0.05$) with a trend towards significant differences when only one toy was present ($p = 0.13$). Groups were not different for focused attention. The NEURO group was more perseverative on DA than the controls ($p < 0.05$).

Conclusions: Results suggest that attention and executive functioning can be assessed clinically in children with early neurological injury.

Correspondence: *Amy Heffelfinger, MCW, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: aheffelfinger@mcw.edu*

A. HEFFELFINGER, J. KOOP, K. LINDSTEDT & K. ESPY. Delayed Alternation: Clinical Application in 2-5 Year Olds.

Objective: Assessment measures of executive functioning in preschool-age children are limited. Application of research measures (Delayed Alternation; DA) may be clinically useful. Proposed hypotheses are: Performance 1) varies across subjects, 2) relates to overall cognition, attention, and adaptive functioning, and 3) predicts clinical Attention/EF concerns.

Participants and Methods: 125 subjects ranging from 2 to 5 years old (80 boys, 45 girls, 25 controls) completed Mullen or DAS, NEPSY Visual Attention, and CBCL.

Results: 1) Each of the DA variables assessed had substantial performance variability including number correct (mean=12.67, $SD=4.18$, min=2 and max=20), longest correct run (mean=5.61, $SD=5.82$, min=0 and max=19), and longest perseverative run (mean=2.58, $SD=2.33$, min=0 and max=13). These variables were intercorrelated ($r = .459$ to $.837$); thus, only total correct will be discussed. 2) Total correct was significantly correlated with cognition ($r=0.55$) and age ($r=0.25$). Controlling for cognition and age, DA was significantly correlated with NEPSY Visual Attention Cats commission errors ($r = -0.51$), but not Cats omissions or adaptive functioning. 3) DA performance was correlated with parent and teacher CBCL attention concerns ($r = -.28$ to $-.34$),

but not when controlling for cognition. To explore the relationship between CBCL, DA and cognition, regressions were conducted for subjects with cognition < 86 ($n=53$) and > 85 ($n=57$). Number correct predicted parent report of attention problems in cognitively intact subjects only [attention problems: $R=0.53$, $t = -1.89$, $p < .05$; ADH symptoms: $R=0.53$, $t = -2.13$, $p < .05$].

Conclusions: DA appears to be a useful measure of executive functioning in 2-5 year old children, especially those with average cognitive abilities.

Correspondence: *Amy Heffelfinger, MCW, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: aheffelfinger@mcw.edu*

S. HUGHES, C. JORDAN & E. SHAPIRO. Predictors of Stability and Decline in Bayley Scores Through the "Terrible Twos"

Objective: In a longitudinal study of children being raised in poverty, particular difficulty was observed during neuropsychological testing at age 24 months. Review of scores on the Bayley Scales of Infant Development (BSID) showed 3 distinct patterns over time: 1) Stable performance across the 12-18, 24, and 36 month assessments (the "Stable" group); 2) Lower performance at 24 months than 12-18 and 36 months (the "Blip" group); and 3) Performance at 24 months declining from 12-18 months and remaining low at 36 months (the "Declined" group). Further analysis was done to attempt to explain these distinct patterns of performance.

Participants and Methods: Family SES, maternal characteristics, child temperament, and child attention were compared across the three performance groups using MANOVA in 77 children from the DREAMS Child Development Project dataset.

Results: Significant differences were found between groups in SES, maternal Cognitive and Emotional Asset factors, and 20- and 26-month child Positive Affect (PA) scores from the Minnesota-Preschool Affect Rating Scale (MNPARS). No differences were seen in attention (Early Childhood Vigilance Task), or Negative Affect and Self Regulation (MNPARS). Post-hoc analysis showed that compared to the Stable group, both the Blip and Declined groups had lower maternal Cognitive Assets factor scores and lower child PA MNPARS scores. The Declined group also had lower maternal Emotional Assets scores.

Conclusions: At 24 months, test performance is affected by child temperament, maternal well-being and parenting skills, and SES. Brief decline in the Blip group is interpreted as the collision of poorer parenting skills and low child PA at a difficult developmental age. Persisting low scores in the Declined group are felt to reflect additional, long-term deleterious effects of maternal distress on child development.

Correspondence: *Steve Hughes, PhD, Pediatrics, University of Minnesota, MMC 486, 420 Delaware Street SE, Minneapolis, MN 55455. E-mail: hughe029@umn.edu*

J. MICHEL, R.J. MCINERNEY & K.A. KERNS. Differentiating ADHD and FASD: the Children's Learning Questionnaire.

Objective: Fetal Alcohol Spectrum Disorder (FASD) results in various behavioral, cognitive and psychosocial sequelae. Inattention and hyperactivity are common, and many children with FASD are mis- or co-diagnosed with Attention Deficit Hyperactivity Disorder (ADHD).

This study sought to differentiate between children with ADHD and children with FASD, using two standardized and one novel questionnaire: (1) BRIEF (2) ABAS-2; and (3) Children's Learning Questionnaire (CLQ), created to explore caregiver perceptions of a child's transfer of learning in everyday life. CLQ items were developed according to areas that research and clinical knowledge have identified as particularly challenging for children with FASD.

Participants and Methods: Caregivers of 18 children with FASD and 15 children with ADHD (ages 6 - 15) completed all 3 questionnaires. In addition, parents of 18 typically developing children completed only the CLQ.

Results: Composite scores on the ABAS-2 and the BRIEF failed to differentiate between children with FASD and children with ADHD. However, on the CLQ, children with FASD were rated as having significantly weaker transfer of learning abilities compared to the other groups, making this the only measure on which children with FASD and children with ADHD differed significantly (ADHD, $p < .01$, $d = 1.3$; Control, $p < .01$, $d = 3.0$).

Conclusions: The CLQ may prove to be a useful tool for helping to differentiate children with FASD from children with ADHD. Psychometric properties of the CLQ and clinical implications will be presented. Correspondence: Jennifer Michel, M.Sc., Psychology, University of Victoria, Dept. of Psychology, PO Box 3050, Victoria, BC V8W 3P5, Canada. E-mail: jmichel@uvic.ca

K. PHILLIPS, J.I. KOOP & A.K. HEFFELFINGER. Clinical Utility of the NEPSY Visual Attention Supplemental Indices.

Objective: NEPSY Visual Attention Cats is one of the few tasks with normative data to assess specific attention skills in 3–5 year olds. Clinical experience, however, suggests concern with the Scale Score. It combines completion time and number of errors, and, thus, does not appear particularly sensitive to observable attention difficulties. While the Scale Score appears to capture poor performance in an inattentive or anxious child with long completion time, it consistently overestimates the skills of children who are impulsively quick at task completion.

Participants and Methods: The Cats Scale and Supplemental Scores (time, commission and omission errors) of 92 children (aged 3–5; $x=4.31$ years; $sd=0.69$) were examined in relation to parental and teacher report on the Achenbach Child Behavior Checklist (CBCL). It was hypothesized that 1) completion time would not be sensitive to attention problems, 2) commission and omission errors would be sensitive to attention problems, and 3) the scaled score would not be sensitive to attention problems.

Results: As hypothesized, Completion Time was positively correlated with parental and teacher Withdrawal T Score [$r(91)=0.22$, $p<0.05$; $r(92)=0.30$, $p<0.01$], but not Attention T Score. Cats Omissions and Commissions were positively correlated with only teacher Attention T Score [$r(92)=0.26$, $p<0.01$, $r(92)=0.23$, $p<0.05$]. The Cats scaled score was negatively correlated with parent and teacher CBCL Attention T Score [$r(91)=-0.26$, $p<0.01$; $r(92)=-0.33$, $p<0.01$] but also teacher CBCL Withdrawal [$r(92)=-0.20$, $p<0.05$].

Conclusions: Interpreting both Scale and Supplementary Scores is more informative about actual attention problems than only the Scale Score for Visual Attention.

Correspondence: Jennifer I. Koop, PhD, Neurology, Division of Neuropsychology, Medical College of Wisconsin, 9200 West Wisconsin Ave., Milwaukee, WI 53226. E-mail: jkoop@mcw.edu

M. SEMRUD-CLIKEMAN, S. PLIZSKA & K. HIGGINS. Stimulant Medication and Neuropsychological Functioning in ADHD.

Objective: Children with ADHD with a history of stimulant treatment are hypothesized to show improved functioning in neuropsychological functioning. Few studies have evaluated children with a history of stimulant treatment on the same measures as administered to children without a treatment history. The long-term effect of stimulant medication use on neuropsychological functioning has not been carefully studied.

Participants and Methods: The participants in this study were 18 boys: ADHD:combined type with a history of stimulant medication, ADHD:combined type who are treatment naïve (TN), and typically developing controls. No child diagnosed with ADHD had any comorbid diagnosis. All were right-handed and English speaking. Each child completed an individually administered neuropsychological battery including measures of ability, achievement, attention, executive function, and language. All children treated with stimulant medication were not on medication 24 hours prior to the evaluation.

Results: No differences among the groups was found on measures of age, verbal ability, nonverbal or spatial skills, overall ability reading, mathematics calculation, or spelling. However, both ADHD groups scored significantly poorer than the controls on a measure of written expression with the TN group scoring significantly worse than the other two groups. Attention measures found significant differences among the groups with a significant difference between the TN and controls present but not with the treated group. The Tower of London found significant differences among the groups with the children with ADHD TN scoring the poorest on the number of violations on this measure.

Conclusions: Findings from this study suggest that while children with a history of stimulant medication improve on measures of attention and executive functioning, they continue to score more poorly than controls. Of additional interest is the finding that children who are treatment naïve score the poorest on most measures.

Correspondence: Margaret Semrud-Clikeman, Ph.D., Educational Psychology, University of Texas, 1 University Station, D 5800, Austin, TX 78712. E-mail: peg.semrud@mail.utexas.edu

K. SHEPARD & N.L. NUSSBAUM. The Relationship Between Processing Speed and Attention Symptoms.

Objective: This study investigates the relationship between processing speed and attention symptoms in. A recent review of research indicates that although slow processing speed is assumed to be associated with attention, little empirical research exists that supports this assumption (Klienmann et al., 2005). In a preliminary study, Shepard and Nussbaum (2006) found that slow performance on the WISC-IV Processing Speed Index (PSI) was associated with increased inattentive symptoms, as measured by the SNAP-IV. The purpose of the current study is to expand on the aforementioned preliminary findings by including additional measures of reaction time, fine-motor speed, and general intellectual ability.

Participants and Methods: The clinical sample consisted of 80 children (7–15 y.o.) referred for a neuropsychological evaluation due to academic difficulties. Attention difficulties were measured using the SNAP-IV. Processing speed was measured with the PSI from the WISC and Hit Rate from the Connor's CPT. Fine-motor speed was assessed using the grooved pegboard. Intellectual ability was assessed using the General Ability Index from the WISC-IV. Stepwise regression analysis was used to test the hypotheses regarding the predictors of attention difficulties. Statistical significance was set at the $p<0.05$.

Results: All of the predictor variables (PSI, GAI, CCPT, and dominant hand on Pegs), were entered into the stepwise regression models for both inattentive symptoms and hyperactive symptoms. For the inattentive symptoms, only the PSI was a significant predictor, accounting for 10 percent of the variance ($F(1,77)=8.46$; $p=.004$). None of the variables were significant predictors of hyperactive/impulsive symptoms.

Conclusions: These results suggest a link specifically between more complex processing speed and attention symptoms. This study has possible important implications regarding neurobehavioral functioning and intervention for youth with slow processing speed.

Correspondence: Katherine Shepard, MA, School Psychology, University of Texas at Austin, 410 Towne Park Trail, Austin, TX 78751. E-mail: katherineshepard@yahoo.com

E.I. ANANYEVA, G. SHERESHEVSKY, L.I. WASSERMAN & M.V. WASSERMAN. Standardization and Validation of a New Non-Verbal General Cognitive Ability Test for Children in Russia.

Objective: General intelligence assessment remains a topical issue in pediatric neuropsychology, relevant, among other things, to monitoring cognitive interventions' effectiveness. There is a need for brief yet informative instruments, administrable under time constraints, and for

a larger number of such instruments, to avoid practice effects. In Russia there is a shortage of psychometrically validated tests, impelling the standardization and validation of the Test of Intellectual Potential (TIP). Being non-verbal can render this test useful outside of Russia as well.

Participants and Methods: TIP is a non-verbal general intelligence test, consisting of graphic stimuli sequences, for which a best element to continue a sequence has to be chosen. TIP has 2 parallel forms and requires under 15 minutes to complete. Standardization sample included nearly 2000 normal children and adolescents, aged 7 to 16 years (split into one year bands), from various regions of Russia. To investigate TIP's validity and clinical utility studies are being conducted with various clinical groups of children and adolescents.

Results: Raw scores from standardization sample were transformed into stanines and IQ scores. Test-retest (parallel forms) reliability was assessed with a smaller sample ($n = 135$), yielding $R = .79$ ($p < .01$). TIP's correlation with Raven's Matrices was $.90$ ($p < .01$), also assessed with a smaller sample ($n = 98$, age range 12 – 16).

Conclusions: TIP appears to be a valuable clinical instrument for general cognitive ability assessment, requiring, nonetheless, further validation studies with various clinical groups, highlighting, among other things, relation of general ability to component processes and functions.

Correspondence: Gary Shereshevsky, St.Petersburg State University, V.M. Bekhterev Psychoneurological State Research Institute, St. Petersburg, Russia, 14 Exeter Street, Brooklyn, NY 11235. E-mail: shgary@yandex.ru

C.S. VON THOMSEN, S. TALBOT, T.A. ZABEL & E.M. MAHONE. (Un)Reliable Change of the CPT-II in Healthy Children.

Objective: The Conners' CPT-II is a measure of sustained attention commonly used to serially detect changes in mental status and/or response to treatment. This study examined the stability of CPT-II test scores in typically developing youth to confirm test reliability under stable conditions.

Participants and Methods: Participants were 28 healthy children (13 girls) ages 5-18 without MR (mean PPVT-III SS=100), LD, or psychiatric disorders (DICA-IV). Each took the Conners' Continuous Performance Test-II (CPT-II) twice: at time 1 ([T1]; mean age 13.0 years) and an average of 7 months later (time 2 [T2]; mean age 13.6 years). "Statistically rare" changes in test scores (T1-T2) were defined as change scores falling outside a 90% reliable change index (RCI) confidence interval (CI) (i.e., $Sdiff \times 1.64$). RCI CIs were used to determine the significance of any changes in test scores (T1-T2) on four commonly used CPT-II variables: Omissions, Commissions, Response Time, and Variability. Published (CPT-II manual) standard error of measurement (SEM) information was only available for raw scores, and analysis was conducted accordingly.

Results: Paired sample (T1,T2) t-tests using standard scores did not indicate a practice effect for any of the four variables. Test-retest correlations of standard scores were acceptable (i.e., $r > .40$) for each CPT-II variable except Omissions ($r = .30$). Using the available SEM information for RCI CI calculation, Commissions and Response Time had an acceptable proportion of statistically rare changes in raw scores (T1-T2): Commissions (0%); Response Time (21%, 3 declining). In contrast, a significant proportion (Chi-Square $< .001$) of statistically rare changes in scores were detected for Omissions (61%, 7 declining) and Variability (93%, 13 declining).

Conclusions: Using currently published SEMs for RCI calculations, several CPT-II variables are too unreliable in typically developing children to be used for empirically detecting treatment responses and/or cognitive decline in the serial assessment of children.

Correspondence: Theodore Zabel, Ph.D., Kennedy Krieger Institute, 416 Bretton Place, Baltimore, MD 21218. E-mail: zabela@kennedykrieger.org

C. VONTHOMSEN, S. TALBOT, E.M. MAHONE & T.A. ZABEL. Reliable Change Indices in Pediatric Serial Assessment: Three Different Scenarios Involving Typically Developing Children.

Objective: This study examined the impact of adjusting for practice effects in reliable change index (RCI) calculations when serially assessing children and adolescents.

Participants and Methods: Thirty children (13 girls) ages 5-18 without MR (mean PPVT-III SS = 100), LD, or psychiatric disorders (DICA-IV). Each child was tested twice: at time 1 ([T1]; mean age 13.0 years) and an average of 7 months later (time 2 [T2]; mean age 13.6 years), using three timed measures including WISC-IV Block Design, Woodcock Johnson-III Visual Matching and Retrieval Fluency. "Statistically rare" changes in standard scores (T1-T2) were defined as change scores falling outside a 90% RCI confidence interval (CI) (i.e., $Sdiff \times 1.64$). RCI CIs were calculated with and without consideration of mean test-retest gains (i.e., practice effects) reported in the WISC-IV (test-retest interval = 32 days) and WJ-III manuals (test-retest interval = 1 day).

Results: Scenario 1: When RCI CIs were calculated without consideration of practice effects (npRCI), an acceptable proportion of statistically rare changes in Block Design scores (20%, 2 declining) was observed. In contrast, when using practice-adjusted RCI (pRCI), this same data yielded an unexpectedly high (Chi-Square $< .01$) number of significant intra-individual test score changes (27%, 7 declining). Scenario 2: The opposite pattern was observed using the Visual Matching data, with an unexpectedly high (Chi-Square $< .01$) proportion of test score changes (20%, 0 declining) using npRCI, and an acceptable number (4 total [13%]: 1 decline) using pRCI. Scenario 3: An acceptable proportion of statistically rare changes in Retrieval Fluency scores (16%) was observed using both npRCI (1 declining) and pRCI (4 declining).

Conclusions: A preferable approach to RCI calculation (e.g., npRCI versus pRCI) was not evident from this data. Reliability estimates calculated from short test-retest intervals may be inappropriate for practice-adjusted RCI use in the serial assessment of children.

Correspondence: Theodore Zabel, Ph.D., Kennedy Krieger Institute, 416 Bretton Place, Baltimore, MD 21218. E-mail: zabela@kennedykrieger.org

Cognitive Intervention/Rehabilitation

N. BELFOR, S.M. ATKINS, H.W. MAHNCKE & M.M. MERZENICH. A Novel Brain Plasticity Based Training Program Improves Learning and Working Memory on modified Token Test in healthy elderly.

Objective: To investigate changes in working memory and learning in healthy older adults following training with a computerized brain-plasticity-based training program.

Participants and Methods: Data from three randomized controlled studies were combined ($N = 265$, mean age = 72.2; mean MMSE = 28.8). The experimental training (ET) group $N = 137$, the active control (AC) group $N = 56$, and the no contact control (NCC) group $N = 72$. All participants completed pre- and post-training assessment including a modified version Token Test (mTT). Both the ET and AC training were ~60 minutes/day, 5 days/week, 40 sessions. The ET group used a brain-plasticity-based training program designed to enhance the speed and accuracy of information processing in the auditory system while stimulating neuromodulatory systems involved in learning and memory. AC participants used educational DVD lectures on the computer. NCC participants were only contacted for neuropsychological testing. The differences between three groups on change scores between post and pre-mTT was analyzed with ANOVA and post-hoc LSD test.

Results: Results showed statistically significant difference between the change scores (post-training minus pre-training) across the 3 groups

(ANOVA, $p=0.00$). Post-hoc analysis (LSD correction) showed a statistically significant difference between treatment and both control groups ($p=0.00$ AC; $p=0.03$ NCC), favoring ET. There was not significant difference between the control groups ($p=0.24$). The magnitude of the improvement in ET group was $z=0.2$.

Conclusions: The training program improves working memory and attention as measured by mTT in normal older adults. Current and future studies will investigate whether this change generalizes to activities of daily functioning.

Correspondence: *Nataliya Belfor, Ph.D., Outcomes, Posit Science, 225 Bush Street, 7th Floor, San Francisco, CA 94104. E-mail: natasha.belfor@positscience.com*

B.D. BRIGIDI, D. SMITH, L. FORNNARINO, L. JONES, H.S. FRIEDMAN & R.H. RAYNOR. Assessing Adult CNS Tumor Patients' Intentions to Complete Daily Neuropsychological Rehabilitation Using the Theory of Planned Behavior.

Objective: There are no published studies on neuropsychological rehabilitation for adults with CNS tumors, which may be due to the fact that survival has traditionally been dismal. However, recent advances in treatment has increased survival time and pushed quality of life issues, such as neurocognitive impairment, to the forefront of comprehensive neurooncological care. As an initial starting point to developing a neuropsychological rehabilitation program for adults with CNS tumors, we conducted a survey based on Ajzen's (2002) Theory of Planned Behavior to assess patients' preferences and behavioral, normative, and control beliefs regarding neuropsychological rehabilitation.

Participants and Methods: 250 surveys were administered either in person or by mail to adult CNS tumor patients who completed neuropsychological evaluation between 6/2005 and 6/2006. The survey consisted of 43 items, mostly rated on a 7-point Likert-type scale, related to regularly practicing computer-based neuropsychological rehabilitation. Response rate was 38%, which, with removal of missing data, resulted in 92 completed surveys available for analysis.

Results: Respondents were 39% female, 90% WHO tumor grades III or IV, mean age of 45 years old, 65% married, 94% Caucasian, 28% working full-time, 78% at least college education, an average of 102 days since diagnosis, and 100% reported owning a computer with Internet access. Linear regression showed that patients' control and normative beliefs were significant predictors ($ps < .0001$) and accounted for .62 of the variance of intentions to practice daily neuropsychological rehabilitation.

Conclusions: Neuropsychological rehabilitation appears to be both needed and desired by patients with CNS tumors and the current results provide initial information about the parameters for this important intervention.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

B.D. BRIGIDI, A.E. POWELL, L.M. FORMAN, H.S. FRIEDMAN & R.H. RAYNOR. Testing a New Component for Neuropsychological Rehabilitation: A Feasibility Study of Acceptance-Based Cognitive Training.

Objective: The holy grail of neuropsychological rehabilitation has been transferring gains made on specific tasks or tests in artificial environments to functional improvements in everyday activities. Present in both training and "real-life" experience is, at least at some level, the brain-injured individual's perception of their own impairment and the manner in which they deal with perceived changes from premorbid functioning. Incorporating techniques of acceptance-based behavior therapy into cognitive training provides a framework for individuals with mild to moderate neurocognitive impairment to effectively cope with mak-

ing mistakes and maintain focus, first in artificial training situations, and, then later, outside of this context. In this way, acceptance-based cognitive training may bridge a gap between performance on specific training tasks and functioning in everyday activities. As such, we are conducting a feasibility study of acceptance-based cognitive training.

Participants and Methods: Five adult primary CNS tumor patients were recruited to complete 1 1/2 hour training sessions on 3 out of 7 days per week for 6 weeks in a sound-attenuated room in an outpatient clinic setting. Each session consisted of 1/2 hour of mindfulness and acceptance training followed by 1 hour of computer-based cognitive training. The research design is an A-B-A design and participants complete a brief neuropsychological/quality of life test battery at baseline, post-intervention, and 3-months post-intervention (HVLIT-R, COWAT, Trails A & B, FACT-BR, FACT-COG). In addition, participants are required to complete self-ratings in a daily log of mood, coping, and perceived cognition. **Results:** Pre- and post-intervention data for five adult primary CNS tumor patients with stable disease will be presented.

Conclusions: Preliminary analyses show improvement on computer training tasks and ratings of mood between sessions.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

D. DAWSON, H.J. POLATAJKO & B. LEVINE. Naturalistic Rehabilitation for Executive Dysfunction.

Objective: Meta-cognitive strategies appear to have a positive effect in the rehabilitation of executive dysfunction. However, achieving generalization to daily life remains a challenge. We believe that providing rehabilitation in the person's own environment using activities identified by them as important and meaningful will enhance the benefits of meta-cognitive training and promote generalization. The objective of this pilot study was to test the applicability of the Cognitive Orientation to Occupational Performance (CO-OP) approach for use with adults with executive dysfunction arising from traumatic brain injury (TBI).

Participants and Methods: A combined single-case, pre-post test design was used with three adults, 10+ years post-severe TBI. Assessments included neuropsychological tests of attention, memory and executive function, a naturalistic assessment of executive dysfunction (Multiple Errands Test), a standardized interview to set goals, and ongoing videotaped observation of activity performance. The intervention entailed guiding participants to use a meta-cognitive problem solving strategy in the performance of their selected activities. The intervention occurred over 20 sessions (1-hour each) over 10 weeks, in participants' environments (e.g., home, local grocery store etc.).

Results: All participants improved their performance on trained activities. There were some indications of transfer to trained tasks. For 2 of the 3 participants, a caregiver committed to continuing to use this approach for acquiring additional daily living activities.

Conclusions: The CO-OP Approach has the potential for use with adults with TBI. It is a unique approach to rehabilitation for people with cognitive impairments as contextual it is focused solely on activities identified by the participants as important to them.

Correspondence: *Deirdre Dawson, PhD, Kunin-Lunenfeld Applied Research Unit, Baycrest, 3560 Bathurst St., Toronto, ON M6A 2E1, Canada. E-mail: ddawson@klaru-baycrest.on.ca*

J.C. FELVER-GANT, A. BRUCE, M. ZIMMERMAN, L. SWEET, R. MILLMAN & M. ALOIA. Working Memory in Obstructive Sleep Apnea: Construct Validity and Treatment Effects.

Objective: To better understand the effects of OSA on working memory performance. We first examined the construct validity of a working memory task (the 2-Back task) as it is related to other tests of cognitive functioning, and then determined the effects of PAP treatment on measures of both working memory and related component processes.

Participants and Methods: Fifty-six OSA participants were administered neurocognitive tests of working memory and related subordinate processes prior to initiation of PAP treatment and at a three month follow-up visit. Objective monitors were employed to measure PAP treatment adherence. Statistical analyses were conducted to examine treatment adherence and neurocognitive performance over time.

Results: Performance on the 2-Back task was statistically correlated with both a second working memory task (PASAT) and all subordinate neurocognitive measures employed. Participants were separated into high and low PAP adherence groups using a median split of 4 hours of PAP use per night. Repeated measures ANOVAs demonstrated that high adherers performed better across time on both tests of working memory (n-Back: $F(46) = 4.73, p < .04$; PASAT: $F(46) = 4.92, p < .04$) whereas low adherers performed more poorly. There were no treatment effects for any other cognitive measure.

Conclusions: The n-Back task demonstrated adequate construct validity as a measurement of working memory in individuals with OSA. Our treatment adherence findings suggest that the superordinate construct of working memory is more sensitive to the effects OSA treatment than are any of its subordinate cognitive processes.

Correspondence: *Joshua C. Felver-Gant, BA, Psychiatry and Human Behavior, Brown University, Brown University, Box G-BH (Duncan Bldg.), Providence, RI 02912. E-mail: joshua_felver-gant@brown.edu*

E.I. FRANCHOW, Y. SUCHY & A. EASTVOLD. Brain Injury and Return to Work: Subjective Ratings of Memory Predict Outcome Failures.

Objective: Return to Work programs represent a valuable rehabilitation option for brain-injured individuals. However, their success rates have averaged between 30 and 40%, making the identification of risk factors for program failure a high priority. Although neuropsychological assessments have proven effective in predicting outcomes, they are often prohibitively costly. The present study examines whether a brief memory scale administered by rehabilitation staff can identify clients who are certain to fail and thus inappropriate for the program.

Participants and Methods: Retrospective outcome data for 52 clients from a multidisciplinary return to work program were examined. A 16-point rating scale of memory based on subjective staff judgments during the first week in the program was used as a predictor of outcome (i.e., success=any type of employment, failure=no employment).

Results: Results showed that, consistent with the literature, approximately 34% of clients succeeded. ROC curve analyses showed that memory scale scores below 6.00 predicted program failure with a 100% specificity and 53% sensitivity. After eliminating participants who were identified by the scale as having a zero chance of succeeding, the success rate increased dramatically from 34% to 50%.

Conclusions: These results support recent endeavors to develop brief assessment tools that can both standardize subjective staff assessments and serve as accurate predictors of program success or failure. The presently examined instruments offer promise for a-priori identification of prospective Return to Work Program clients who are certain to fail, either because they have reached the end of possible recovery or because their memory difficulties require a special, more tailored, treatment approach.

Correspondence: *Emilie I. Franchow, Psychology, University of Utah, S345 Willowcreek Drive, Sandy, UT 84093. E-mail: e.franchow@utah.edu*

L. SHEPPARD & J.C. FREELAND. Computer-Aided Errorless Learning Paradigm to Improve Face-Name Recall Memory in Patients with Acquired Brain Injury.

Objective: Difficulty learning the names of familiar people is a significant social challenge to persons living with the effects of acquired brain injury. Errorless learning techniques have been used for the rehabilita-

tion of a number of different cognitive deficits including face name learning. The present study used a novel computer-aided technique to explore the learning of names of familiar rehabilitation staff. A differential reinforcement procedure closely followed the original paradigm of Terrace (1963.)

Participants and Methods: Five patients participated who were involved in rehabilitation for neurobehavioral deficits secondary to severe acquired brain injury. The aim was to learn the names of 10 familiar rehabilitation staff using a computer assisted errorless learning procedure. The training protocol was developed on an inexpensive software package designed for classroom teaching. This allowed use by staff with very limited preparation and ensured a standard protocol in each case. Participants received a small monetary reward for a correct response and a smaller reward for not guessing which then repeated the practice exposure. All participants were tested prior to the training and ten staff whose names they had not recalled were selected for training. Training ceased after the participant could correctly respond to the names of the ten staff on three consecutive trials.

Results: Compared to baseline the participant's free recall of the staff's names improved significantly ($\chi^2=11.045, df=3, p<0.01$). These results showed evidence of generalizing over time with improvements at one day ($Z=-2.03, p<0.05$), one week ($Z=-2.03, p<0.05$) and 6 weeks post intervention ($z=-2.04, p<0.05$).

Conclusions: The study supports the use of a computer-aided errorless learning procedure to teach the names of familiar people to patients with severe acquired brain injury. The results also demonstrated the effectiveness of a differential reinforcement technique which encourages fewer errorful responses during training.

Correspondence: *John C. Freeland, PhD, Brain Injury Rehabilitation Trust, York House, 107 Heslington road, York YO10 3AY, United Kingdom. E-mail: freeland@BIRT.co.uk*

A. PADMANABHAPILLAI, B. FREILICH & A. MEDALIA. Number Needed To Treat: Efficacy of NEAR Cognitive Remediation.

Objective: Number needed to treat (NNT) is a useful measure of treatment effect, which has become a popular method in recent years for clinical decision-making. NNT represents the number of patients who would need to be treated with a specified intervention in order to obtain one additional positive outcome that would not have occurred with a comparison treatment. The goal of the present study was to determine NNT for NEAR cognitive remediation in psychiatric patients.

Participants and Methods: Data was drawn from two RCTs on cognitive remediation comparing Neuropsychological Educational Approach to Remediation (NEAR) to treatment as usual (TAU). First study consisted of 54 inpatients with schizophrenia or schizoaffective disorder (36 experimental; 18 control) with an outcome measure of problem-solving for independent living. Second study consisted of 32 outpatients, 18 had schizophrenia (11 experimental; 7 controls) and 14 patients had affective disorders (6 experimental; 8 controls). The outcome measures were scores on tests of executive functioning, learning and memory. Significant improvement was determined using reliable change indexes (RCI) for each of the participants. NNT was calculated as the inverse of the difference between the percentage of patients with a significant RCI in the experimental and in the control group.

Results: NNT ranged from 2-5 in these RCTs, which used neuropsychological tests and functional outcome as measures of efficacy.

Conclusions: The NNT of NEAR, a behavioral treatment for cognitive dysfunction compares favorably to the NNT reported for widely used pharmacologic treatments, indicating that NEAR is a useful addition to psychiatric treatment programs.

Correspondence: *Ajayan Padmanabhapillai, PhD, Psychiatry, Montefiore Medical Center, Klau-2, 111 East 210th Street, Bronx, NY 10467. E-mail: ajayanpsyche@yahoo.com*

J.B. FULTON & N.L. HOWES. Executive Function Enhancement in Children and Adolescents with Severe and Persistent Mental Illness (SPMI): A Small Sample Study.

Objective: Executive function (EF) difficulties have been documented in a host of neurological and psychiatric conditions affecting children and adolescents. Yet, research on treatments aimed at improving executive functions in youth has been limited. This study examined the effectiveness of a multicomponent executive function enhancement program delivered in an inpatient psychiatric facility with a group of children and adolescents who have severe and persistent mental illnesses. It was hypothesized that youth receiving EF enhancement treatments would demonstrate greater improvements on EF measures than a comparable group receiving only psychiatric and psychotherapeutic interventions.

Participants and Methods: Participants (n=18) were youth admitted to a state inpatient psychiatric hospital. Subjects were matched on age, gender, length of treatment, and performance on EF measures at intake. All subjects were administered EF measures at admission and at discharge. Scores were derived from tests appropriate to the youth's age with children receiving the NEPSY and adolescents receiving the Trail Making Test.

Results: A t-test for matched samples compared group performances on EF measures. As predicted, Ss receiving EF enhancement treatments demonstrated significantly greater change on EF measures (M = 19.88, SD = 10.48) than Ss receiving standard treatments (M = 1.15, SD = 24.91), $t(16) = 2.078$, $p = .027$ (one-tailed).

Conclusions: Within this study children and adolescents at a state psychiatric facility receiving a multicomponent executive function enhancement track demonstrated greater improvements over the course of treatment than those receiving treatment as usual. This study indicated that specific, intensive treatments can be beneficial in enhancing EF abilities in youth populations.

Correspondence: *John B. Fulton, BS, Psychology, Brigham Young University, 769 S. 320 W., Provo, UT 84601. E-mail: byupsychology@yahoo.com*

C.V. HEUGTEN, C. GEUSGENS, J. JOLLES & W. VAN DEN HEUVEL. Generalisation of Strategy Training Effects in Stroke Patients with Apraxia: there is no place like home?

Objective: The objective of this study was to examine performance on ADL tasks in stroke patients with apraxia and healthy controls in different settings (familiar and unfamiliar) in order to gain more insight into the capacity to use strategies in different contexts as a form of generalisation.

Participants and Methods: Twentynine stroke patients with apraxia were observed while performing ADL tasks after 8 weeks of strategy training in two settings: rehabilitation centre and home. Thirty healthy controls were observed performing ADL tasks in their own kitchen and in an unfamiliar kitchen.

Both groups were observed using standardized ADL observations for stroke patients with apraxia and the controls were also observed using the rationale of the AMPS.

Results: There were no significant differences between the level of functioning of the stroke patients in the rehabilitation centre versus their own home, suggesting transfer of training effects.

The healthy controls did not show any differences on the ADL-observations either, but since this instrument was designed to measure limitations due to apraxia, this was not expected. On the AMPS-related measure however, controls did show differences in functioning between the two settings: in their own home less time was needed to perform the tasks and the overall score of process skills also showed better functioning in their own familiar surroundings.

Conclusions: This study forms a challenge for future research since it appears that there is a discrepancy between the results of the two separate studies: the patients on the one hand do profit from training in

the rehabilitation centre when returning to the home situation. While the healthy controls show that even without brain damage, the environment in which a task is being performed, has influence on the level of performance. These conclusions will be discussed in relation to the goal and organisation of rehabilitation programmes.

Correspondence: *Caroline V. Heugten, PhD, rehabilitation, iRv, PO Box 192, Hoensbroek 6430 AD, Netherlands. E-mail: c.vanheugten@irv.nl*

B.W. JASPER, H.M. CONKLIN, R.B. KHAN, W.E. REDDICK, S. HELTON, M. BONNER, R. BROWN, S. WU, X. XIONG & R.K. MULHERN. Acute Neurocognitive Response to Methylphenidate Among Childhood Cancer Survivors: A Randomized, Double-Blind, Cross-Over Trial.

Objective: Children surviving acute lymphoblastic leukemia (ALL) and brain tumors (BT) are at significant risk for attention and learning problems. Yet, there have been few attempts to study interventions to remediate these problems. The current study investigated the acute efficacy and tolerability of Methylphenidate (MPH) among learning impaired ALL and BT survivors.

Participants and Methods: Patients (N= 122) participated in a two-day, in-clinic, double-blind, cross-over trial during which they received MPH (0.60 mg/kg; maximum dose 20 mg) and placebo (lactose) in randomly assigned order. Performance on measures of attention, memory and academic achievement was evaluated using a mixed model that accounts for carry over effects (e.g., practice effects). Common side effects of stimulant medication were assessed using Barkley's Side Effects Rating Scales.

Results: A significant MPH vs. placebo effect was revealed for Stroop ink color naming using the mixed model ($p = .01$) and a trend was identified for CPT Beta ($p = .06$). All Stroop indices and CVLT-C recognition false positives showed a greater positive than negative change for MPH over placebo (binomial test $p < .005$). Logistic regression indicated that male gender, treatment age > 4 and IQ > 70 were predictive of better medication response for some cognitive indices. There were no significant differences in number or severity of side effects following MPH and placebo.

Conclusions: MPH shows neurocognitive benefit and is well tolerated by ALL and BT survivors. Processing speed, response tendency and recall accuracy were most sensitive to MPH. Level and severity of side effects were similar to rates reported in the ADHD literature.

Correspondence: *Bruce W. Jasper, Ph.D., Psychology, Memphis VA Medical Center, 1030 Jefferson Ave., Memphis, TN 38104. E-mail: bbwujj@juno.com*

D.R. LITKE & S. PEERY. An Errorless Learning Approach In A Cognitive Remediation Group Treatment: A Case Study.

Objective: An errorless learning paradigm using simple component tasks to help insure accurate acquisition of information was used in a cognitive remediation group. The objective was to help brain injured patients acquire knowledge in an error-free way and then use that knowledge to solve a subsequent complex task.

Participants and Methods: We adapted a complex "Logic Art" task into a multistage set of component sub-tasks that incrementally increased in complexity. Strategy use was emphasized during training. Patients were 4 men and 6 women. Diagnoses included TBI (7/10), and one each with CVA, MS, and epilepsy. They were functioning independently in ADLs but required social and cognitive supports. Two were working part-time; no others were working. Mean (SD) neuropsychological test scores: VIQ = 105 (13.3); PIQ = 93 (10.0); FSIQ = 100 (8.5). They presented with deficits of visual attention (Picture Completion mean = 7.7; SD = 2.6).

Results: When initially presented with the test task (a complex Logic Art 10x10 grid) at baseline, no subject was able to complete it. Patients reported feeling overwhelmed, frustrated, and angry. After a 10 week module, patients required the following amounts of cueing to complete the test grid: no cueing (2/10), minimal cueing (3/10), moderate cueing (3/10), maximal cueing (2/10).

Conclusions: All patients showed improved performance compared to their baselines and were able to complete 10x10 grids that were less complex than the 10x10 test grid. Performance on the test grid, however, was varied. Possible explanations for this finding include: 1) the jump in complexity from simple 10x10 grids to the test grid require additional incremental steps during training; 2) some patients require additional repetitions of intermediary steps; 3) the integrated use of all strategies needed to solve the test grid required a level of cognitive flexibility that was not targeted in this errorless learning training. In addition to cognitive strategies, emotional regulation strategies were highly useful.

Correspondence: *Shelley Peery, PhD, Psychology, Rusk Institute of Rehabilitation Medicine, NYU Medical Center, 400 East 34th St., New York, NY 10016. E-mail: shelley.peery@nyumc.org*

P. MOES, B. BOLT, N. MEDEIROS-WARD & K. ZUIDEMA. The Effect of Training with the Makoto Apparatus on Neurocognitive Performance.

Objective: A variety of commercial enterprises have made claims about the benefits of their product for neurological and cognitive development or rehabilitation (e.g., “Brain Gym”). The present exploratory study was designed to examine the putative benefits of one such product, the Makoto training apparatus, for cognitive and neuropsychological treatment.

Participants and Methods: Three studies tested the impact of this training device on neurological development (e.g., interhemispheric transfer), and neurocognitive performance (e.g., reaction time, attention, executive function). The first study examined the effects of the training on reaction time and interhemispheric transfer, with a normal healthy population. The second study examined the impact of the training on neurocognitive abilities for individuals with closed head injury, measuring, reaction time, executive function and interhemispheric transfer. The third study examined the potential attentional and neurocognitive benefits for adolescents diagnosed with a variety of cognitive, developmental and behavioral conditions.

Results: Primary findings from the first study indicated significant improvements in reaction time for the Makoto training group, compared to control groups, but no significant changes in measures of interhemispheric interaction. The second study found significant changes in executive function, as measured by the trail-making test, but no changes in interhemispheric interaction. Finally, the third study failed to show any improvements in measures of attention (i.e., TOVA test), or interhemispheric interaction following Makoto training.

Conclusions: While the findings did not confirm claims that the training would improve interhemispheric interaction, there were small improvements found in some measures of neurocognitive function that merit additional study.

Correspondence: *Paul Moes, Ph.D., Psychology, Calvin College, 3201 Burton St. SE, Grand Rapids, MI 49506. E-mail: pmoes@calvin.edu*

C. NIKI, T. MARUYAMA, Y. MURAGAKI & T. KUMADA. Relearning Kanji Words by Short Presentation in a Patient with Left Temporal Lobe.

Objective: We investigated reacquisition of word knowledge in a patient with left temporal lobe, by short presentation (just 10 sec) of each word. **Participants and Methods:** Participant (KS): A 38-year-old man who suffered brain tumor in the left anterior temporal region. After tumor resection, he manifested impairment of writing Kanji words, especially irregular-reading words.

Procedure: In each trial, a target world written in phonemic Kana character was presented for 5 sec, followed by a correct Kanji word for 5 sec. KS was asked to covertly translate Kana to Kanji while a Kana word was presented. There were forty-two words. He participated the practice session in 14 days, with three new words per a day. He received the same 3 words session twice a day. The practice session repeated third times (52 days). After each practice session, he took part in a Kanji dictation test. In addition, two and five months after the final practice session, the same Kanji dictation test was performed.

Results: Results: Before learning, his performance of dictation was 0% correct. After the first learning session, his performance was increased to 58% correct. After the second learning session, the performance was 68% correct, and after the third, 88%. Two and five months after finishing all learning session, it was 67% and 69%, respectively. Performance of non-learning words in each test was 41%, and 34% which was significantly lower than those for learned words.

Conclusions: Discussion: After watching words only in ten minutes a day, his performance of writing words was increased, and this effect was continued even after the fifth month.

Correspondence: *Chiharu Niki, Ph.D., Institute for Human Science and Biomedical Engineering, National Institute of Advanced Industrial Science and Technology, Tsukuba central 6, 1-1-1, Higashi, Tsukuba, Ibaraki, Tsukuba 305-8566, Japan. E-mail: chiharu-niki@aist.go.jp*

S. PEERY & R. SHERR. Rehabilitation of Alexia without Agraphia in an Amnesic Man: A Case Study.

Objective: Alexia without agraphia is a syndrome involving the ability to write without the ability to read due to disruption of orthographic word-forms. Rehabilitation typically involves training letter-by-letter reading. We present a case study of a 37 year old, college educated man with pure alexia whose rehabilitation was complicated by severe amnesia.

Participants and Methods: TD was 33 when diagnosed with cerebral abscess. Post right frontal craniotomy, he had right homonymous hemianopia and apraxia, aphasia, amnesia, and alexia. He had been tested pre-morbidly, 16 months post surgery and after two years of cognitive remediation. When outpatient cognitive rehabilitation began, TD was beginning to resume writing, as his right sided apraxia decreased. Rehabilitation consisted of twice weekly cognitive remediation with a focus on increasing reading ability. Techniques included kinesthetic facilitation (i.e., tracing) and intensive repetition to re-create letter-symbol associations followed by word recognition and sentence reading tasks. Reading speed was a function of word length.

Results: Pre-morbidly, VIQ=108, PIQ=127, FSIQ=117 and he was able to read at the college level. Sixteen months post surgery, VIQ=78, PIQ=63, FSIQ=69; he was unable to identify letters or numbers; WMS-III <1st-5th %ile. After two years of cognitive rehabilitation, 33 months post surgery, VIQ=83, PIQ=77, FSIQ=84, WRAT-III Reading=34th %ile; WMS-III 1st-5th %ile; reading rate=60 words/minute and was a function of familiarity.

Conclusions: This case offers an example of rehabilitation of alexia without agraphia in the context of a complex clinical picture. Despite persistent amnesia, TD was able to learn letter-by-letter reading and increase his speed of processing for decoding to be functional, if not automatic. This case is also significant for the fact that rehabilitation began two years after the brain injury, well after the period of expected spontaneous recovery, yet he showed improved functioning with a targeted intervention.

Correspondence: *Shelley Peery, PhD, Psychology, Rusk Institute of Rehabilitation Medicine, NYU Medical Center, 400 East 34th St., New York, NY 10016. E-mail: shelley.peery@nyumc.org*

S. RASQUIN, P. VAN DE SANDE, B. PRAAMSTRA & C. VAN HEUGTEN. Cognitive Behavioural Intervention for Depression after Stroke: Effects and Feasibility in a Series of Single Cases.

Objective: To investigate the effect and feasibility of a newly developed therapy to reduce depressive symptoms, based on cognitive-behavioural principles on five chronic stroke patients.

Participants and Methods: A single-subject experimental design (SSED) was used with an AB design, and follow-up at one and three months.

Five chronic stroke patients from an outpatient rehabilitation centre participated.

Outcome measures: Depressive mood, quality of life and feeling of happiness were measured on four occasions during four weeks (A phase), with the Beck Depression Inventory, Symptom Checklist 90, Stroke Adapted Sickness Impact Profile, and a visual analogue scale (VAS) respectively. During the intervention's B phase, three times a week VAS was assessed. Directly after the intervention, one, and three months later, all measures were repeated.

The intervention consisted of cognitive behavioural principles: recognise negative thoughts and challenge them by learning principles of relaxation (8, 1 hour, sessions with a psychologist).

Results: Three patients improved clinically on one of the outcome measures, three patients reported a minor improvement in quality of life, and four patients reported a more happy feeling. Three months after the intervention three patients reported fewer depressive symptoms. Both patients and therapist were positive about the intervention and three months later, in daily life, all patients still apply strategies learned in the intervention.

Conclusions: Despite some ambiguous results, it seems that the cognitive-behavioural intervention has some effect on mood in the patients. Moreover the intervention is feasible for stroke patients. Large scale research studies are recommended.

Correspondence: *Sascha Rasquin, Phd, IRV, PO Box 192, Hoensbroek 6430 AD, Netherlands. E-mail: s.rasquin@irv.nl*

S. RASQUIN, K. BEERS, B. WIP & C. VAN HEUGTEN. Effectiveness of Neuropsychological Rehabilitation in Patients with Acquired Brain Injury.

Objective: In The Netherlands, yearly, 50.000 people are diagnosed as having survived brain injury. On the long term (6 to 12 months after injury) especially cognitive and emotional consequences are disabling for the patients daily life and their environment. Daily activities like going to work, leisure time and household can not be performed as patients were used to before their injury. A new Cognitive Rehabilitation Program is offered to these patients. The program consists of 3 treatment modules: cognitive training, social skills training and psycho-education. In this research project we plan to evaluate the efficacy of this program by comparing the outcome of the Neuropsychological rehabilitation to outcome of a control group.

Participants and Methods: This study has a Randomised Controlled Trial Design.

Both groups consist of 15 therapy sessions in groups of 7 patients. Seventy patients with acquired brain damage, older than 18 years, good insight in own daily functioning, willing to participate in a group, no alcohol or medication abuse, and no dementia. In the experimental group patients receive neuropsychological rehabilitation (regarding both cognitive and emotional/social deficits). In the control group the patients only receive information about the possible cognitive and emotional consequences of acquired brain injury. Outcomes (at the start of the program, at the end, and 6 months later): quality of life, self efficacy, emotional complaints, and cognitive disorders.

Results: The participants are very positive about the intervention. In this study we extend these results with data about the effectiveness of this rehabilitation program.

Conclusions: Although this cognitive behavioural program is promising, more in depth research about the effectiveness on participation in society is necessary.

Correspondence: *Sascha Rasquin, Phd, IRV, PO Box 192, Hoensbroek 6430 AD, Netherlands. E-mail: s.rasquin@irv.nl*

M.L. ROHLING, M.E. FAUST, B. BEVERLY, G.J. DEMAKIS & S.R. MILLIS. Meta-Analytic Review of Evidence Based Cognitive Rehabilitation.

Objective: This presentation will describe our quantitative review of literature examining cognitive rehabilitation following traumatic brain injury and cerebral vascular accident.

Participants and Methods: We examined the same literature as did Cicerone et al. (2000 & 2005), who have published two reviews on this issue. Using meta-analytic procedures standardized mean effect sizes were calculated (i.e., Cohen's d) for each intervention. Effect sizes were analyzed for heterogeneity across several domains, including: (a) class of research; (b) treatment recommendation level (i.e., standard, guideline, option); (c) domain of treatment (e.g., attention, visuospatial); (d) type of disorder (i.e., TBI vs. CVA); (e) time since injury (e.g., acute, sub-acute, & chronic); and (f) patient demographics.

Results: Effects of rehabilitation were better for patients who suffered from language deficits as well as spacial inattention. Both groups of patients tended to have suffered from a CVA rather than a TBI. No strong evidence existed for class of research, time of injury, or other patient characteristics.

Conclusions: Cicerone et al.'s (2001 & 2005) generated practice parameters using common medical labels of Standards, Guidelines, and Options. Despite their exceptional effort, results of the current meta-analysis found significant discrepancies between Cicerone et al.'s qualitative reviews and our quantitative review of the same literature. Effects were far more modest than was suggested by Cicerone et al. Differences should lead clinicians to alternative treatments than those recommended by Cicerone et al. (2000 & 2005).

Correspondence: *Martin L. Rohling, Ph.D., Psychology, University of South Alabama, 331 Life Sciences Building, Mobile, AL 36693. E-mail: mrohling@usouthal.edu*

D.I. SITZER, E.W. TWAMLEY & D.V. JESTE. The Relationship Between Changes in Neuropsychological and Functional Abilities Among Schizophrenia Outpatients.

Objective: Neuropsychological impairment is a primary feature of schizophrenia and has been associated with functional impairment. Psychosocial interventions such as Cognitive Training (CT) have demonstrated the ability to improve neuropsychological functioning in this population, but it is unclear if these improvements result in improved daily functioning. We hypothesized that improvements in cognitive functioning would be related to improvements in functional abilities.

Participants and Methods: 24 outpatients with schizophrenia or related psychotic disorders (71% male, 67% Caucasian, mean age=50, mean education=13 years) participated in a randomized controlled trial comparing CT to standard pharmacotherapy. Before and after the 12-week intervention, participants completed measures of cognition (attention, learning, memory, executive functioning, prospective memory, processing speed, working memory, and language) and daily functioning (the UCSD Performance-Based Skills Assessment, measuring recreation planning, financial management, communication skills, transportation management, and completion of household chores). Change scores were calculated for each cognitive and functional domain. Pearson correlations were used to determine if changes in cognition were related to changes in daily functioning.

Results: Improved attention was associated with improved financial ($r=.416, p=.048$) and transportation management ($r=.470, p=.024$). Changes in all other domains of cognitive functioning were unrelated to changes in functional abilities.

Conclusions: The finding that improvements in attention were associated with improved daily functioning is consistent with previous literature suggesting that attention/vigilance is related to functional ability. However, changes in other domains of cognitive functioning that have been associated with functional abilities (e.g., working memory and executive functioning) were unrelated to changes in functional abilities, possibly due to the small sample size.

Correspondence: *David I. Sitzer, Ph.D., Psychiatry, University of California, San Diego, 1051 Diamond St. #7, San Diego, CA 92109. E-mail: dsitzer@ucsd.edu*

I. WINKENS, C.M. VAN HEUGTEN, L. FASOTTI & D.T. WADE. Reliability and Validity of Two New Instruments for Measuring the Consequences of Slowness of Information Processing in the Daily Lives of Stroke Patients.

Objective: To examine psychometric characteristics of two measures related to mental slowness experienced after stroke: one observing performance on tasks, the other a questionnaire evaluating perceived consequences.

Participants and Methods: 37 stroke patients and 33 matched controls were studied. A subgroup of 10 patients and 22 controls was observed by two independent raters to determine inter-rater reliability, and a subgroup of 18 patients completed the questionnaire twice over a two-week interval to determine test-retest stability.

Results: Internal consistency was acceptable for the Observation Test (Cronbach's $\alpha = .71$ and $.73$) and good for the Questionnaire ($\alpha = .91$). For the Observation Test percentages of absolute agreement between two independent raters ranged between 56% and 91%, correlations ranged between .77 and .99 and Intra Class Correlation coefficients were between .86 and .99. For the Questionnaire percentages of absolute agreement only reached a maximum of 11%, but correlations ranged between .85 and .90 and Intra Class Correlation coefficients were be-

tween .91 and .95. Correlations of between .40 and .70 were found between the Observation Test and neuropsychological tasks for speed of information processing. The Questionnaire correlated most strongly with scores on tests for ADL functioning, fatigue and depression (correlations ranged between .37 and .63).

Conclusions: The two new instruments offer reliable and valid methods for measuring limitations in daily activities related to mental slowness and some of the consequences of mental slowness in terms of fatigue, depressive complaints and independent ADL functioning.

Correspondence: *Ieke Winkens, PhD-student, iRv, Institute for Rehabilitation Research, Zandbergsweg 111, Hoensbroek 6430 AD, Netherlands. E-mail: i.winkens@irv.nl*

FRIDAY MORNING, FEBRUARY 9, 2007

Paper Session 5

9:00–10:30 a.m.

Pediatric Assessment/Treatment

J. DONDERS & J. NIENHUIS. Correct Recall versus Intrusive Errors on the CVLT-II after Traumatic Brain Injury.

Objective: To determine if discriminability variables, which take into account both correct responses and intrusive errors on the California Verbal Learning Test – Second Edition (CVLT-II), would yield better separation of clinical versus control participants than reliance on traditional indexes that only consider words correctly recalled.

Participants and Methods: Participants included a two-year consecutive series of patients with traumatic brain injury (TBI, $n = 48$) and a group of demographically matched healthy controls ($n = 48$). Potential participants with complicating premorbid histories or who did not put forth valid effort were excluded.

Results: On all short and long delay, free and cued recall trials, clinical patients recalled fewer correct words, and also made more intrusive errors, than control participants ($p < .05$ for all variables after stepwise Bonferroni correction). However, logistic regression analyses indicated that discriminability variables yielded a classification of clinical versus

control participants (69%) that was only slightly, and not statistically significantly, better than that based on traditional indexes (59%). This may have been due to the fact that only about a third of the participants with TBI had a truly impaired (i.e., > 1 standard deviation) level of intrusions.

Conclusions: Discriminability variables provide a diagnostic advantage over traditional CVLT-II delayed recall indexes in only a minority of patients with TBI. Furthermore, because of modest classification accuracies, exclusive reliance on the CVLT-II in the diagnosis of potential memory impairment is not advisable.

Correspondence: *Jacobus Donders, PhD, Psychology, Mary-Free Bed Rehabilitation Hospital, 235 Wealthy S.E., Grand Rapids, MI 49503. E-mail: jacobus.donders@maryfreebed.com*

H.W. SESMA, B.S. SLOMINE, R. DING & M.L. MCCARTHY. Executive Functioning in the First Year Following Pediatric Traumatic Brain Injury.

Objective: Children with traumatic brain injuries (TBI) often show impaired executive function (EF). The Behavior Rating Inventory of Executive Function (BRIEF), a caregiver-report questionnaire, measures EF in everyday activities. This study used the BRIEF to document caregiver-reported EF in children with TBI in the first year after injury and identify child, family, and injury factors associated with dysfunction.

Participants and Methods: Caregivers of children aged 5 to 15 years (330 mild to severe TBI, 103 control fractures) enrolled in a longitudinal outcomes study. Caregivers completed the BRIEF by telephone at baseline (obtained retrospectively), three months post-injury, and one year post-injury.

Results: Using analysis of variance, TBI groups and controls showed no baseline differences in BRIEF scores. Three months post-injury, children with mild ($M=54.1$), moderate ($M=54.5$), and severe TBI ($M=58.1$) all had more dysfunction than controls ($M=51.1$) on the General Executive Composite (GEC). Children with severe TBI also had more dysfunction than controls on the Behavioral Regulation Index (BRI) and the Metacognition Index (MI). One year after injury, all TBI groups differed from the controls on BRI, MI, and GEC. At all time points, pre-existing learning/behavior problems, lower respondent education, and poor family functioning predicted greater GEC dysfunction in a generalized estimating equation model. Injury severity, injury mechanism, and insurance status predicted GEC at 3 and 12 months. EF ratings remained stable from 3 to 12 months.

Conclusions: Findings support previous reports that preinjury child-, family-, and injury-related factors affect 12-month outcomes but suggest that, unlike performance measures of EF, caregiver ratings do not improve in the first year.

Correspondence: *Heather W. Sesma, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 E. Fairmount Avenue, 3rd Fl., Baltimore, MD 21231. E-mail: sesma@kennedykrieger.org*

P.S. FASTENAU, C.S. JOHNSON, A.W. BYARS, D.W. DUNN & J.K. AUSTIN. A 3-Year Prospective Study of Neuropsychological Changes in Children Following the First Recognized Seizure: Relationship to Neurological and Psychosocial Variables.

Objective: The present study followed a large community-based cohort of children prospectively for 36 months following their first recognized seizure (FRS) and examined changes on a broad neuropsychological (NP) battery in comparison to sibling controls. Risk factors and protective factors were examined.

Participants and Methods: 134 children (52% female, 88% right-handed, 89% Caucasian) and 96 closely matched sibling controls completed NP testing after their FRS and again 36 months later. Age at FRS ranged from 5.8 to 14.9 years ($M=9.5$, $SD=2.5$), and diverse seizure types were represented. $IQ>55$ was required for inclusion ($M=101.9$, $SD=16.0$). IQ was estimated using K-BIT, and other NP variables were reduced to four factors: Language, Processing Speed, Executive/Construction, and Verbal Memory. Analyses of covariance (adjusting for baseline NP scores) were used to assess the association of clinical/family variables with change in NP scores for affected children relative to siblings.

Results: Relative decline (versus siblings) was evident in speed ($p<.001$) and memory ($p<.05$). Decline was associated with earlier onset (all variables, $p<.05$), use of AEDs (IQ, language, speed, memory; $p<.01$), recurrent seizures (IQ, speed, memory; $p<.05$), and seizure type (speed only; $p<.01$). Caregiver education was a protective factor in IQ, language, and memory ($p<.05$) for both groups. Gender and family mastery were unrelated to NP change. MRI abnormalities were associated with low NP scores at baseline with no change.

Conclusions: This prospective study with a large, representative cohort of children with FRS and their sibling controls documents early NP delays, particularly for children with the aforementioned risk factors. This study improves on prior studies that relied on small and/or chronic samples, few cognitive measures, and/or limited follow-up intervals. Implications will be discussed with regard to early identification, intervention, and a published theoretical framework of pediatric epilepsy. [Funded by NIH/NINDS #22416] Correspondence: *Philip S. Fastenau, Ph.D., Psychology, IUPUI, 402 N. Blackford St., Rm LD 124, Indianapolis, IN 46202-3275. E-mail: pfastena@iupui.edu*

J. HALE, D. BLAINE-HALPERN & K. BEAKLEY. Executive Impairment Determines ADHD Response to Methylphenidate Treatment.

Objective: Although methylphenidate (MPH) often ameliorates ADHD behavioral dysfunction according to informant report and ratings, titra-

tion is seldom based on neuropsychological data, which could explain why academic gains remain limited in this population. Documenting executive-working memory (EWM) and self-regulation (SR) neuropsychological impairments could aid in ADHD diagnosis, and subsequently used to monitor MPH response.

Participants and Methods: Children with Inattentive (IT; $n = 17$) or Combined ($n = 32$)/Hyperactive-Impulsive ($n = 4$) (CHT) ADHD underwent double-blind placebo MPH trials with baseline, and randomized placebo, low dose and high dose conditions. Repeated executive-regulation measures and behavior ratings-observations were rank ordered separately across conditions with nonparametric randomization tests determining MPH response.

Results: Using EWM and SR factor scores derived from a published maximum likelihood SEM study to determine impairment level, repeated measures MANOVA results revealed robust MPH effects on 11 of 12 EWM/SR measures (range $F(3,138) 3.42$ to 31.17 , $p = .019$ to $<.001$), demonstrating their utility in determining MPH response. However, linear, quadratic, and cubic orthogonal polynomial contrasts revealed drug effects were not uniform. Neuropsychological impairment yielded better insight into findings than ADHD diagnosis, with interaction effects suggesting greater impairment resulted in better MPH response.

Conclusions: Results suggest children with EWM (i.e., dorsolateral-striatal circuit) and SR (i.e., orbital-striatal circuit) deficits, common in ADHD-CHT, show better MPH response than those with low impairment, common in ADHD-IT, possibly because the latter heterogeneous subtype includes children with other disorders. EWM and SR evaluation could foster ADHD diagnoses and MPH titration to ensure academic and behavioral treatment efficacy.

Correspondence: *James Hale, Ph.D., Psychology, Philadelphia College of Osteopathic Medicine, 4190 City Avenue, Philadelphia, PA 19131-1693. E-mail: jamesha@pcom.edu*

Symposium 5

9:00–10:30 a.m.

Methods of Inference and New Developments in the Practice of Clinical Neuropsychology

Chair: David Schretlen

Discussant: Jason Brandt

D.J. SCHRETLEN. Methods of Inference and New Developments in the Practice of Clinical Neuropsychology.

Symposium Description: Every neuropsychological assessment engages the clinician in a process of reasoning to draw inferences about a patient's functioning. At least three approaches to clinical inference have been described. These include eliciting pathognomonic signs, detecting cognitive deficits, and recognizing patterns that are characteristic of various diseases or conditions. In this symposium, the first speaker (Schretlen) will discuss the assumptions, logic, strengths and weaknesses of each approach to clinical inference. This review will address such fundamental questions as what represents an abnormal test performance, are there any pathognomonic signs in neuropsychology, and when is pattern analysis useful? The second presenters (Shear and Poreh) will de-

scribe recent developments in the “process” approach (i.e., quantitative process analysis). After placing this method of reasoning in historical context, they will review empirical evidence that supports its diagnostic utility, as well as ongoing psychometric challenges in applying this approach. The third speaker (Testa) will describe how deficit measurement has evolved over time from reliance on raw scores to the use of age-adjusted scores, and ultimately to the emergence of regression-based methods to residualize scores on various demographic characteristics. This talk will include a step-by-step description of the procedures used to compute regression-based norms, and illustrate its diagnostic advantages and potential dangers using data derived from individual cases and clinical samples. Finally, Dr. Jason Brandt, serving as a discussant for the symposium, will attempt to integrate these approaches, comment on when they are most useful, and discuss the extent to which they advance our knowledge of neuropsychological phenomena.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

D.J. SCHRETLEN. The Logic and Method of Inference in Clinical Neuropsychology.

Objective: How does one decide whether a neuropsychological examination is abnormal? What is meant by the term “cognitive deficit,” and what represents an “impaired” test performance? These questions are both fundamental to the process of clinical inference in neuropsychology yet deceptively simple. In fact, they defy simple answers and require careful consideration of such matters as the nature of population and test score distributions, the relationship of demographic variables to cognitive test performance, the prevalence of the diseases or conditions in question, and the range of normal intra-individual variability in cognitive performance. These issues are all critical to how we formulate the results of a diagnostic assessment. In this presentation, I will describe three basic approaches to clinical inference. These include reliance on pathognomonic signs, deficit measurement, and pattern analysis to interpret neuropsychological findings. This presentation will focus on the logical assumptions, implementation, usefulness, and limitations of each approach. For example, I will ask whether there are any pathognomonic signs in clinical neuropsychology, examine how we conceptualize and assess cognitive deficits, and discuss the risky practice of administering additional tests to clarify ambiguous findings. We will consider the underlying logic of each method of reasoning, and I will attempt to elucidate factors that threaten its validity and how to manage these threats. This presentation will provide practical information for novices and challenge some cherished beliefs of experienced clinicians.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

P.K. SHEAR & A.M. POREH. Quantitative Examination of Process-Based Assessment Procedures.

Objective: Neuropsychological assessment measures have traditionally emphasized global summary scores to describe performance. There is, however, abundant evidence to suggest that different individuals may demonstrate strikingly different approaches to the same problem, and that these differing processes are not adequately captured by traditional summary scores. It has been suggested in multiple reports by Werner and then more prominently by Kaplan and her colleagues that the process by which an examinee approaches a cognitive task can provide important information about the presence, lateralization and localization of brain dysfunction. Until recently, however, these widely referenced clinical assertions about process aspects of task performance have been based largely on case studies or analyses of modest numbers of patients. This presentation will begin with a historical overview of the clinical process approach. We will then provide an overview of existing empirical studies that address

the diagnostic utility and the psychometric qualities of process variables. Particular attention will be paid to current knowledge of fundamental test features such as reliability, validity and normative data. Finally, we will discuss ongoing challenges to quantitative process-based assessment.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

S. TESTA. Regression-Based Norms: Historical Development and Current Applications.

Objective: Traditionally, measurement of a cognitive ability involves comparing an individual’s test performance to the distribution of scores generated by healthy peers. This comparison quantifies the difference between an observed test performance and what is expected. Typically, the expected score is derived from a normative sample that is partitioned into subgroups (e.g., by age, education, and/or sex) to account for the influence of non-disease demographic characteristics that influence performance. However, controlling for more than one or two characteristics this way requires very large samples. Further, some demographic sub-groups entail arbitrary divisions. Regression-based normative (RBN) techniques, which use a statistical procedure to generate expected scores, overcome these obstacles in several ways. First, expected scores are based on the simultaneous consideration of several demographic variables, rather than only one or two at a time. This requires a relatively smaller sample than traditional normative approaches. Second, using RBN methods to define expected performance avoids the inevitable age and education discontinuities that characterize demographically defined sub-groups. Although, RBN techniques have enjoyed increasing acceptance over the past 10-15 years, it appears that the methods are not widely understood. Therefore, after providing an historical overview of how the RBN approach represents a logical extension of methods traditionally used to compute IQ (and other age-adjusted scores), a step-by-step illustration of RBN procedures will be presented. Finally, to illustrate both the diagnostic advantages and the potential dangers of applying regression-based norms to clinical neuropsychological interpretation, data from individual cases and clinical populations will be presented.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

Symposium 6

9:00–10:30 a.m.

Interventions to Maintain Independence in MCI/Early Dementia

Chair: Glenn Smith

Discussant: Deborah Attix

D. ATTIX, M.C. GREENAWAY, D. LOEWENSTEIN, G.E. SMITH & C. LINDA. Interventions to Maintain Independence in MCI/Early dementia.

Symposium Description: Because of the progressive nature of Alzheimer's disease and other degenerative dementias, efforts to develop nonpharmacologic interventions to maintain function within these populations have been sparse. However, with advances in our early detection capabilities, in our appreciation of learning systems and in technologies, there is growing recognition of opportunities to maintain function and quality of life during the course of cognitive decline. The last decade has offered promising preliminary results from intervention efforts targeting memory and coping. This symposium will focus on now emerging approaches to compensation for memory and cognitive impairment in MCI and early dementia through the use of various cognitive training strategies or the use of technology. The authors will detail their various approaches targeting the maintenance of functional skills and offer data supporting outcomes. The relative merits of trying to maintain memory skills versus use compensatory techniques will be considered. Further, presentations will discuss both multi-technique approaches versus single strategy efforts. Barriers to favorable outcomes, such as depression or anosognosia, will be explored. Challenges in the definition and measurement of outcomes will also be discussed. Finally and importantly, the necessity of systematic treatment planning to select appropriate intervention techniques and targets will be discussed as the foundation of treatment benefit.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

M. GREENAWAY. Compensating for Memory Loss in Amnesic Mild Cognitive Impairment.

Objective: Many individuals with amnesic Mild Cognitive Impairment (MCI) are interested in trying to manage their memory difficulties. However, few treatments beyond medications are available. Memory notebooks have been demonstrated to be an effective means of compensating for memory loss in traumatic brain injury, and may also prove beneficial in amnesic MCI.

The Memory Support System (MSS) is a calendar and organization system with accompanying curriculum designed for the unique needs of older individuals with progressive memory impairment. This project sought to determine if individuals with MCI could learn to utilize an MSS to compensate for memory loss.

Participants and Methods: Eighteen MCI subjects and their partners underwent a six-week MSS training program. Subjects worked together with a MSS trainer in multiple weekly appointments and in outside assignments. Compliance, activities of daily living, and caregiver burden were assessed at the beginning, end, and eight-weeks following intervention.

Results: Sixteen of the eighteen patients completed the program. All but one of these was compliant with the calendar system at training completion, and 83% of those continued to be compliant at follow-up. There were no significant changes in functional ability or caregiver burden. However, results suggest stabilization in functioning and a trend towards reduction in caregiver burden despite worsening cognitive function.

Conclusions: Results suggest individuals with MCI are capable of learning a memory compensation calendar system. While initial results about caregiver burden and functional ability are encouraging, research with additional outcome measures are needed to further examine the MSS's impact.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

D. LOEWENSTEIN. An Integrated Program of Cognitive and Functional Rehabilitation in Mild Alzheimer's Disease.

Objective: There is emerging evidence that cognitive rehabilitation approaches that employ spaced-retrieval, errorless learning, and capitalizes on strengthening procedural and motor memory may be useful in helping to enhance and maintain the cognitive and functional status of persons in the early stages of Alzheimer's Disease

Participants and Methods: We describe the results of an integrated cognitive rehabilitation program relative to non-specific mental stimulation for mildly impaired Alzheimer's disease patients on cholinesterase inhibitors. Methodological challenges in conducting these types of studies are examined. In addition, lessons learned from these previous studies have been applied to an ongoing NIA funded investigation in which more direct real-world functional skills are being trained.

Results: We will provide 3-month and 6 month outcome data.

Conclusions: It is concluded that training component cognitive processes is less important than training ecologically valid and relevant cognitive and functional skills.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

G.E. SMITH. Telehealth Home Monitoring Of Solitary Persons With Mild Dementia.

Objective: Medication safety is a special concern for the 30-40% of dementia patients that live alone at time of diagnosis and plays an important part in relocation decisions.

We hypothesized that televideo monitoring could improve medication self-administration accuracy and reduce family distress for persons with mild dementia that live alone, or spend a significant amount of their day alone.

Participants and Methods: Over two years the Mayo Foundation and Minnesota Department of Human Services supported the Mayo Alzheimer's Disease Research Center, in utilizing two-way interactive video technology to provide remote supervision of 12 persons with mild cognitive impairment (Petersen et al., 1999) or mild dementia (Clinical Dementia Rating =1). We used the technology primarily to monitor medication compliance. We conducted more than 4000 contacts with these persons and found adequate technical outcome in 82% of calls. Medication compliance was assessed monthly by an independent evaluator.

Results: End medication compliance was 81% in our video monitored group compared to 66% in our controls ($p < .05$). Comparison of compliance from initial to end ratings revealed that video monitored participants compliance remained stable (change of .07 percentage points) while unmonitored patients compliance fell 12 percentage points, consistent with expectations for dementia. This difference was also significant.

Conclusions: Home televideo monitoring may provide a cost-effective way to maintain mild dementia patients in their own homes for a longer period of time.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

L. CLARE. Awareness and outcome of cognitive rehabilitation in early-stage Alzheimer's disease.

Objective: People with early-stage Alzheimer's disease vary considerably in level of awareness as demonstrated in their ability or willingness to make accurate appraisals of their current functioning. There is evidence to suggest that level of awareness is a key predictor of success in cognitive rehabilitation interventions for people with early-stage Alzheimer's disease, just as it is for people with acquired brain injury.

Participants and Methods: This paper presents a model for understanding variations in awareness in Alzheimer's disease, outlines an approach to assessing awareness of current functioning, reviews existing evidence on the relationship between awareness and intervention outcome.

Results: We present new data from 8 participants in an ongoing trial to elucidate key aspects of the way in which awareness influences outcome.

Conclusions: Assessing awareness of deficits is an important component of treatment planning in cognitive interventions with mild cognitive impairment and mild Alzheimer's Disease populations.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

Poster Session 6: Neurocognitive Functions

9:00–10:30 a.m.

Attention

M.E. BARNES, E. VAN RAAJ, N. PRATT, D. GOZAL, V. MOLFESE & D.L. MOLFESE. Rarely Snoring Children Exhibit ERP Differences From Controls.

Objective: Brain activity of snoring children was recorded to determine if differences exist in attention that are not apparent in behavior. Previous research suggests that children who habitually snore exhibit reduced intelligence and attention scores, have increased academic problems, and exhibit anxious/depressive symptoms.

Participants and Methods: Differences in attentional processing and auditory event-related potentials (ERPs) were investigated in 26 children (mean age 6.0 yrs, 16 females, 13 controls) using a 128-electrode net during an auditory Oddball task, a measure of attention. Snoring was assessed by parental report. Children participated in an overnight polysomnographic sleep study to rule out the presence of sleep disorders.

Results: ERPs were submitted to a temporal Principal Components Analysis (PCA) with subsequent factor scores serving as dependent measures in a Repeated Measures Analysis of Variance (RMA). A main effect occurred for group (snorers versus controls), $F=6.405$, $p=0.018$. Observed Power = 0.68, indicating that snoring children generated larger ERPs than control children 500 ms post-stimulus onset. Larger ERP amplitudes occurred at 600ms in snorers relative to controls over right hemisphere temporal leads, $F=7.402$, $p=0.032$. This contrasted with earlier activation in the control children at 500ms, $F=12.632$, $p=0.011$, over right occipital electrodes. Snoring participants had increased amplitudes over left hemisphere compared to non-snorers. $F=5.664$, $p=0.019$, while hemisphere differences occurred in the Control children, $t=-2.601$, $p=0.023$.

Conclusions: The larger amplitude but slower ERPs in the snoring children suggest more effortful processing in snorers. These findings extend upon previous behavioral reports that snorers have attentional impairments relative to their age- and sex- matched controls.

Correspondence: *Dennis L. Molfese, Ph.D., Birth Defects Center, University of Louisville, Health Sciences Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

R.C. CHAN, C. YIP & S. SU. The Chinese version of the Test of Everyday Attention for Children: The preliminary norms of healthy Chinese children aged 3 to 8.

Objective: The present study attempted to explore the developmental pattern of attentional performances in a group of healthy Chinese school-aged children. In particular, it aimed to examine the applicability of the Chinese version of an ecologically valid test of attention, the Test of Everyday Attention for Children (TEA-Ch).

Participants and Methods: One hundred and twenty three healthy children aged 3 to 8 were recruited. Attention performance was assessed by the TEA-Ch. Another comprehensive set of executive function tests was also administered to all children, including the Wisconsin Card Sorting Test (WCST), Word Fluency Test (WFT), and Chinese version of Stroop color word interference test, and the neurological soft signs.

Results: There were no significant differences between boys and girls in the attentional performances. The subtests of the TEA-Ch showed modest to moderate correlation with tests of executive function (e.g., WCST, Stroop, WFT). Sky Search, Sky Search DT, Creature Counting, Walk Don't Walk and Code Transmission subtests showed significant correlation to the WCST; Opposite Worlds subtest correlated significantly to the Stroop test; and the relationship between Code Transmission subtest and the WFT was significant, too. Principal component analysis of the TEA-Ch also demonstrated a three-factor structure similar to previous findings, namely sustained attention, selective attention and executive control of attention.

Conclusions: These findings suggest that healthy Chinese school-aged children advanced differentially in sustained attention, selective attention and executive control of attention with age. Preliminary findings from the principal component analysis suggest that the factor structure of attentional performances in the TEA-Ch was relatively stable and may be suitable for use for the Chinese context.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan2003@yahoo.com.hk*

V. DRAGO, P.S. FOSTER, F. SKIDMORE, B. KLUGER, F.B. DAVID, D. ANTONIELLO & K.M. HEILMAN. Attentional Grasp in Parkinson's Disease.

Objective: Lateral cues significantly modulate line bisection performance such that normal subjects err toward the cue. We performed line bisection with lateral cues in PD patients and age matched controls.

Participants and Methods: 16 right handed PD patients and 7 matched controls were asked to bisect 154 lines of different lengths. These lines had either a right side or a left side cue or bilateral cues or no cues.

Results: The results of a mixed factorial ANOVA indicated a significant group by cue interaction. Subsequent analyses indicated that the PD patients evidenced a significant rightward bias in the right cue condition, suggesting a greater attentional grasp compared to the controls. This effect was not seen with the controls.

Conclusions: Based on Denny Brown hypothesis that the frontal lobe is the "avoidance lobe" and the parietal lobe is the "approach lobe", we might assume that the attentional grasp could be a result of a frontal lobe impairment often associated with PD. However, we remain uncertain as to why this response is asymmetrical. Perhaps top-down or global and bottom-up or focal attentional processing systems are mutually inhibitory and these two types of attentional processes are mediated by different hemispheres. The right hemisphere would mediate

the top-down or global attention and the left hemisphere the bottom-up or focal attention. In Parkinson's patients these systems might be disinhibited. Thus, without the lateral bottom-up stimulation, the top-down attention is dominant and the PD deviated to the left, but with a bottom-up stimulus the left hemisphere is activated and the subjects would deviate rightward.

Correspondence: *Valeria Drago, MD, Neurology, University of Florida, 100 S. Newell Drive, Room L3-100, Gainesville, FL 32610. E-mail: valeria.drago@neurology.ufl.edu*

P.D. DUKARM & J.C. GARDINER. Trail Making Test Performance for Various Rural Neurological and Psychiatric Groups.

Objective: The objective of the current study is to report descriptive data for the popular Trail Making Test (TMT) for a large, rural northern plains sample comprised of various neurological and psychiatric groups. The primary purpose of the study is to provide clinicians with additional data for normative comparison.

Participants and Methods: The sample included individuals who were referred for neuropsychological evaluation between the years 1987-2006 ($n = 1521$). Referral settings included outpatient, inpatient, VA, and community mental health. The sample consisted primarily of Caucasian participants ($n=325$) and Northern Plains American Indian patients ($n=97$). Neurological groups represented in the sample include: Traumatic Brain Injury ($n=490$), Cerebrovascular Accident ($n=64$), Toxic Exposure ($n=112$), General Medical ($n=52$), Pain disorder ($n=33$) and Cognitively Intact patients ($n=55$). Psychiatric Groups represented include Schizophrenia ($n=28$), Major Depression ($n=160$), Post Traumatic Stress Disorder ($n=40$), Attention Deficit Hyperactivity Disorder ($n=36$), and Substance Abuse ($n=115$). Data was stratified by age and educational level.

Results: Descriptive and inferential statistics were conducted on all groups for Part A and B of the Trail Making Test. Additionally, descriptive statistics for Part B minus A (B - A) are provided for the neurological groups. Multinomial Logistic Regression procedures were conducted in order to evaluate the classification ability of the TMT for each diagnostic category.

Conclusions: Consistent with previous research, the Trail Making Test demonstrated an inadequate ability to differentiate various neurological and psychiatric groups. The test remains a useful screening device for determining the presence of brain damage of various origins however, should not be used to differentiate between various neurological or psychiatric conditions due to its limited specificity. Limitations of the present study include a retrospective research design and heterogeneous clinical groups.

Correspondence: *Paul D. Dukarm, Ph.D., Psychological Services, San Francisco VAMC, 4150 Clement Street, San Francisco, CA 94121. E-mail: pdukarm70@yahoo.com*

P.J. DUQUETTE, S.R. HOOPER & D.S. GIPSON. Attention Functioning in Pediatric Chronic Kidney Disease.

Objective: To measure attention in children with chronic kidney disease (CKD). Previous research has highlighted generalized neurocognitive deficits secondary to kidney dysfunction in childhood. However, few studies have specifically examined aspects of attention in children with CKD. Using Mirsky's five-component neuropsychological model, it was hypothesized that children with CKD would evidence deficits in attention across multiple constructs.

Participants and Methods: A cross-sectional case-control design was used to compare children with CKD ($n = 30$) to a matched, non-medical control group ($n = 45$). The CKD group, with a mean age of 12.70 years ($SD = 3.32$ years), consisted of those receiving dialysis ($n = 15$)

and those managed with conservative therapies ($n = 15$). Control group participants were distributionally matched to the CKD group with respect to age, gender, ethnicity, and maternal education. Measures were selected to align with the five attention constructs posited in Mirsky's model: Focus/Execute, Sustain, Stability, Shift, and Encode.

Results: Overall group comparisons resulted in a significant MANOVA, $F(5,69) = 5.68$, $p < .001$. Follow-up univariate analyses revealed significant differences (CKD < Controls) on: Stability, $F(1,73) = 5.59$, $p < .03$; and Encode, $F(1,73) = 19.61$, $p < .001$. Effect sizes, calculated by Cohen's d , were moderate for Stability ($d = 0.55$) and large for Encode ($d = 0.95$). The groups did not differ on: Focus/Execute ($p = .43$), Sustain ($p = .38$), or Shift ($p = .27$).

Conclusions: These findings highlight vulnerabilities of specific neurocognitive functions in the pediatric CKD population. The CKD group demonstrated significantly lower function in behaviors related to encoding information and consistency of attention over time. Taken together, these findings implicate possible regulatory problems in children with CKD, and questions the integrity of structural and functional aspects of frontal and prefrontal brain regions in this population.

Correspondence: *Peter J. Duquette, University of North Carolina, 2120 El Paseo St. #2807, Houston, TX 77054. E-mail: pduquette@unc.edu*

R. NAIDOO, J. WALKOWIAK & M. SEMRUD-CLIKEMAN. Effects of Disinhibition on the Written Expression and Working Memory of Children With ADHD.

Objective: There is growing consensus supporting the executive function deficit hypothesis in ADHD populations. This deficit is manifest as disinhibition (impulsivity and hyperactivity). There is a paucity of empirical research on the association between disinhibition and academic performance, with some emergent research indicating an association between written expression and executive functions. In this study, the relationship between disinhibition, working memory and written expression was explored.

Participants and Methods: Disinhibition, as measured on the Structured Interview for Diagnostic Assessment of Children (SIDAC: modified K-SADS, Puig-Antich & Chambers, 1978), was used to predict the written expression (WIAT-II) and working memory (WISC-IV) performance of 9 to 14 year old children ($N=54$) with ADHD-PI ($n=17$), ADHD-C ($n=17$), and without ADHD ($n=17$). Simple regression analyses were conducted to explore the relationship between disinhibition, working memory and written expression.

Results: Regression results indicate that disinhibition significantly predicted written expression, ($R^2 = .238$, $F(1, 49) = 15.330$, $p < 0.001$) accounting for 23.8% of the variance. Disinhibition was also a significant predictor of working memory ($R^2 = .255$, $F(1,49) = 16.805$, $p < 0.001$), accounting for 25.5% of the variance. Working memory was found to significantly affect the performance outcome on written expression ($F(2, 48) = 10.11$, $p < 0.001$), accounting for 29.8% of the variance, when the effects of full scale IQ were statistically controlled.

Conclusions: These results suggest that performance on written expression tasks is affected by working memory, which in turn is affected by disinhibition. The implications of these findings are that disinhibition may be an important determinant of success on some types of academic tasks.

Correspondence: *Reshma Naidoo, Westside Neurorehabilitation Center, 600 Main Street, Lewiston, ME 04240. E-mail: rbnaidoo@gmail.com*

T. NOVAKOVIC-AGOPIAN & R. BOWLER. Visual Attention Test Battery - Normative Data.

Objective: This study obtained normative data for the Visual Attention Test battery (VAT). The VAT is based on the cognitive neuroscience and neuroimaging attentional research of M. Posner and others, and has been adapted for clinical use. It consists of two attentional tests (Orienting of Attention and Inhibition of Automatic Orienting) that assess

posterior and anterior-executive attentional functions (Novakovic-Agopian & Bowler, 2002). The VAT assesses the overall speed of processing (RT); an individuals' performance on posterior attentional functions (such as benefit from being correctly oriented -Validity Effect, and the effective sampling of novel areas within the visual field - Inhibition of Return); and the anterior functions (such as the inhibition of automatic/reflexive orienting).

Participants and Methods: 231 individuals (age 16-80), demographically representative of San Francisco Bay Area (18% Hispanic, 17%Asian, 8%African American, and 54% Caucasian) were included.

Results: There were no significant effects of gender or ethnicity. The RT increased with age ($p < 0.00$), and decreased with higher education ($p < 0.00$), and longer cue to target interval duration ($p < 0.00$). On the Orienting task, subjects benefited from being correctly cued at the 100 ms interval duration (Validity effect, $p < 0.00$), which disappeared at the 800 ms interval duration (Inhibition of Return). Older subjects benefited more from having longer interval duration to respond. On the Inhibition task, in which the subjects were told in advance that most cues are going to be misleading, they were able to inhibit reflexive orienting at both 100ms and 800ms interval durations. At longer interval durations, the younger age and higher education were associated with more efficient inhibition of automatic orienting ($p < 0.01$ and $p < 0.00$ respectively).

Conclusions: The normative sample results will be discussed in the context of the current attentional research. The VAT battery as well as the results from different clinical populations will also be presented.

Correspondence: *Tatjana Novakovic-Agopian, Ph.D, UCSF, CPMC, 661 Myra way, San Francisco, CA 94127. E-mail: tna@cns-site.com*

M.S. PANIZZON, M.J. LYONS, M.W. BONDI, D.C. DELIS, C.E. FRANZ, S.A. EISEN, M.D. GRANT & W.S. KREMEN. Genetic and Environmental Contributions to Attentional Asymmetry in Middle-Age: Findings from the Vietnam Era Twin Study of Aging.

Objective: Asymmetric cognitive profiles have shown utility in identifying elderly individuals with a genetic risk for Alzheimer's disease based upon the presence of the APOE-e4 allele. We sought to examine the prevalence of cognitive asymmetry within the domain of attention, as well as the genetic contribution to this trait in a sample of middle-aged male twins.

Participants and Methods: 746 participants were examined as part of the Vietnam Era Twin Study of Aging. The mean age at assessment was 55.3 years ($SD = 2.3$), and the mean years of education was 13.9 ($SD = 2.1$). Each participant was administered the Digit Span and Spatial Span subtests of the WMS-III, as part of a day-long series of assessments. Asymmetry was operationalized as an absolute difference in standardized scores greater than or equal to 1.5 SDs. APOE genotyping was available to a majority of the participants ($n = 600$). Heritability was determined via the structural equation modeling software Mx.

Results: Within the entire sample, 18.8% of the participants demonstrated an asymmetric attentional profile. Asymmetry was found to be highly heritable; genetic factors accounted for approximately 68% of the total variance in the construct. The remaining variance (32%) was accounted for by unique environmental factors. A comparison of asymmetry profiles across APOE groups (e4- vs. e4+) revealed no significant differences in the prevalence of asymmetry.

Conclusions: These results demonstrate that attentional asymmetry is a highly heritable construct; however, attentional asymmetry does not appear to be a function of an individual's APOE genotype at this age.

Correspondence: *Matthew S. Panizzon, M.A., Psychology, Boston University, 648 Beacon Street, Second Floor, Boston, MA 02215. E-mail: panizzon@bu.edu*

A. PAPAZOGLU, T. KING, R. MORRIS, C. HENRICH, M. MORRIS & N. KRAWIECKI. Attention Mediates Radiation's Impact on Adaptive Functioning in Children with Brain Tumors.

Objective: Radiotherapy is associated with an increased survival rate in children with brain tumors, but also with cognitive decline. This study examined the effects of radiation treatment on adaptive functioning in children with brain tumors. The potentially mediating effects of attention, verbal memory, and receptive language skills were explored.

Participants and Methods: Twenty-five children treated for tumors of the third ventricle and cerebellar regions were included in this study. The mean age at diagnosis was 8.21 years ($SD = 4.86$) and 10.80 years ($SD = 4.02$) at evaluation. The male to female ratio was 14:11. Twenty-two participants were Caucasian and three were African American. The ability of performance on the PPVT as well as Trial 1 and the Long Delay Free Recall Trial of the Rey Auditory Verbal Learning Test to mediate the relationship between time elapsed since the initiation of radiation treatment ($M = 2.14$ years; $SD = 2.36$) and adaptive functioning (Vineland Adaptive Behavior Scales) was examined.

Results: Using hierarchical regression, time since radiation dropped from significance (from $\beta = -.38$, $p = .03$ to $\beta = -.11$, $p = .31$) with the addition of attention ($\beta = .45$, $p = .03$) to the model, indicating full mediation. Receptive language and memory abilities did not mediate this relationship and were excluded from the model.

Conclusions: The results of this study suggest that time since radiation directly decreases attention performance, and poor attention in turn is associated with lower adaptive functioning. Implications of this finding on treatment planning and neuropsychological rehabilitation will be discussed.

Correspondence: *Aimilia Papazoglou, M.A, Georgia State University, 140 Decatur Street, 7th Floor Room 772, Atlanta, GA, GA 30303. E-mail: apapazoglou1@student.gsu.edu*

K.P. RIDLEY, A.L. WINTER, K.A. KAYSER, J. WALKOWIAK & M. SEMRUD-CLIKEMAN. Comparing Social Perception Abilities in Children with ADHD-Combined and ADHD-Primarily Inattentive.

Objective: Previous research has found that children with attention deficit hyperactivity disorder (ADHD) have difficulties related to social and emotional competence. Few studies have compared the subtypes of ADHD (Combined and Primarily Inattentive) in relation to social perception difficulties.

The present study examines group differences between children with ADHD-C, ADHD-PI, and controls on a measure of social perception.

Participants and Methods: Participants: Three groups, aged 6-16 years old, were evaluated (ADHD-Combined ($N = 38$), ADHD-Primarily Inattentive ($N = 30$), and controls ($N = 39$)). No comorbid diagnoses were present.

Procedures: Each participant completed a measure of social perception (CASP) and a measure of overall cognitive functioning (WASI), which was included as a covariate in the analyses. Each parent completed a diagnostic interview to confirm a previous diagnosis of ADHD. An ANCOVA with FSIQ as the covariate was utilized.

Results: The effect of clinical diagnosis on performance on the CASP was significant ($p = .015$). Participants diagnosed with ADHD-PI demonstrated significantly lower scores than the control group on the CASP ($p = .004$) while the ADHD-C group did not differ from the controls or the ADHD-PI.

Conclusions: Results from this study suggest that inattention has a significant effect on the individual's ability to interpret social cues during interactions with others. Children diagnosed with ADHD-PI may have more difficulty than typically developing children in recognizing other's emotions. In addition, these findings suggest that the social perception ability of children with symptoms of hyperactivity/impulsivity as well as inattention (i.e. ADHD-C) is not significantly different from normal controls.

Correspondence: *Kristen P. Ridley, B.A., Department of Educational Psychology, The University of Texas at Austin, 1007 S Congress Ave, Apt #241, Austin, TX 78704. E-mail: kristen.ridley@mail.utexas.edu*

C. SANCHEZ, J. SCHATZ & W.R. COLE. The Development of Inhibitory Control from Middle Childhood to Young Adulthood.

Objective: Response inhibition is an important aspect of selective attention that allows for the modification of well-learned responses when alternative responses are necessary. Prior behavioral studies have shown mixed findings as to the extent of change in inhibitory control during middle childhood. The present study examined cross-sectional behavioral and electrophysiological changes in inhibitory control using a Stroop-like interference task.

Participants and Methods: Response inhibition was measured via behavioral responses and event-related brain potentials (ERP) in a version of the Counting Stroop task with interference, neutral and facilitation trials. Thirty-two children (8 to 13 years) were divided into three age groups and compared to eighteen young adults. ERP was measured using 128-channel EEG recording.

Results: Data were analyzed with repeated measures multivariate analysis of variance with condition as the within-subjects factor and age group as the between-subjects factor. Both child and adult groups demonstrated interference effects in their behavioral responses; however, there were no behavioral differences (response time, errors) between age groups beyond general processing speed differences. ERP differences indicated age-related changes in the locus of selective attention. The youngest children (8-9 year-olds) showed differences between inhibition and neutral conditions for a late medial frontal negative potential whereas older children and young adults showed these differences for an early posterior negative potential.

Conclusions: The data indicated developmental changes in the neural mediation of inhibitory control on this task. Some inhibitory control tasks may be mediated earlier in processing as processing resources increase. The absence of group differences in the behavioral data highlights the limits of assessing brain function solely with behavioral methods.

Correspondence: *Carmen Sanchez, B.S., Psychology, University of South Carolina, Barnwell Building, Columbia, SC 29208. E-mail: sanchece@gwm.sc.edu*

J. LOW, M. SEMRUD-CLIKEMAN, G. CHRISTOPHER & M. GARCIA. Locus of Control Across ADHD Subtypes.

Objective: Very little is known about the degree to which children with attention-deficit hyperactivity disorder (ADHD) vary in external versus internal of locus of control and little to evaluate differences between the subtypes. The purpose of this research was to investigate whether there are differences on a measure of locus of control between children with ADHD:PI and ADHD:C and controls.

Participants and Methods: Three groups of children (aged 6-16) were included (ADHD:C, $n=46$; ADHD:PI $n=48$, controls $n=77$). No children with comorbid diagnoses were included. The BASC II was administered to all children. Scales included the locus of control, clinical maladjustment, school maladjustment, self-reliance, and social stress. A simultaneous multiple regression was performed to test whether children with ADHD:C and ADHD:PI differed from controls on a measure of locus of control.

Results: The overall multiple regression was statistically significant ($R^2 = .805$, $F [7, 163] = 96.189$, $p < .0001$), and the variables accounted for 80% of the variance in the locus of control scores. Post-hoc comparisons indicated that children with ADHD:PI are more likely to report thoughts consistent with external locus of control compared to control subjects, while children with ADHD:C cannot be distinguished from control subjects on this measure of locus of control.

Conclusions: These results suggest that youth diagnosed with attention-deficit hyperactivity, primarily inattentive type show higher levels of external locus of control than do control subjects. The results also suggest that youth with attention-deficit hyperactivity, combined type do not differ significantly from control subjects on measures of locus of control.

Correspondence: *Justin Low, University of Texas - Austin, Department of Educational Psychology, 1 University Station, D5800, Austin, TX 78712. E-mail: jаланlow@hotmail.com*

M. SHIKHMAN & J.M. HALPERIN. Visual and Auditory Interference on Cross-Modal Tasks: Why It is Harder to Concentrate on Conversation While Looking Out the Window Then to Read While Listening to the Radio.

Objective: While differences in processing between visual and auditory modalities have been widely studied, relative influences exerted by these modalities on each other under cross-modal interference conditions received less attention. This study investigates visual and auditory interference in a battery of matched unimodal and cross-modal tasks.

Participants and Methods: Thirty-nine undergraduate students took part in this study. Participants were tested using a computerized Simon Says test, which was designed specifically for this study. The test consists of five blocks – a practice, a visual go-no-go task, an auditory go-no-go task, a visual bimodal task with auditory distracters, and an auditory bimodal task with visual distracters.

Results: The rate of omission errors on the auditory go-no-go task was significantly higher ($t = 5.455$; $p < 0.01$) than on the visual one. For the cross-modal tasks, RTs and accuracy rates were analyzed using repeated measures ANOVA. The ANOVA showed main effects of Modality ($p < 0.01$ for RTs and $p < 0.001$ for accuracy rates), and Interference ($p < 0.001$ for the RTs and for accuracy rates). RTs were faster and accuracy rates were higher when subjects responded to the visual stimuli as opposed to auditory stimuli. A significant two-way interaction of Modality with Interference ($p < 0.001$) was also found, whereby under the interference condition, RTs increased and accuracy decreased significantly more on auditory trials than on visual trials.

Conclusions: Participants had greater difficulties responding to auditory targets than visual ones, and had more difficulties ignoring visual distracters than auditory ones. This supports the hypothesis of visual dominance in adults.

Correspondence: *Marina Shikhman, MA, QC, City University of New York, 1530 Palisade Ave, #29D, Fort Lee, NJ 07024. E-mail: semirando_m@yahoo.com*

N.N. ZEITLIN & J.P. BAERWALD. Intelligence Quotient (IQ) and Executive Function in Children with Attention-Deficit/Hyperactivity Disorder: A Meta-Analysis.

Objective: This study examined the performance of individuals diagnosed with ADHD on IQ and executive function tasks. We expected to find no difference in cognitive task performance between ADHD children and normal controls, based on emerging literature suggesting that IQ is not globally suppressed in those with ADHD (Schuck & Crinella, 2005). In addition, it was expected that the ADHD children would exhibit poorer performance on executive function domain tasks when compared to the normal control children.

Participants and Methods: A meta-analysis of 18 studies was conducted on measures of general intelligence and executive function.

Results: Full-Scale IQ, Verbal IQ, and Performance IQ were all significantly different between the ADHD group and the normal controls ($d = .57$, $d = .56$, and $d = .53$, respectively), with the normal controls achieving higher IQ scores. Three of the four executive function tasks examined (Trailmaking Test, The Wisconsin Card Sorting Test, and the Test of Variables of Attention) yielded significant effect sizes. ($d = .07$ to d

= .82), indicating that they were sensitive to the diagnostic grouping of ADHD versus normal control, with the ADHD individuals performing more poorly on these tasks. Findings related to the Stroop Color and Word Test yielded insignificant findings, however the task was determined to be of limited utility due to its poor psychometric properties.

Conclusions: The results of this meta-analysis indicated that IQ does appear to be suppressed in individuals diagnosed with ADHD. We could only speculate as to what specific variables within the diagnosis of ADHD were most responsible for these differences. Future research is needed to examine the variables that influence the symptomatic presentation of individuals with ADHD to identify other factors may be negatively affecting their cognitive ability. Future researchers should aim to delineate ADHD subtypes within their experimental groups, so that the presence or absence of specific subtype differences could be accounted for. Correspondence: *Nicole N. Zeitlin, Psy.D., Clinical Psychology, Loyola College, 9 Lauer Terrace, Silver Spring, MD 20901. E-mail: nzeitlin@comcast.net*

Language: Aphasia

L.J. ALTMANN & C.A. MORELLI. Effects of Semantic Training on Lexical Access: A Best Case Scenario.

Objective: This study examined the effects of semantic training on lexical access in the most optimal population, unimpaired young adults, to determine whether there was generalization to untrained items from the trained category, untrained items in untrained categories or to performance on another task.

Participants and Methods: 30 young adults completed pre and post-training picture naming and category generation tests. They received Semantic Feature Analysis training on 7 of 24 items in 2 of 3 semantic categories: vehicles, tools, and clothing. Each trained item was trained three times. All items from the trained categories and half the items from the control category were repeated at pretest.

Results: Naming accuracy showed significant effects of time, training type and time x training type. Naming accuracy was similar across categories at pre-test; however, at post-test, trained items were at ceiling, generalization items were significantly less accurate, and control items were significantly less accurate than both other item types.

RTs for all items were faster at post-test, and RTs for trained items changed more than RTs for generalization but were similar to changes in control items.

Performance on category generation improved similarly in all 3 categories.

Conclusions: These results illustrate that generalization can occur to untrained items following semantic training, but only to other items from the same category. Generalization is also likely to affect only accuracy of naming not RTs, based on the finding that trained items and the untrained category showed similar RT changes. Lack of generalization to category generalization suggests that improvements may be limited to other picture-based tasks, if any. These findings are consistent with theories in which items within a category share core features, which, when activated, can improve access to all items that share these features.

Correspondence: *Lori J. Altmann, PhD, Communication Sciences and Disorders, University of Florida, 336 Dauer Hall, Box 117420, Gainesville, FL 32611-7420. E-mail: laltmann@ufl.edu*

J. BALDO & N. DRONKERS. Neurological and Genetic Factors Affecting Severity of Aphasia Following Stroke.

Objective: The question of why some individuals recover from aphasia following stroke while others do not remains a mystery in the field. A number of predictors for recovery have been suggested, including age,

gender, ethnicity, and site and size of lesion. Recently, it has been suggested that certain genes such as Apolipoprotein E (ApoE) may also play a role in the brain's response to neurologic insult. The current study aimed to identify the role of lesion site and size, as well as ApoE status, in patients' ability to recover from aphasia.

Participants and Methods: The participants included 49 patients who suffered a single left hemisphere stroke. Severity of aphasia was evaluated by the Western Aphasia Battery (WAB). Lesion site and size were analyzed using specialized PC software. ApoE status (presence or absence of the e4 allele) was determined by an independent lab based on buccal swabs.

Results: The effect of ApoE-e4 status was not a significant factor in predicting aphasia severity following stroke, nor did it play a role in the degree of language recovery from the acute to chronic stage. There was an effect of lesion volume on aphasia severity, such that larger lesions were associated with more severe aphasia. However, the degree of recovery (as measured by a change in the overall WAB score from the acute to chronic phase) did not correlate with lesion volume. In terms of lesion site, poorer language recovery was associated with lesions in the superior temporal gyrus and inferior parietal lobe, while greater language recovery was most strongly associated with the inferior frontal gyrus.

Conclusions: The current results suggest that lesions in more posterior regions of the left hemisphere, namely, superior temporal and inferior parietal cortex, are associated with poor recovery from aphasia following stroke. Counter to prediction, ApoE status did not play a role in language recovery.

Correspondence: *Juliana Baldo, Ph.D., VA Northern California, 150 Muir Rd. (126s), Martinez, CA 94553. E-mail: juliana@ebire.org*

C. DOMEN, A. COLANGELO & L. BUCHANAN. Explicit Access to Phonology in Deep Dyslexia: Evidence from a Forced Choice Rhyme Decision Task.

Objective: According to Buchanan et al. (2003) deep dyslexia (DD) arises from a failure of inhibition in the phonological output lexicon that compromises selection for production. In this view, both implicit and explicit access to phonological representations remain relatively unaffected. Colangelo & Buchanan (in press) showed that an individual with DD, JO, could rely on nonword (pseudohomophone) phonology to make explicit semantic decisions. Although her ability to retrieve semantic information associated with pseudohomophones is necessarily mediated by assembled phonology, whether JO can make explicit phonological decisions is unclear. A rhyme decision task reported here tests that ability.

Participants and Methods: JO, a classic deep dyslexic (Colangelo & Buchanan, in press), was asked to silently read 32 lists of 4 orthographically diverse rhyming words (e.g., pier, deer, year, and here) and select the rhyming item from two orthographically similar options (e.g., ear and bear).

Results: JO selected correctly on 23 of 32 (72%) trials - a strong trend towards a difference from chance, $p = .06$, by Fisher's exact probability test.

Conclusions: Although better than both chance and her ability to read words aloud (64% correct), JO's performance was certainly not unaffected by her disorder. Though consistent with the main tenets of the failure of inhibition theory, this finding nonetheless introduces additional questions regarding the extent to which explicit access corresponds to selection for production. We will discuss these findings within the context of a more fully specified model of deep dyslexia with reference to both selection and production processes.

Correspondence: *Christopher Domen, Psychology, University of Windsor, 173 Chrysler Hall South, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: domen@uwindsor.ca*

L.A. EDMONDS & S. KIRAN. The Effect of Verb Network Strengthening Treatment (VNeST) on Sentence Production in Persons with Aphasia.

Objective: Previous verb retrieval treatments in aphasia have resulted in equivocal sentence production improvement. The present treatment promotes thematic role retrieval (chef/sugar) for trained verbs (measure) to strengthen the agent-verb-patient network, thereby improving sentence production. Improvement in sentence production for trained verbs (The carpenter measures the stairs.), semantically related untrained verbs (The nurse weighs the baby.) and related standardized tests is predicted. No improvement on a control task will occur.

Participants and Methods: Four persons with aphasia (>9 MPO) participated in a single-subject multiple baseline across subjects study. Weekly probes monitored a sentence completion control task and picture description eliciting sentences containing trained and untrained verbs along with pre- and post-treatment testing. Treatment included: 1) generating agent-patient pairs (chef/sugar) for 10 verbs (e.g. measure), 2) answering wh- questions (Where does a chef measure sugar?), 3) making semantic decisions about sentences (The chef measures the recipe.), 4) repeating step 1. Treatment (3 hours/wk) was terminated with 80% accuracy in step 1.

Results: All participants exhibited generalization (>40 percentage points over baseline) in sentences containing trained and untrained verbs with no improvement on the control task. Across participants, Boston Naming Test and Northwestern Verb Production Battery sentence scores improved (average improvements: 27.7, 17.9 percentage points). Chi-square analyses revealed 3/4 participants produced more complete and relevant sentences (< .05) in connected speech.

Conclusions: Systematic retrieval of agent-patient pairs presumably strengthened connections between trained verbs and their thematic roles, facilitating spreading activation to untrained verb networks to improve word retrieval and sentence production across a number of tasks, including connected speech. These results are encouraging with respect to potential carry over to overall communication abilities.

Correspondence: *Lisa A. Edmonds, PhD, Communication Sciences and Disorders, University of Florida, 351 Dauer Hall, PO Box 117420, Gainesville, FL 32611. E-mail: edmonds@csd.ufl.edu*

L.A. EDMONDS & S. KIRAN. The Effect of Verb Network Strengthening Treatment (VNeST) on Connected Speech in Persons with Aphasia.

Objective: Previous treatments for sentence production in aphasia have resulted in equivocal improvement in connected speech. The present treatment promotes systematic retrieval of thematic pairs (chef/sugar) related to trained verbs (measure). Spreading activation from the trained verb networks to untrained networks is predicted to facilitate word retrieval in connected speech tasks containing familiar and concrete lexical items.

Participants and Methods: Four persons with aphasia (>9 MPO) participated in treatment, which included: 1) generating agent-patient pairs (chef/sugar) for 10 verbs (e.g., measure), 2) answering wh- questions (Where does a chef measure sugar?), 3) making semantic decisions about sentences (The chef measures the recipe.), 4) repeating step 1. Treatment (3 hours/wk) was terminated with 80% accuracy in step 1. Pre- and post-treatment connected speech samples included the speech elicitation picture from the Western Aphasia Battery, the Cookie Theft picture, and a Cinderella re-tell. Utterances were coded for 1) completeness (inclusion of subject-verb-(object)), and 2) relevance to topic.

Results: Three participants showed significant improvement in production of complete and relevant utterances (P1: (52% to 82.1%; $\chi^2(1) = 6.59, p < .025$); P2 (50.9% to 67.8%; $\chi^2(1) = 4.48, p < .05$); P3 (62.5% to 90.8%; $\chi^2(1) = 11.68, p < .001$); P4 (50.4% to 52.8%; $\chi^2(1) = 0.16, p < 1$). The same participants also showed increases in number of utterances (utts) and/or MLU: P1 (25 to 39 utts; MLU 4.79 to 6.29); P2 (53 to 59 utts MLU 5.48 to 5.98); P3 (47 to 65; MLU 8.62 to 8.71).

Conclusions: Strengthening verb networks resulted in predicted connected speech improvements for 3/4 participants. Post-hoc analyses revealed pre-treatment sentence construction deficits (not observed in the other participants) for the participant who did not improve. These results are preliminary but encouraging with respect to VNeST's potential to improve spontaneous speech and communicative effectiveness. Correspondence: *Lisa A. Edmonds, PhD, Communication Sciences and Disorders, University of Florida, 351 Dauer Hall, PO Box 117420, Gainesville, FL 32611. E-mail: edmonds@csd.ufl.edu*

D.M. FITZGERALD-DEJEAN, S.S. RUBIN & J.H. FISHER. Correlational Examination of Environmental Symbol Processing and Language in Neurologically Damaged Adults.

Objective: Previous visual symbol recognition research has utilized pictures, graphemes, words, gestures, pantomimes, and sign language to investigate symbolic processing. This study specifically examined "environmental" symbol recognition in neurologically impaired and normal subjects. ESR results of neurologically impaired groups were further compared to a measure of verbal and nonverbal language.

Participants and Methods: Thirty four neurologically impaired subjects, including 13

with aphasia due to CVA, 16 with traumatic brain injury, and 5 with right hemisphere CVA, were compared with 15 neurologically normal subjects on an environmental symbol recognition (ESR) measure. The ESR utilized digital pictorial stimuli and response choices in order to examine comprehension of environmental symbols/signs, pictographs, and trademarks. Secondly, neurologically impaired groups were assessed with the Aphasia Diagnostic Profiles (ADP) to correlate ESR performance with a standardized measure of language.

Results: Parametric and non-parametric testing was conducted on raw scores attained from ESR and ADP scores. Neurologically normal subjects performed significantly better than the impaired subjects on the ESR. For the neurogenic sample as a whole, regression results indicated high relationships between the ADP and ESR performance with coefficients identifying significant relationships with Naming, Phrase Length, Auditory Comprehension, and Gestural Ability.

Conclusions: Results further verify the nature of environmental symbol recognition in neurogenic populations. ESR performance was highly associated with overall performance and specific parameters of language. This presentation will explore application across neurogenic populations. Correspondence: *Donna M. Fitzgerald-DeJean, M.A., COMD, Louisiana State University, 8617 Scarlett Dr, Baton Rouge, LA 70806. E-mail: dfitzg1@lsu.edu*

C. GOLASHESKY, K. LEE, S. AHMETI, K. TUCKER & A.M. BARRITT. Retrospective examination of lay-coached computer training for people with chronic aphasia.

Objective: We retrospectively examined a subset of data collected in the course of lay-coached computer communication software training (Parrot Software) at the Adler Aphasia Center, providing peer support and guidance for people with aphasia and their loved ones, to learn if objective language performance improved.

Participants and Methods: Of 56 members with chronic aphasia, who completed any of 55 tasks in 6 program categories over their membership period, we examined data for 24 members (mean 52.5 months post-event) who attended computer coaching >30-35 hours/year, and >half of sessions each quarter. We examined recorded performance on Vocabulary and Grammar (VG), the only language program category used by all 24. Within VG, members had completed different lessons (total 11). We analyzed performance data for all 11 VG lessons, and for the four lessons completed by >50% of the 24 members.

Results: Performance improved over the Vocabulary and Grammar program as a whole (t-test, $p < 0.001$), but lesson performance improved significantly only for "Using Adjectives" (Wilcoxon, $p = 0.013$).

Conclusions: Formal behavioral therapy options for people with chronic post-stroke aphasia may be limited; people with post-stroke aphasia may also seek informal or self-treatment as a substitute or adjunct in the chronic recovery phase. It is hoped that the participant role may be empowering (Goldfarb and Pietro, 2004), and less stressful (Sakamoto et al., 1999), as compared with a traditional patient role. Other factors may have contributed to performance improvement in this preliminary retrospective study, but results suggest lay-coached computer training may benefit people with chronic aphasia. Further research examining the impact of lay training on function and personal self-management may be warranted.

Correspondence: *Anna M. Barrett, MD, Stroke Rehabilitation Research, Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: abarrett@kmrrec.org*

M.L. HENRY, S.Z. RAPCSAK & P.M. BEESON. Intensive Semantic Treatment for Lexical Retrieval in Primary Progressive Aphasia.

Objective: Treatment for lexical retrieval impairments has been shown to yield positive outcomes in individuals with aphasia due to focal lesions, but there has been little research regarding the treatment of such impairments in individuals with progressive aphasia. The purpose of this study was to examine the therapeutic effects of a semantic treatment for anomia in progressive aphasia relative to the outcome in an individual with stroke-induced aphasia.

Participants and Methods: Two individuals with progressive aphasia and one with stroke-induced aphasia participated in this study. Each received intensive treatment intended to improve lexical retrieval in the context of generative naming for selected semantic categories. Treatment tasks included guided lexical retrieval prompted by the identification and elaboration of items within subcategories, as well as other semantic tasks, such as sorting by subcategory and identifying semantic attributes of exemplars. Treatment outcomes were quantified using standard effects sizes, and McNemar tests for pre-post treatment

Results: One of the individuals with progressive aphasia and the individual with stroke-induced aphasia showed large positive treatment effects for targeted semantic categories. The individual with the focal lesion also showed large effects on untreated categories, and significant improvement on a standardized measure of naming. The other participant with progressive aphasia showed small effects overall for treated categories

Conclusions: Findings indicate that intensive, semantically-based treatment for lexical retrieval can result in positive changes in individuals with progressive aphasia as well as stroke-induced aphasia. Examination of individual differences suggested that the status of semantic and episodic memory provides predictive information regarding responsiveness to treatment.

Correspondence: *Pelagie M. Beeson, Ph.D., Speech & Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: pelagie@u.arizona.edu*

L.M. MAHER, J.I. BREIER, S. SCHMADEKE, B. NOVAK & A.C. PAPANICOLAOU. Functional Imaging Before and After Constraint Induced Language Therapy for Aphasia Using Magnetoencephalography.

Objective: Magnetoencephalography (MEG) was used to index the relative engagement of cortical areas that may potentially serve as a substrate for language recovery.

Participants and Methods: Five patients with chronic aphasia underwent functional imaging using MEG before and after constraint induced language therapy (CILT). Therapy was conducted in dyads of partici-

pants and consisted of three-hour sessions, four days a week, for three weeks for a total of 36 hours of treatment. Constraint was operationally defined as limiting the response to spoken verbal production only. Treatment response was measured by changes in response accuracy and in correct information units.

Results: Patients who responded well to CILT exhibited a greater degree of late MEG activation in posterior language areas of the left hemisphere and homotopic areas of the right hemisphere prior to therapy than those who did not respond well. Response to CILT, however, was positively correlated with the degree of pre-therapy MEG activity within posterior areas of the right hemisphere only on an individual basis.

Conclusions: These findings are consistent with the notion that, at least in some patients with chronic aphasia, response to language therapy may be related to the degree of activation of the right hemisphere in response to linguistic stimulation prior to therapy.

Correspondence: *Lynn M. Maher, PhD, Dept. of Communication Sciences and Disorders, University of Houston, 100 Clinical research Services, Houston, TX 77204. E-mail: lmmaher@uh.edu*

A. BOSE, T. MCHUGH, H. SCHOLLENBERGER, H. HOTZ-NOURSE & L. BUCHANAN. Quality of Life in Aphasia.

Objective: Communication is fundamental to psychosocial adjustment in society. Although aphasia is a communication problem resulting from stroke or brain injury, few studies have investigated how different aspects of quality of life are affected in people with aphasia.

Participants and Methods: This two-part investigation used aphasia-friendly quality of life scales (Stroke and Aphasia Quality of Life Scale, SAQOL-39, Hilari et al., 2003, and ASHA Quality of Communication Life Scale, Paul et al., 1989) to measure different aspects of quality of life (e.g., socialization, communication, physical abilities) and to determine changes in quality of life following participation in a weekly group treatment program.

Results: Group comparison of quality of life between normal and aphasic groups showed that individuals with aphasia had lower scores on all domains of quality of life. Specifically, physical, psychological and communication quality of life scores were markedly lower for the aphasic group. Participation in the weekly group treatment program, which was focused on individualized language strategies and discussion in an informal setting, resulted in significant gains in psychosocial and communication functioning. Although structured linguistic tasks (e.g., verbal fluency, narrative discourse) showed limited changes, participants showed improvement in their informal conversational abilities.

Conclusions: The results from this preliminary study suggest that the negative effects of aphasia on psychosocial and communication aspects of quality of life can be ameliorated by active participation in a communication group.

Correspondence: *Tara McHugh, MA, University of Windsor, Chrysler Hall South, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: mchugh@uwindsor.ca*

J. PATTERSON. Cueing Hierarchies in Treatment for Word Retrieval Deficit in Aphasia: A Review of the Evidence.

Objective: A cueing hierarchy is a principled manner of presenting cues or priming information in a treatment protocol to elicit production of a target response. Cueing hierarchies are frequently used in treatment for word retrieval deficits in aphasia. The current project presents a systematic review of the evidence supporting cueing hierarchies as a treatment technique for word retrieval deficits in persons with aphasia.

Participants and Methods: Studies were identified through electronic and manual literature searches and a study was included in the review if it (1) included participants with a word retrieval impairment accompanying aphasia following left hemisphere stroke, (2) used a cueing hierarchy as the primary treatment technique, and (3) reported individual participant graphic data sufficient to determine treatment duration

and pattern of behavior change. Thirty-two studies were coded for number of participants, age, time post onset, pretreatment and post treatment test scores, total number of sessions, frequency and duration of sessions, characteristics of the cueing hierarchy (number of steps, nature of cues [i.e. semantic or phonological information] and target response), method of experimental control, and outcome as measured by change in test scores, performance on related tasks (i.e. discourse production) trend analysis of treatment data, and treatment effect size.

Results: Results of the review are presented as an evidence table summarizing the studies and narrative comments comparing them for patterns in type or administration of cueing hierarchy, as well as change in outcome measures.

Conclusions: Results support the use of cueing hierarchies to treat word retrieval deficits.

Correspondence: *Janet Patterson, California State University East Bay, 25500 Carlos Bee Blvd, Hayward, CA 94542. E-mail: janet.patterson@csueastbay.edu*

Language: Other (e.g., Naming, Fluency, Reading)

E.N. ANDRESEN & D.C. OSMON. What Aspects of a Word Facilitate Reading? Three Priming Meta-Analyses.

Objective: For years, researchers have been investigating different aspects of word recognition in order to discover which is most crucial for fluent reading. Many researchers have employed priming and lexical decision tasks to this end, especially within the semantic (meaning-based), orthographic (form-based), and phonologic (sound-based) research areas. Three meta-analyses, one in each priming area, were conducted in order to determine the size of the facilitative priming effects.

Participants and Methods: After performing a search of online databases and perusing the references of key articles, 33 studies were included in the meta-analyses. 38 effect sizes (17 semantic, 12 orthographic, and 9 phonologic) were computed and tested for heterogeneity, representing a total of 1,635 research participants.

Results: The 17 semantic studies yielded a small, homogeneous average effect (-0.347). The 12 orthographic studies yielded a small, heterogeneous average effect (-0.324, $Q(11) = 27.19, p < .004$). The 9 phonologic studies yielded a moderate, homogeneous average effect (-0.586). Moderator analyses detailing the origin of the orthographic effects and phonologic confounds in orthographic primes demonstrated small to moderate effects. Of especial interest are the orthographic studies with primes unconfounded by phonology, which demonstrated a moderate effect (-0.642).

Conclusions: The general findings of these meta-analyses indicate that both orthographic and phonologic processes play important, distinct parts in word recognition, relative to the comparison condition of semantic priming. Results from a homogenous subset of orthographic studies are roughly equivalent to results from phonologic studies, which can be taken as evidence for the dual-route model of reading.

Correspondence: *Elizabeth Andresen, B.A., Psychology, University of Wisconsin-Milwaukee, 3016 N Oakland Ave #117, Shorewood, WI 53211. E-mail: andrese2@uwm.edu*

P.M. BEESON, B. WHITE & S.Z. RAPCSAK. Toward a Better Understanding of Response to Agraphia Treatment.

Objective: According to a dual route model of written language processing, spelling of irregular words provides an index of the status of lexical spelling procedures, whereas nonword spelling provides information about sublexical processing that relies on phoneme-grapheme conversion. Because regular words can be spelled using either route,

accuracy for such words may reflect the combined function of the two routes. We examined the relative performance on these three stimulus types to characterize pre-post treatment performance of three individuals with acquired agraphia, and further evaluated interactive spelling processes using a prediction equation from Coltheart et al. (2001).

Participants and Methods: The three participants in this study each exhibited acquired agraphia following cerebrovascular pathology. Two showed marked impairment of irregular word spelling relative to regular words and nonwords (surface dysgraphia), and the third showed marked impairment of nonword spelling relative to regular and irregular words (phonological dysgraphia). Behavioral treatment was implemented to strengthen lexical and sublexical spelling procedures and to promote interactive use of residual spelling abilities.

Results: Following treatment, the participants with surface dysgraphia showed significant improvement for spelling both regular and irregular words, whereas the participant with phonological dysgraphia improved for all stimulus types. Based on the prediction equation, two individuals demonstrated increased interactive use of lexical and sublexical spelling knowledge.

Conclusions: Changes in relative performance on the spelling of regular, irregular, and nonwords, as well as estimates from the prediction equation, provided quantitative means to characterize the nature of cognitive changes in response to spelling treatment.

Correspondence: *Pelagie M. Beeson, Ph.D., Speech & Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: pelagie@u.arizona.edu*

P.M. BEESON, M.L. HENRY & S.Z. RAPCSAK. Predicting Reading and Spelling Performance in Acquired Alexia and Agraphia.

Objective: A dual route model of written language processing posits that irregular words are read via a lexical route, whereas nonwords are decoded by sublexical grapheme-to-phoneme conversion. Regular words can be read via either route, and it has been shown in children who are learning to read that their competence for regular words can be predicted by their performance on irregular words and nonwords. We tested whether such predictions hold for reading, and also for spelling, in adults with acquired alexia and agraphia.

Participants and Methods: Reading and spelling performance of twenty-four individuals with focal left hemisphere damage was examined using balanced lists of regular words ($n = 60$), irregular words ($n = 60$), and pronounceable nonwords ($n = 20$). The probability (P) of correctly reading regular words was calculated using the formula proposed by Coltheart et al. (2001), wherein $P(\text{regular}) = P(\text{irregular}) + [(1 - P(\text{irregular})) * P(\text{nonword})]$.

Results: The predicted response accuracy for regular words was highly correlated with the actual response accuracy for both reading ($r = .983, p < .01$) and spelling ($r = .968, p < .01$).

Conclusions: These results are comparable to the correlation coefficient of .921 reported by Coltheart and colleagues in 1,488 children who were either developing normally or exhibited developmental dyslexia. These data suggest that the prediction equation has clinical and research utility to capture the characteristics of reading/spelling performance in adults with acquired alexia/agraphia. Our findings also provide evidence for an interactive use of lexical and sublexical information in written language processing.

Correspondence: *Pelagie M. Beeson, Ph.D., Speech & Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: pelagie@u.arizona.edu*

M.Y. CARPENTIER, B.I. MILLER & J.R. O'JILE. Expressive and Receptive Language Abilities in Children with ADHD: An Overlooked Area of Neuropsychological Deficit.

Objective: Recent research suggests that many of the observable characteristics (e.g., inability to focus or sit still) of Attention-Deficit Hyperactivity Disorder (ADHD) may actually be due to difficulties with

language processing (Denckla, 2003). However, it is notable that relatively few studies have assessed language abilities in investigations on neuropsychological deficits in children with ADHD (Jonsdottir et al., 2005; Sergeant et al., 2002). The objective of this study was to assess for level of impairment and differences in expressive and receptive language among children with ADHD.

Participants and Methods: Sixty-four children (43 boys, 21 girls) ages 5-15, with a primary diagnosis of ADHD, completed the Wechsler Intelligence Scale for Children-III (WISC-III) and Peabody Picture Vocabulary Test-III (PPVT-III) as part of a larger neuropsychological battery. The Vocabulary subtest standard score of the WISC-III was utilized as a measure of expressive language, while the standard score of the PPVT-III was utilized as a measure of receptive language.

Results: Results indicated that 59.3% and 46.2% of children with ADHD were impaired in expressive and receptive language (i.e., standard score less than or equal to 85), respectively. Results of a paired samples t-test also revealed that children with ADHD performed significantly better on receptive, as opposed to expressive, language ($t(48) = -3.24, p < .01$).

Conclusions: The current results suggest that children with ADHD have specific difficulty with language tasks requiring deeper semantic understanding of words (i.e., expressive language), suggesting the potential utility of interventions designed to increase not only breadth, but also depth of knowledge. Our results also provide evidence for the importance of screening for language abilities, specifically discrete aspects of language (e.g., expressive and receptive language), in neuropsychological assessment of children with ADHD.

Correspondence: *Melissa Y. Carpentier, MS, Dept of Psychiatry, Div of Psychology, University of Mississippi Medical Center, 2500 N. State Street, Medical Alumni House, Room 318, Jackson, MS 39216. E-mail: melissa.carpentier@gmail.com*

A.M. CLEMENTS-STEPHENS, P. GAUR, S.L. RIMRODT & L.E. CUTTING. Sentence Comprehension Processing in Adolescents and Young Adults.

Objective: Functional neuroimaging studies examining sentence comprehension have primarily focused on adult populations, with few studies examining the relationship in activation patterns between adults and adolescents.

Participants and Methods: To investigate differences in activation patterns, 12 skilled readers (7 adults, 5 adolescents) completed a sentence comprehension task while in the scanner. To isolate regions important for comprehension, the sentence comprehension task was contrasted with a baseline task controlling for single word reading.

Results: Both groups showed activation in left inferior frontal gyrus and left temporal lobe, as well as right cerebellum. Two-sample t-tests were used to examine differences in activation patterns between groups. Results indicated that compared to adolescents, adults showed additional recruitment of bilateral frontal regions, bilateral cerebellum, and left temporal lobe and supramarginal gyrus. Compared to adults, the adolescent group showed additional recruitment in right cingulate gyrus (including posterior cingulate).

Conclusions: Our results, which are consistent with previous literature, suggest that the left inferior frontal gyrus, left temporal lobe, and right cerebellum are regions important for comprehension beyond single word reading. In adults, additional activation was seen in areas known to be important for reading and comprehending text. In adolescents, additional activation was seen in cingulate gyrus, suggesting that they may need to recruit regions implicated in attention, response selection, and performance monitoring to complete the task.

Correspondence: *Amy M. Clements-Stephens, Kennedy-Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: clements@kennedykrieger.org*

M.A. COLLETTE, J. WILFAHRT & D. FODEMAN. Organization and Quality of Children's Written Language and Computers.

Objective: This study used a story writing test to investigate the influence of writing on a Computer versus Handwriting on the Organization and Quality of children's Writing. Previous studies have found inconsistent results due in part to small sample sizes and variable subject populations and methodologies. Organization and quality are often not operationally defined. It was hypothesized that children's Keyboarded stories would be better organized and of higher quality, longer, and more often edited than their handwritten stories.

Participants and Methods: 258 subjects were recruited from 5 age groups, Grades 2 (N=29), 3 (N=34), 4 (N=35), 5 (N=33), and 6 (N=127). Participants wrote 2 stories each, one Keyboarded and one Handwritten, in response to picture prompts from the Test of Written Language Development (Thematic Maturity subtest) which were scored for Quality and Organization, number of Words, Edits and length of Time spent Writing.

Results: The results provide strong support for the hypothesis. Using Paired Samples T Tests, stories which were Keyboarded on the Computer had higher scores for Organization/Quality for grades 3 ($t=3.68, sig. .001$), 4 ($t=4.04, sig. .0008$), 5 ($t=2.76, sig. .01$), and 6 ($t=3.002, sig. .005$) and for number of Words written.

Grades 2, 3, 5 and 6 had more Edits, and Grades 2, 3, 4 and 6 spent more Time Writing.

Conclusions: Children overall wrote higher Quality, better Organized and longer stories when they Keyboarded them rather than Handwrote them, and spent more Time Writing. They also made more Editing changes. Children thus are likely to develop writing skills earlier, and to be more enthusiastic learners and easier to teach. It is proposed that students be taught Keyboarding earlier and allowed access to computers for their Writing output and instruction.

Correspondence: *Martha A. Collette, phd., Boston Psychological Assoc., 24 neptune st, Beverly, MA 01915. E-mail: marthacollette@comcast.net*

J. CUMMINE, F. STOCKDALE-WINDER, M. CROSSLEY & R. BOROWSKY. Hemispherectomy and Basic Reading Processes.

Objective: The present study explored models of language function following hemispherectomy and their specific predictions about the outcome of basic reading processes. Sight vocabulary (SV; i.e., irregular word naming accuracy) and phonetic decoding (PD; i.e., nonword naming accuracy) as measures of basic reading processes, were evaluated to determine impairments in basic reading processes (i.e., dyslexia). It was hypothesized that the pattern of results would be best represented by the model of hierarchy of specialized function (Ogden, 1989) and the 'crowding' hypothesis (Lansdell, 1969).

Participants and Methods: Participants included two women who had undergone hemispherectomies (one right-sided and one left-sided), and a control sample (N=60) of normal readers. Participants were presented with three blocks of letter-strings, including regular words (e.g., hint), irregular words (e.g., pint), and nonwords (e.g., bint). Participants were asked to read the letter-strings aloud as quickly and accurately as possible.

Results: Naming accuracy was computed for each participant, on each block. Dyslexia was assessed via a regression-based methodology (Castles and Coltheart, 1993). Phonological dyslexia is evaluated by plotting PD skills as a function of SV skills. Surface dyslexia is evaluated by plotting SV skills as a function of PD skills. Sample ellipses were placed around the data to capture the skilled readers' performance (McDougall et al., 2005). Participants whose performance fell below the 95% ellipsoids were classified as dyslexics.

Conclusions: The data supports Ogden's hierarchy of specialized function and Lansdell's crowding hypothesis. SM (right hemispherectomy) displayed a small advantage in reading accuracy when compared to JH (left hemispherectomy). Both participants demonstrated deficits in naming nonwords (and would be classified as phonological dyslexics), suggesting that PD is lower on the hierarchy of specialized function and was crowded out or not assumed, by the remaining hemisphere.

Correspondence: *Jacqueline Cummine, Psychology, University of Saskatchewan, Psychology Department, 9 Campus Drive, Saskatoon, SK S7N 5A5, Canada. E-mail: jacqueline.cummine@usask.ca*

A. EDWARDS-STEWART, E. COADY, H. RUSSELL, J. UOMOTO & J. SHAW. Impact of Mood State on Word Valence.

Objective: To identify impact of mood state (depression vs. anxiety vs. mixed depression and anxiety vs. no depression or anxiety) on positive or negative valence word production among neuropsychological patients. **Participants and Methods:** 86 participants (59% male; 78% Caucasian; mean age: 45) underwent neuropsychological assessments at a Pacific Northwest rehabilitation hospital. Four mood groups were determined based on clinical diagnosis and/or Personality Assessment Inventory elevations ($T > 65$) for depression and anxiety or anxiety related disorders. Nineteen individuals were included in depression only group, 16 in anxiety only, 28 in mixed depression and anxiety, and 23 had no mood disorder. A MANOVA was conducted including both positive and negative valence with subsequent ANOVAs.

Results: A one-way MANOVA yielded significant differences among the four mood groups on word mood valence, Wilks's $\Lambda = .83$, $F(5, 162) = 2.68$, $p < .05$. The multivariate η^2 based on Wilks's Λ was relatively small, .09. Comparisons on each dependent variable were conducted to follow-up tests on the MANOVA. Using the Bonferroni method, only negative valence was significant, $F(3, 82) = 5.41$, $p < .01$, $\eta^2 = .17$. Post hoc analyses on these ANOVAs for the mood groups consisted of conducting pairwise comparisons to find which mood state affected production of negative valence most strongly. The mixed mood group produced significantly more negative valence words than any of the other mood groups.

Conclusions: Findings suggest combined depression/anxiety mood state is associated with greater production of negative valence words than either depression or anxiety alone.

Correspondence: *Amanda Edwards-Stewart, M.S., Seattle Pacific University, 12221 100th Ave NE B101, Kirkland, WA 98034. E-mail: autonomy7@msn.com*

C. HO, E. DENNIS, D. WITTENBERG, A. GANTMAN, N. KOBAYASHI, A.L. REISS, J.D. GABRIELI & F. HOEFT. Neuroanatomical Correlates of Various Reading Dimensions in Adolescents with a Wide Range of Reading Ability.

Objective: The present study sought to investigate, for the first time, neuroanatomical signatures of various reading skills using voxel-based morphometry (VBM).

Participants and Methods: Sixty-two healthy adolescents (mean age: 13.4; SD:2.6) with a wide range of reading abilities, including both dyslexic and normal readers, were investigated. Participants were tested on a standard battery of reading and IQ tests, including: Woodcock Reading Mastery Test word identification, word attack and passage comprehension subtests, Woodcock Johnson spelling subtest and Rapid Automatic Naming. Optimized VBM analysis was performed on high resolution anatomical scans collected from each participant. Whole brain regression analyses between modulated local gray or white matter volumes and various behavioral scores were performed ($p = 0.05$ corrected for the whole brain).

Results: Correlations between gray or white matter volume and skills thought to be essential for reading, including decoding, reading comprehension, rapid naming, and spelling, showed common as well as distinctive brain structures associated with each reading skill. More specifically, the left parieto-temporal and inferior frontal gray matter volumes were positively correlated with all reading dimensions. Anterior regions of the inferior frontal gyrus and temporal regions were specific to comprehension and bilateral dorsolateral prefrontal regions were specific to rapid naming. Perisylvian white matter volume was positively associated only with comprehension and rapid naming skills.

Conclusions: Overlapping but dissociable neuroanatomical structures are associated with a wide range of reading dimensions. Further research into the association of brain structures and reading dimensions may yield important insights into the neural substrates of reading and the pathophysiology of disabilities such as dyslexia.

Correspondence: *Fumiko Hoeft, M.D., Ph.D., Stanford University, 401 Quarry Rd. M/C 5795, Stanford, CA 94305. E-mail: fumiko@stanford.edu*

M. KIM, H. JEON & K. LEE. Korean Syntactic Comprehension Test in the Patients with Various Cerebral Ischemic Lesions.

Objective: Syntax processing for language comprehension depends on a temporofrontal network, including left inferior frontal region (LIF) and left anterior/superior temporal region (LAST). To examine the capability to process syntactic features unique to Korean, such as heavy dependence of parsing on syntactic morphemes rather than word order in sentences, we developed Korean Syntactic Comprehension Test (KSCT). We administered the test to patients with various cerebral lesions to correlate the lesion location and the test performance.

Participants and Methods: KSCT was administered to 20 patients with a cerebral infarction and 14 normal subjects. They were tested using auditory comprehension subtest of Korean-Western Aphasia Battery (K-WAB). Brain MRIs were reviewed for lesion correlation with the test results.

Results: Lesion location was significantly correlated with KSCT score: patients with a lesion at LIF/LAST was worse than other patients or normals ($p=0.033$ and 0.005 , respectively). KSCT was more specific for the presence of left temporofrontal lesions than K-WAB (91.7 vs. 83.3%, respectively), but with less sensitivity (90 vs. 100%, respectively). There was no significant effect of age on KSCT, but education level was positively correlated.

Conclusions: Although syntactic parsing in Korean is primarily done by morphemes added at the end of content words, syntactic comprehension depended on LIF, similarly as in other languages in which word order determines syntax. Thus, testing syntactic comprehension will have a value in assessing left frontal function in native speakers of Korean as well, despite the unique syntactic features of the language.

Correspondence: *Min-Jeong Kim, M.D., Neurology, Seoul National University Hospital, 28 YeonGeon-Dong, JongNo-Gu, Seoul 110-744, South Korea. E-mail: okdol@medimail.co.kr*

A. MOLNAR, M. WAGNER, J. WU, R. WAFORD, C. WARREN & D.L. MOLFESE. ERP And Near-Infrared Procedures In The Same Subjects Indicate Similar Brain Regions Activated.

Objective: This study investigated auditory word vs. non-word discrimination when cues discriminating between two stimulus classes during the final consonant sound (e.g., /pig/ vs. /pip/). Subjects responded to an infrequent occurring exemplar from one stimulus category occurred. Larger effects were expected over frontal and central brain regions. Both ERP and near infrared technologies assessed brain involvement.

Participants and Methods: 10 participants (5 males, mean age = 23.2 years, SD = 1.55) in an auditory oddball paradigm listened to series of consonant-vowel-consonant words and non-words. The final consonant sound determined if a stimulus was a word or not. Participants responded to the class of stimuli (words or non-words) that occurred on 12% of the trials (target). Event-related potentials (ERPs) were recorded to each stimulus from 256-electrode hydrocell net. In addition, near-infrared recordings (NIR) measured blood oxygen-hemoglobin levels from 30 optodes, arranged in a 6x5 configuration over the left inferior frontal area. Stimulus assignment as target and non-target and the order of the methods (ERP, NIR) were counterbalanced across subjects.

Results: Larger amplitude ERPs occurred to target versus non-target stimuli from 44 to 188 ms after stimulus onset, $F(1,8)=12.742$, $p<.007$, obs. power=.88. Post hoc analyses of a condition x electrode effect, $F(1.634, 14.073)=16.34$, $p<.001$, obs. power=.992, indicated larger

amplitude ERPs occurred over frontal areas to frequent stimuli. Analysis of near-infrared data paralleled these findings and indicated lower oxygenated-hemoglobin during the target condition than the frequent condition, $F(1,8)=12.333$, $p=.008$, $obs. power=.866$. No significant behavior differences in either accuracy or response time were found across methodologies.

Conclusions: ERP and near-infrared technologies provided converging spatio-temporal information concerning language processing. Results are discussed in relation to language processing and co-articulated speech cues.

Correspondence: *Dennis L. Molfese, Ph.D., Birth Defects Center, University of Louisville, Health Sciences Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

E.N. MOORE, E.D. PALMER, M. LUNA, F. RAMSIER, L.A. BRUESEKE, M.A. RUBIO, B.B. WULFECK, J. REILLY, D. TRAUNER & R. MÜLLER. Developmental Changes in Morphosyntactic Judgments of Tag Grammaticality.

Objective: Behavioral studies have suggested continued development of morphosyntactic functions throughout childhood. Previous studies have used tag question production tasks to investigate this development. The current study employs grammaticality judgment of tag questions. Its aim was to test whether morphosyntactic language skills would show continued development in mid-childhood.

Participants and Methods: 11 right-handed, healthy children (mean age 9.2 years; range 7.7-10.5; 8 females) participated in computerized auditory morphosyntactic tag judgment tasks. Using a button response, participants judged the grammaticality of 72 tagged sentences (e.g. It is cold outside, isn't it?) containing either no violation or polarity, inversion, number agreement or subject agreement violations.

Results: Mean accuracy was 78.9% (range 54-92). The mean hit rate (correctly accepting a grammatical sentence) was .80 (range .69-.94). A linear regression analysis showed that age was a significant predictor of hit rate ($\alpha=.05$; $t(10)=3.01$, $p=.015$), with the hit rate increasing with age.

Conclusions: The significant linear increase in hit rate from ages 7 to 10 suggests that morphosyntactic language skills continue to develop across this age range. Since this is an age range that can be studied using fMRI, the tag judgment paradigm can be implemented in imaging studies of morphosyntactic development. The judgment paradigm is particularly suited for fMRI as it does not require overt speech production, a frequent cause of head motion resulting in distortion of imaging data. Correspondence: *Erin N. Moore, B.Sc., San Diego State University; 6363 Alvarado Ct, Suite 225, San Diego, CA 92101. E-mail: emoore@projects.sdsu.edu*

S.A. ORJADA, M.F. GARRETT & R.M. HARNISH. Comprehension of Implicatures Without Context in Individuals With Right Hemisphere Damage: A Preliminary Study.

Objective: Pragmatic language is often impaired after right hemisphere damage (RHD). However, implicature comprehension, a type of pragmatic language, has not been examined in this population. In implicature, one says something and means some expansion or completion of what was literally said.

The aim of this study was to determine whether participants with RHD perform differently than controls in comprehending implicature.

Participants and Methods: Four participants with RHD and four matched controls read 150 sentences in eight categories (cardinal, hyperbole, lexically-driven, locative, possessive, reciprocal, scalar, and temporal). Each sentence was followed by two answer choices representing literal ("I have nothing [at all] to wear") or enriched interpretations ("I have nothing [desirable] to wear"), enriched interpretations being the appropriate response. Participants circled the choice best representing what the sentence would mean in a typical conversation.

Results: Visual inspection of the data revealed that participants with RHD were generally less accurate than control participants, with controls achieving 100% accuracy on most implicatures except hyperbole. Statistical analysis revealed that individuals with RHD performed significantly more poorly than controls in three categories of implicature: hyperbole ($t=-7.41$; $p=.0001$), lexically-driven ($t=-2.05$; $p=.0431$), and temporal ($t=-3.46$; $p=.0067$).

Conclusions: Participants with RHD had difficulty with implicature comprehension, especially hyperbole. Because implicatures are a common feature of everyday communication, impaired implicature comprehension may contribute to poor social interaction. The present results support previous research that suggests individuals with RHD process pragmatic language in a more literal manner than their neurologically-normal counterparts. These results also have implications for the assessment and treatment of individuals with RHD.

Correspondence: *Sarah A. Orjada, M.A., CCC/SLP, Speech, Language, and Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: sorjada@email.arizona.edu*

C.J. PATRICK, D.C. OSMON & M. MCCARREN. The Influence of Visual Field in the Word Letter Phenomenon (WLP): Does the perceptual advantage for words depend upon bi-hemispheric processing?

Objective: The WLP is a well-established effect in visual word recognition demonstrating that participants identify a target letter more accurately if presented as part of a word than alone. Recent research has produced findings broadening the possibilities for what the WLP may indicate regarding visual word recognition. The superiority for words has been removed by lateralizing the target displays, indicating the WLP only occurs in the central visual field (CVF). The first hypothesis was the WLP would occur in the CVF. The second hypothesis was the WLP would be removed in the left visual field (LVF) and right visual field (RVF).

Participants and Methods: All 30 participants were undergraduate students. Participants completed a WLP task designed in accordance with the Riecher – Wheeler paradigm. Common four letter words differing by only one letter (i.e. show & snow) and isolated letters designed to coincide with the words (i.e. h & n) were presented in one of three visual fields for 40ms followed by a pattern mask and a forced choice alternative. Both hypotheses were tested using a 3 X 2 repeated measures ANOVA. Estimated effect sizes (Cohen's d') were calculated.

Results: The results produced a WLP in the CVF. Mean accuracy for word and isolated letter targets was 94%, and 90% respectively ($p = 0.011$; $t=2.728$; $d' = .61$). For RVF presentations, the results produced a nonsignificant difference ($p = .391$; $t = -.871$) between word (87%) and isolated letter (89%) targets. For LVF presentations, the WLP was reversed displaying a significant advantage ($p = .025$; $t = -2.364$; $d' = .60$) for isolated letter targets (83%) relative to word targets (78%).

Conclusions: In addition to the replication of the WLP, a new finding in this study is a significant letter effect in the LVF. This reversal of the WLP result aligns with other recent findings, indicating a bi-hemispheric process in word recognition. Further work exploring this effect and relating it to clinical measures of reading ability is warranted.

Correspondence: *Cory J. Patrick, Psychology, University of Wisconsin - Milwaukee, Garland Hall Rm. 224, 2441 E. Hartford Ave., Milwaukee, WI 53211. E-mail: cpatrick@uwm.edu*

S.Z. RAPCSAK, M.L. HENRY & P.M. BEESON. Alexia with Agraphia Following Damage to Left Inferior Temporo-Occipital Cortex.

Objective: According to traditional neuropsychological models of written language processing, damage to left inferior temporo-occipital cortex results in alexia without agraphia. We tested the validity of this assumption by examining the reading/spelling performance of patients with focal damage to this brain region.

Participants and Methods: Nine individuals with vascular lesions confined to left inferior temporo-occipital cortex and 16 age-matched controls participated in the study. Oral reading and spelling to dictation were assessed with a comprehensive battery that contained regular words, irregular words, and nonwords. Scores on these subtests were used to calculate the size of the regularity effect (regular - irregular) and the lexicality effect (words - nonwords) in reading and spelling. Reading latencies were assessed with a list of words ranging from 4-7 letters in length.

Results: Patients demonstrated an increased regularity effect in both reading and spelling compared to controls. Patients also showed features of letter-by-letter (LBL) reading, including an exaggerated word-length effect, and they read real words significantly better than nonwords resulting in an enhanced lexicality effect.

Conclusions: Damage to left inferior temporo-occipital cortex can produce not only isolated reading impairment, but also alexia with agraphia. We propose that lesions confined to occipital association areas (BA13/19) result in peripheral visual impairment that produces LBL reading and a disproportionate difficulty in decoding unfamiliar letter strings or nonwords. By contrast, damage to the visual word form area (BA37) results in a degradation of central orthographic representations and produces alexia with agraphia characterized by increased regularity effects in both reading and spelling.

Correspondence: *Pelagie M. Beeson, Ph.D., Speech & Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: pelagie@u.arizona.edu*

S.Z. RAPCSAK, M.L. HENRY & P.M. BEESON. Reading and Spelling: Two Sides of the Same Coin?

Objective: According to shared-component models of written language processing, damage to semantic, phonological, and orthographic representations should result in complementary forms of alexia and agraphia. By contrast, independent-component models allow for dissociations between patterns of reading and spelling impairment. To test these different predictions, we compared the reading and spelling profiles of individuals with acquired alexia/agraphia.

Participants and Methods: Participants included stroke patients with perisylvian (n=13) vs. extrasylvian lesions involving left inferior temporo-occipital cortex (n=9), patients with semantic dementia (SD) (n=7), and normal controls (n=16). Reading/spelling was assessed with regular words, irregular words, and nonwords. Scores were used to calculate the size of the regularity effect (regular - irregular) and the lexicality effect (words - nonwords).

Results: Perisylvian patients showed exaggerated lexicality effects in reading/spelling, consistent with phonological dyslexia/dysgraphia. By contrast, patients with SD and patients with extrasylvian temporo-occipital lesions demonstrated enhanced regularity effects in reading/spelling, consistent with surface dyslexia/dysgraphia. However, the latter group also showed an increased lexicality effect in reading but not in spelling (phonological dyslexia without phonological dysgraphia) and evidence of letter-by-letter reading.

Conclusions: Our study confirms that damage to central semantic (SD patients), phonological (perisylvian patients), and orthographic (extrasylvian patients) representations produces complementary forms of alexia/agraphia. The dissociation between phonological dyslexia and phonological dysgraphia documented in patients with extrasylvian temporo-occipital lesions most likely reflects a peripheral visual impairment and therefore does not provide compelling evidence for the independence of reading and spelling. Overall, our findings support shared-component models of written language processing.

Correspondence: *Pelagie M. Beeson, Ph.D., Speech & Hearing Sciences, University of Arizona, PO Box 210071, Tucson, AZ 85721-0071. E-mail: pelagie@u.arizona.edu*

S. RIMRODT, S.R. HOLLEY & L.E. CUTTING. Different Skills Contribute to Reading Comprehension Depending on Time-Restriction.

Objective: Previous studies have demonstrated that single word reading, oral comprehension, and working memory are correlated with measures of reading comprehension. The present analysis addresses the changing relationship between these skills depending on whether the reading comprehension measure is more or less time-restricted.

Participants and Methods: Data was obtained from eighteen college students with either good scores (>40th percentile, N=12) or poor scores (<25th percentile, N=6) on Woodcock Reading Mastery Test-Basic Skills composite. Oral comprehension (OC; Woodcock-Johnson III), working memory (SS=sentence span) and reading comprehension (Nelson Denny Reading Test-Form G (NDRT)) were assessed. Two separate NDRT scores were recorded; one for responses marked within the typical 20-minute time-limit (NDRT-20) and another for all responses marked during the entire 32-minute extended-time administration (NDRT-32). Regression analyses assessed relative contributions of OC, SS and Basic Skills to the two NDRT scores.

Results: Regarding NDRT-20 variability, SS accounted for 22% and OC for only 6%; regression revealed SS beta=0.443 (p=0.07) and OC beta=0.437 (p=0.5). Regarding NDRT-32 variability, SS (at 24%) and OC (at 27%) were equally strong predictors; regression revealed SS beta=0.413 (p=0.05) and OC beta=0.437 (p=0.04). However, Basic Skills was the strongest predictor of both NDRT-20 (beta=0.6;p=0.009) and NDRT-32 (beta=0.75;p<0.001). Restricting the analysis to the twelve best readers, OC accounted for 46% of NDRT-32 variability (with OC beta=0.695; p=0.02 and SS beta=0.1; p=0.6); neither OC nor SS was significant in predicting NDRT-20 variability.

Conclusions: These preliminary data suggest that working memory may be important during time-restricted reading comprehension while oral comprehension has greater impact on less time-restricted reading. Correspondence: *Sheryl L. Rimrodt, M.D., Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205. E-mail: rimrodt@kennedykrieger.org*

S. RIMRODT, A. VENKATADRI, A.M. CLEMENTS-STEPHENS & L.E. CUTTING. fMRI of Reading Comprehension in Young Adults With and Without Reading Impairment.

Objective: Reading comprehension is a primary modality for accessing new information in adult learners; however, basic word reading skill is not uniformly strong among college-level students. In this study, we sought to understand differences in reading comprehension across adults with different levels of word reading ability by comparing the neural activation patterns associated with sentence comprehension in skilled and less-skilled adult readers.

Participants and Methods: Ten college students completed reading tests and an fMRI session including a sentence comprehension task. Based on Woodcock Reading Mastery Test Basic Skills scores, five were good decoders (controls; greater than 40th percentile) and five were poor decoders (PD; less than 25th percentile). To isolate regions important for comprehension, the sentence comprehension task was contrasted with a baseline task controlling for single word reading. Using SPM2 random effects analyses, one- and two-sample t-tests showed within-group activations and between-group differences.

Results: Each group showed activation in bilateral frontal regions and the superior temporal gyrus. Compared to the PD group, controls showed additional recruitment of left precentral gyrus, left superior frontal gyrus and right cerebellum. Compared to controls, the PD group showed additional recruitment of right temporo-parietal and superior parietal regions.

Conclusions: Results are consistent with previous work showing that frontal and temporal lobe regions are important for comprehension beyond reading single words. Furthermore, similar to previous imaging studies using word reading tasks, this sentence comprehension task appears to recruit greater right hemisphere activity among poorer readers.

Correspondence: *Sheryl L. Rimrodt, M.D., Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205. E-mail: rimrodt@kennedykrieger.org*

T.C. SANDOVAL, T.H. GOLLAN, V.S. FERREIRA & D.P. SALMON. Bilingualism Affects Verbal Fluency: The Dual-Task Analogy.

Objective: When retrieving words from categories, bilinguals produce fewer correct responses than monolinguals (Gollan et al., 2002). We examined the time-course of category retrieval to contrast two different explanations for the bilingual fluency disadvantage. We investigated whether the bilingual effect on verbal fluency mirrors either a) category size effects or b) dual-task effects on verbal fluency in monolinguals (Rohrer et al., 1995).

Participants and Methods: In Experiment 1, English-dominant bilinguals (n=24) and monolinguals (n=30) recalled items from 15 semantic and 24 double-letter categories. In Experiment 2, bilinguals (n=30) recalled items from 12 semantic categories in English and Spanish (with language in counterbalanced order). Participants pressed a button as they produced each response, and the timing of each response was recorded using PsyScope 1.2.3 (Cohen et al., 1993) and a Macintosh computer.

Results: We compared bilinguals to monolinguals (Experiment 1) and Spanish to English (Experiment 2) using separate ANOVAs for correct responses, first response times and mean response times. Like monolinguals in a dual- versus single-task testing situation (Rohrer et al., 1995), bilinguals produced fewer correct responses, took longer to produce a first response, and produced proportionally delayed responses relative to monolinguals. Similarly, bilinguals produced fewer correct in Spanish, took longer to produce a first response in Spanish, and produced proportionally delayed responses in Spanish relative to English.

Conclusions: The results support the dual-task analogy. Being bilingual is analogous to performing a dual-task during category fluency, and speaking the non-dominant language is more dual-task-like than speaking the dominant language.

Correspondence: *Tiffany Sandoval, B.A., UCSD, 7855 Cowles Mountain Court, #A12, San Diego, CA 92119. E-mail: tcsandor@ucsd.edu*

C.E. TYNER, C. DELTORO, M.E. GAIEFSKY, K. KLENBERG, I. LEVEY, K.D. WHITE, B. CROSSON & A.B. MOORE. Homographs: Bringing Norms to Present.

Objective: The objective of this study is establish current normative data for homographs (words with one spelling, yet multiple meanings). Nelson and colleagues originally established homograph norms in 1980. Twilley et al. updated these for use in a Canadian population in 1994. However, the dominant and subordinate meanings of these homographs have changed over the past 20 years (e.g., the dominant association for “tab” has changed from “drink” (1980) to “bill”, with the new subordinate meaning “computer key”). Homographs are valuable for a wide variety of research methodologies and have been employed in studies of autism, schizophrenia, stroke, and dementia.

Participants and Methods: Two methods were used to test 517 homographs. In Method 1, subjects completed a forced-choice questionnaire listing two meanings for each homograph. Subjects were asked to identify which alternative represented the dominant meaning. Four subjects completed this task via Scantron and 94 via the internet. In Method 2, 12 subjects read a series of homographs and were asked to write down the first word that came to mind.

Results: Overall patterns of meaning salience (i.e., dominant vs. subordinate) were similar between the two methodologies (forced-choice and free-response). A dominant meaning was defined as the one chosen by at least a two-thirds majority of respondents. Using this criterion, dominant meanings emerged for 354 of the stimuli (68%). For the remaining 163 stimuli (32%) there was no consensus on a dominant meaning, suggesting that both word meanings were equally salient.

Conclusions: This study presents updated and current homograph norms. It is our intention that these findings will assist other investigations of word priming, word association, and semantic processing.

Correspondence: *Anna B. Moore, Ph.D., Rehabilitation Medicine, Emory University, 1441 Clifton Road, N.E., Room 150, Atlanta, GA 30322. E-mail: abmoore@emory.edu*

Memory

B. ALLY, J. WARING, E. BETH & A. BUDSON. The Effect of Pictures on the Neural Correlates of Recognition Memory.

Objective: Numerous studies of recognition memory have demonstrated the picture superiority effect. However, there has been no systematic investigation of how pictures versus words affect the components of the event-related potential (ERP) old/new effect. Our goal was to examine differences in three specific components of the recognition memory ERP waveform associated with the processes of familiarity, recollection, and post-retrieval monitoring.

Participants and Methods: Using a within-subjects design, 17 young adults saw four study-test phases (Word-Picture, Picture-Word, Word-Word, Picture-Picture) with 50 study items and 100 test items (50% old).

Results: Analysis of hits minus correct rejections revealed that words at study showed greater early bilateral frontal positivity associated with a higher level of familiarity. Further, words showed more activity at right prefrontal and superior parietal regions during the post-retrieval monitoring interval. On the other hand, pictures were better recollected and showed shorter duration of the left parietal effect that is associated with recollection. Additional analyses revealed that phases with non-matched study and test modality (W-P, P-W) showed decreased frontal positivity during the early bilateral frontal effect, increased duration of the left parietal effect, and increased frontal and parietal activity during the post-retrieval monitoring interval.

Conclusions: Based on these findings and a review of the literature, we have developed a novel model of recognition memory. We found that frontal and parietal regions were simultaneously active during the post-retrieval monitoring interval, supporting the hypothesis that interplay between the two regions is necessary to make many recognition decisions. We suggest that the frontal lobes may utilize the parietal cortex as a sketchpad to match the representation stored in memory with perception or to hold multiple representations for response selection.

Correspondence: *Brandon Ally, Ph.D., Department of Neurology, Boston University School of Medicine, GRECC, Bldg. 62, Rm. B31-A, 200 Springs Rd., Bedford, MA 01730. E-mail: bally@bu.edu*

Other:

S.K. (SMITH) PIERSON, S. CAUDLE, K. KRULL, J. HAYMOND, R. TONINI & J. OGHALAI. Etiological Considerations on Cognitive Factors in Preschool-Age Children Diagnosed with Sensorineural Hearing Loss.

Objective: Considerable literature has documented the impact of hearing impairment on spoken language skills in deaf children referred for cochlear implantation. Critical areas of neurocognitive development in the acquisition of visual (manual) language also appear to be impacted, though the evidence is less robust. The present study focused on the development of visual and fine motor skills in deaf, preschool-age children.

Participants and Methods: Participants included preschool-age children with no known neurological conditions referred for neuropsychological evaluation as part of their screening for cochlear implantation (n = 36). Children were classified into three groups based upon the etiology of their deafness (Connexin = 15, Structural Malformation = 11, and Unknown = 10). Data were analyzed from the neuropsychological testing conducted as part of the screening for cochlear implantation.

Results: Correlational analyses were conducted for the etiological groups, with results revealing children with genetic (Connexin) etiology exhibiting a significant reduction in fine motor skills with age, and those with an etiology of structural abnormality exhibiting a significant reduction in visual reception skills with age. Results of planned comparisons conducted as part of a MANOVA (Skill X Group) indicated that the Connexin group was superior to the Unknown group with regard to fine motor skills.

Conclusions: Overall, results support consideration of nonverbal skill development in children with sensorineural hearing loss. The study also supports identification of the etiology of the child's deafness to facilitate the neuropsychological assessment process, thereby better informing treatment planning. Additional implications and future studies will also be discussed.

Correspondence: *Suzanne K. (Smith) Pierson, PhD, Indiana Neuroscience Institute, St. Vincent Hospital, 8333 Naab Road, Suite 270, Indianapolis, IN 46260. E-mail: SKPierson@stvincent.org*

M. ALBERTELLA & K.I. MASON. Disturbances in Mood Contribute to Discrepancies between Subjective and Objective Measures of Executive Functioning in College Students with "Probable" Attention Deficit Hyperactivity Disorder.

Objective: Attention Deficit Hyperactivity Disorder (AD/HD) is, as a neurodevelopmental disorder of behavioral control and self-regulation, characterized by poor sustained attention, impulsivity, and hyperactivity (Barkley, 1997). For many children with AD/HD, these symptoms persist into adulthood and affect daily functioning. The current study examined the extent to which issues with attention and executive functioning impact college students with "probable" AD/HD.

Participants and Methods: The relationship between complaints of executive dysfunction and neurocognitive and psychosocial functioning was examined in 38 college students. All participants were administered a short neuropsychological battery of tests and self-report questionnaires that included the Brown ADD Scale for Adults and the Behavior Rating Inventory of Executive Functioning for Adults. Participants were categorized into two groups, a control group and those with "probable" AD/HD (using the Brown ADD Scale criteria).

Results: The results of this study found that students with "probable AD/HD" reported more difficulties with executive functioning than controls ($p < .001$); however, there were no significant differences between groups on objective tests of executive functioning. Those with "probable" AD/HD also reported more depression ($p < .001$), anxiety ($p < .05$), and sleep disturbance ($p < .001$) than the control group.

Conclusions: The results suggest a relationship between mood, associated sleep disturbance, and self-reports of deficits in executive functioning. Findings also indicate that the discrepancy between subjective and objective measures of executive functioning may be related to deficits in metacognition and self-monitoring.

Correspondence: *Michelle Albertella, California State University, Dominguez Hills, 1704 Via Montemar, Palos Verdes Estates, CA 90274. E-mail: michellealbertella@msn.com*

I. BARON, F.R. LITMAN, M.D. AHRONOVICH & K. ERICKSON. Neuropsychological Outcome of Extremely Low Birthweight Children Born at 23 To 25 Weeks Gestational Age: Intact Function at Early School Age.

Objective: Preterm birth has significant neuropsychological late-effects, the earliest born premature children more at-risk for cognitive and behavioral problems than later born or heavier birthweight infants. This is especially true for infants born < 26 weeks GA. These conclusions often emerge from studies of cohorts born before current neonatal advances but even recent low gestational age cohorts have significant impairments. This negative prognosis is inconsistent with our experience.

Participants and Methods: Data will be presented for all 11 Extremely Low Birthweight (ELBW; < 1000 g) children born at or below 25 weeks gestation in 1998-2000 (mean gestational age = 24.36 weeks; mean birthweight = 661 g; 64% male; mean age = 6.97). These earliest GA children, 34% of a larger ELBW study, were administered IQ, academic achievement, executive function, attention, language, memory, motor function, and behavioral tests. Neonatal medical records confirmed 0% grade III-IV intraventricular hemorrhage, 9% periventricular leukomalacia, 0% ventriculomegaly, 9% necrotizing enterocolitis, 64% chronic lung disease, 73% sepsis, 100% retinopathy and Decadron treatment. 81% were inborn.

Results: Contrary to expectation based on published reports, compared to normative data our < 26 weeks GA children had average intelligence (mean = 93 [12.35]), academic achievement (SS = 99-104), visuomotor skill (SS = 90 [7.54]), language, memory, phonemic discrimination, digit span, selective attention, and verbal fluency but low average spatial ability, block-span, timed motor skill, and motor dexterity.

Conclusions: These data suggest that in the absence of significant intracerebral complications, average neurocognitive development and low average motor and visuomotor outcome is likely regardless of birthweight, gestational age, and common prematurity-associated medical complications during the newborn period. Decadron exposure, sepsis incidence, ROP, CLD did not portend poorer outcome.

Correspondence: *Ida Sue Baron, Ida Sue Baron Ph.D., Independent Practice, 10116 Weatherwood Court, Potomac, MD 20854-2713. E-mail: ida@isbaron.com*

C.S. BLOSS, D.C. DELIS & M.W. BONDI. The APOE-ε4 Genotype and School-Based Group Achievement Test Scores: A Significant Gender by Genotype Interaction in Children.

Objective: A recent study found that the APOE-ε4 genotype was related to years of educational attainment in a sample of elderly adults, suggesting that this genotype may influence cognitive development in early life. Coupled with longstanding evidence that developmental learning difficulties have a significant heritable component, with some studies reporting differential genetic influence in males and females, the current study aimed to explore the relationship between APOE-ε4 and school-based group achievement test scores in middle school-aged boys and girls.

Participants and Methods: A total of 130 children enrolled at a public charter school underwent buccal swab testing to determine their APOE genotype. The sample included 72 girls ($n = 15$ ε4-positive) and 58 boys ($n = 15$ ε4-positive). Participants completed group achievement testing between grades 3 and 8. Mean reading and math NCE scores from the California Achievement Test, Sixth Edition (CAT-6) were examined for each participant, in addition to a discrepancy score calculated for each child, which represented the absolute value of the difference between reading and math scores.

Results: Mean scores on individual reading and math subtests were not significantly different between ε4-positive and ε4-negative children, or between boys and girls. However, a significant gender by genotype interaction was observed for reading - math discrepancy scores ($p < .05$), with ε4-positive girls showing the highest mean discrepancy score (18.3) relative to ε4-positive boys, ε4-negative girls, and ε4-negative boys.

Conclusions: These findings raise the possibility that the APOE-ε4 genotype influences early cognitive development, but that the nature of this influence may depend on gender.

Correspondence: *Cinnamon S. Bloss, M.S., SDSU/UCSD Joint Doctoral Program in Clinical Psychology, University of California, San Diego, VA San Diego Healthcare System, 3350 La Jolla Village Drive, MC 116B, San Diego, CA 92161. E-mail: cinnamon@ucsd.edu*

R.M. BOWLER. Dose-Effect and Covariate Analyses of Education, and Ethnicity on Neuropsychological and Neurological Function in Manganese Exposed Bridge Welders.

Objective: Adverse health effects of confined space welding (on a new span of the San Francisco-Oakland Bay Bridge) were studied with a multidisciplinary methodology to identify dose-effect relationships with manganese (Mn) in air, and blood.

Participants and Methods: Bridge welders (n= 43), exposed to Mn had symptoms of: tremors (41.9%); numbness (60.5%); excessive fatigue (65.1%); sleep disturbance (79.1%); sexual dysfunction (58.1%); toxic hallucinations (18.6%); depression (53.5%); and anxiety (39.5%). Tests included the: WAIS-III and WMS III, Rey-Osterrieth, Stroop, Trails A & B, Animal Naming, Controlled Oral Word Association, the Tomm, Boston Naming, Fingertapping, Dynamometer, Grooved Pegboard, the BDI-II, BAI, and SCL-90-R. Neurological examination findings will be reported.

Results: Outcomes were analyzed in relation to a Cumulative Exposure Index (CEI) based on Mn/air, duration and type of welding and Mn levels in blood. Welders had a mean of 43.9 yrs of age, 12.7 yrs of education, and 15.5 months of welding on the bridge. TLV elevations of Mn/ blood were found for half of the welders with low normal levels of Pb. Mn in air ranged from 0.11 to 0.46 mg/m³ (TLV .20 mg/m³). Dose-effect relations reflect inverse relationships with Mn/Blood, and the CEI and lower IQ, and lower executive function, sustaining concentration and sequencing, verbal learning and verbal IQ, working and immediate memory. Results of the test scores and partial regression plots will be presented as will be the covariance for age, education, ethnicity and the remaining adjusted variance for exposure.

Conclusions: Covariate analyses of demographic characteristics will be discussed in relation to interpreting neuropsychological findings.

Correspondence: *Rosemarie M. Bowler, Ph.D., Psychology, San Francisco State University, 8371 Kent Drive, El Cerrito, CA 94530. E-mail: rbowl@sfsu.edu*

B.D. BRIGIDI, L. FORNNARINO, W.E. COPELAND, H.S. FRIEDMAN & R.H. RAYNOR. Latent Class Analysis of Neurocognitive Impairment and Depression Following Cranial Irradiation and Chemotherapy in Adult Patients with Primary CNS Tumors.

Objective: Therapeutic cranial irradiation and systemic therapies can have detrimental effects on human cognition, but resulting neurocognitive sequelae vary greatly in primary CNS tumor patients. In an effort to better understand potential genetic variation in neurocognitive impairment secondary to treatment, we sought to determine the role of cranial irradiation and systemic therapy in latent subtypes of neurocognitive impairment and depression.

Participants and Methods: Data for 388 right-handed adult primary CNS tumor patients who completed the Hopkins Verbal Learning Test-Revised, Verbal Series Attention Test, Trails A & B, Boston Naming Test, and Beck Depression Inventory-II post external beam radiation were submitted to latent class analysis. Subjects were at a median of 187 days post radiation therapy and at a median of 286 days since time of diagnosis; 54% glioblastoma multiforme, 25% anaplastic astrocytoma, 96% Caucasian, 37% female, 95% WHO tumor grades III or IV; tumor location was 36% frontal lobe and 46% right hemisphere.

Results: Latent class models were estimated for 1-class through 9-class solutions, determined by comparing changes in the Bayesian Information Criterion (BIC) based on dichotomized z-scores. A 4-class solution appeared most parsimonious, which resulted in (probabilities of class membership in parentheses) Class 1-Severe Neurocognitive Impairment/Moderate Depression (.49), Class 2-Severe Immediate Recall/Moderate Psychomotor Speed/Moderate Depression (.26), Class 3-Moderate Verbal Attention/Moderate Executive Dysfunction/Severe Psychomotor Speed/Moderate Depression (.16), and Class 4-Low Neurocognitive Impairment/Low Depression (.10).

Conclusions: This study provides evidence for discrete classes of neurocognitive impairment and mood dysfunction which may be expected in primary CNS tumor patients following radiation and systemic therapies, and requires further validation with genetic markers of neurocognitive impairment.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

B.D. BRIGIDI, L. FORNNARINO, M. AFFRONTI, J.E. HERNDON, II, D.A. REARDON, H.S. FRIEDMAN & R.H. RAYNOR. Contributions of Neurocognitive Factors in Predicting the Survival of Adult Patients with High Grade Primary CNS Tumors.

Objective: To determine the prognostic value of neurocognitive performance in a well-defined sample of high grade CNS tumor patients.

Participants and Methods: We reviewed neurocognitive data for adult high grade CNS tumor patients seen at the outpatient neuropsychology clinic in The Preston Robert Tisch Brain Tumor Center at Duke between 11/1999 and 6/2006. The 297 patients were: 67% male, 89% right-handed, 98% Caucasian, 68% with glioblastoma multiforme [GBM], and 86% with previous radiation therapy. There were 209 deaths within the study period and survival (days) was calculated from the test date.

Results: Cox's proportional hazards model was used to generate a parsimonious survival model from known clinical prognostic factors. Factors retained for further analyses (p < .20) were age (median split at 49 years old) and histology (anaplastic astrocytoma [AA], GBM). Consistent with known literature, at the mean of the covariates, the five-year survival rate was higher for younger patients and patients with AA versus GBM (22% vs. 2%). Proportional hazard regressions were used to assess the prognostic value of 5 neurocognitive covariates after adjustment for clinical variables. In the final model, covariates of WMS-III Visual Reproduction 2 (delayed nonverbal memory), WMS-III Logical Memory 2 (delayed contextual verbal memory), HVLIT-R Total (initial total verbal learning), and Verbal Series Attention Test (verbal attention speed of processing) predicted survival after adjustment for histology and age (p < .05).

Conclusions: The current study confirms previous reports showing that neurocognitive testing provides valuable and unique information regarding survival in adults with high grade CNS tumors beyond that afforded by clinical variables, which supports using neurocognitive measures as part of the standard of care in neurooncology.

Correspondence: *Bart D. Brigidi, PhD, Surgery, Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

T. BUCKLEY, J. TSCHANZ, M. NORTON, C. CORCORAN, J. BREITNER & K.A. WELSH-BOHMER. Metacognitive Judgments and Change in Cognitive and Functional Abilities in a Population of Elderly Individuals. The Cache County Study.

Objective: Few studies have examined self-perception of cognitive change in non-demented individuals. We examined this issue along with cognitive performance in a population of elderly individuals.

Participants and Methods: Cognitive (Modified Mini-Mental State Exam, 3MS) and functional changes (ADLs) were examined in relation to perception of cognitive change/metacognition in a sample of older adults (n= 693; mean(sd) age = 81.4(7.0)). Metacognition was expressed as a 7-item average (higher scores indicate perception of greater decline), and a summary score reflecting improvement, no change, or worsening abilities. Linear mixed models were fitted for each trajectory to examine the effect of metacognition, controlling for demographic variables and APOE genotype.

Results: Correlations between metacognitive means and change in 3MS and ADLs were essentially 0. Mean 3MSs declined in participants reporting no cognitive change (mean=3.4, sd = 8.0) and those reporting a

decline (mean=5.6, sd = 8.8). Linear mixed models revealed a significant difference in rate of decline in 3MS and ADLs ($p < .02$ for both). Age, APOE $\epsilon 4$, and education were also associated with decline ($p < .03$). Interestingly, 22% of subjects reporting no cognitive change exhibited a decline of ≥ 8 3MS-points, and a substantial number were diagnosed with a cognitive syndrome (30%) or dementia (17%) through separate clinical assessment.

Conclusions: While participants reporting worsening cognition declined at a faster rate in 3MS and ADLs than those reporting no change, a striking finding was the low correlation with metacognition and the actual decline among those reporting no change. Future studies will explore the nature of discrepant metacognitive and 3MS-ADL reports.

Correspondence: Trevor Buckley, B.S., Psychology; Utah State University, 976 n 300 e #1, Logan, UT 84321. E-mail: tbuckley@cc.usu.edu

D.J. CROCKETT & J.E. MEYERS. Relationship of Attention and Free Recall on the Rey Complex Figure Drawing Test.

Objective: The relationship between the accuracy of reproduction of complex information during the acquisition, immediate retrieval, and delayed retrieval was studied using the Rey Complex Figure Drawing Test.

Participants and Methods: Multiple Regression Analyses were used to examine the relationship of scores derived from a sample of adults referred for neuropsychological assessment ($n = 867$).

Results: Age was significantly related to Copy-TS ($t = 5.407$, $p < 0.00$, $n = 867$) but not gender. Immediate-TS were related to education ($t = 5.431$, $p < 0.000$, $n = 862$) and gender ($t = -2.218$, $p < .027$). Copy-TS made a significant contribution to Immediate-TS independently from age and gender ($t = 17.376$, $p < 0.00$, $n = 862$). Age ($t = 5.363$, $p < 0.000$, $n = 849$) and gender ($t = -2.502$, $p < 0.013$) made a significant contribution to Delayed-T-score. When the effects of age and gender were controlled, Copy-TS ($t = 3.909$, $p < 0.000$, $n = 848$) and Immediate-TS ($t = 53.615$, $p < 0.000$) made a significant contribution to predicting scores obtained during the delayed condition. Similar patterns were found when the performance of brain dysfunction and non-brain dysfunction participants was examined separately.

Conclusions: The impact of the level of attention to detail and location during the acquisition phase on the accuracy of reproduction during the immediate- and delayed-conditions will be discussed in terms of goals for rehabilitation.

Correspondence: David J. Crockett, Ph. D., Department of Psychiatry, University of British Columbia, Suite 104, 3709 Pender Street, Burnaby, BC, BC V5C 2L2, Canada. E-mail: crockettdj@shaw.ca

A. DEAN, K.B. BOONE, M.A. ZELLER, T.L. VICTOR, A. CIOVICA & M.E. COTTINGHAM. Ethnicity and Performance on the MMPI-2 Fake Bad Scale: A Preliminary Investigation.

Objective: The MMPI-2 Fake Bad scale has been conceptualized as a measure of somatic malingering and is commonly used in litigious situations. However, potential ethnic differences in performance on the scale have not been investigated. Given that some ethnic groups have been proposed to commonly express stress through somatic symptoms (e.g., Hispanic Americans), evaluation of normative ethnic differences on the Fake Bad scale is warranted.

Participants and Methods: Archival neuropsychological data from our clinic was accessed. In a first analysis, patients who were judged to be malingering or were diagnosed with somatoform diagnoses were excluded, and mean differences between Caucasian American ($N = 24$), Hispanic American ($N = 18$), and African American ($N = 19$) Fake Bad scores were assessed with a one-way ANOVA. In a second analysis, malingering and somatoform patients were NOT excluded and differences in the frequency of Fake Bad hits (males > 24 ; females > 26) were compared between ethnic groups with Pearson chi-square.

Results: With malingers and somatoform diagnoses excluded, no mean differences were found between ethnic groups ($p > .05$). Similarly, without sample exclusions, the frequency of scores exceeding Fake Bad cut-offs did not differ between ethnicities ($p > .05$).

Conclusions: In an urban community clinic sample, mean performance on the Fake Bad Scale did not differ by ethnic group. Similarly, when malingers and somatoform patients were included in the analysis, ethnic groups did not differ in the frequency of scores exceeding Fake Bad cut-offs. Results suggest that the Fake Bad Scale is not biased against ethnic minorities. Replication of the study with larger sample sizes is recommended.

Correspondence: Andrew Dean, Ph.D, Neuropsychology; Harbor-UCLA Medical Center, 1000 W. Carson St., F-9, Box 495, Torrance, CA 90509. E-mail: andydean1@msn.com

M. DUX, J.L. WOODARD, K. MORDECAI, A.A. PICA & D. CHARLES. Increased Intraindividual Variability Associated with Decreased Memory Performance in High School Athletes.

Objective: Processing speed and memory are often affected by sports-related concussion, but the nature and pattern of these deficits has varied across studies. This study evaluated whether intraindividual variability on measures of processing speed was related to memory performance at baseline testing.

Participants and Methods: 212 high school athletes (62% male, M age = 15.5 years, M education = 10.3 years, M grade point average = 3.25, Ethnicity = 44% Caucasian, 13.9% African American, 13.4% Hispanic, 10.9% Asian-Pacific Islander, 8.4% other), were administered baseline neuropsychological testing.

Results: A task decomposition paradigm including 4 increasingly difficult tests of processing speed was employed (Salthouse et al., 1997). Intraindividual variability was calculated for the 4 tasks as absolute difference scores based on multiple administrations of alternate forms. Intraindividual variability on an intermediate measure of perceptual comparison speed was negatively correlated with immediate ($r = -.213$, $p = .002$) and delayed recall ($r = -.184$, $p = .007$) on the Brief Visuospatial Memory Test- Revised (BVRT-R). Intraindividual variability on a more difficult speeded comparison task was negatively correlated with delayed recall ($r = -.181$, $p = .008$) on the Hopkins Verbal Learning Test-Revised (HVLT-R) as well as immediate ($r = -.179$, $p = .009$) and delayed recall ($r = -.192$, $p = .005$) on the BVRT-R. Hierarchical regression analyses demonstrated that greater practice or fatigue effects (intraindividual variability) as opposed to mean level of performance, were significantly and uniquely related to performance on memory measures.

Conclusions: Findings suggest that increased intraindividual variability (greater practice or fatigue effects) on measures of processing speed is negatively related with performance on visuospatial and verbal memory. Furthermore, intraindividual variability accounts for significant unique variance in memory performance.

Correspondence: Moira Dux, Psychology, Rosalind Franklin University of Medicine and Science, 4837 N. Claremont, Chicago, IL 60625. E-mail: moira.dux@rfums.org

K. FUCHS, A.P. HALEY, S. DUNHAM, J. KNIGHT-SCOTT & C.A. MANNING. Creatine Levels in the Anterior Cingulate Differentiate Amnesic and Nonamnesic MCI.

Objective: To examine the potential of proton magnetic resonance spectroscopy (1H-MRS) in establishing neurochemical profiles of individuals with Mild Cognitive Impairment (MCI) with and without amnesic presentations.

Participants and Methods: 15 individuals who underwent neuropsychological evaluation as part of the UVA Memory Disorders program (7 met the Petersen criteria for MCI; 8 did not meet the Petersen criteria yet showed cognitive compromise that was not sufficient for a de-

mentia diagnosis). The two groups were not significantly different in age ($p = .63$; range 64-80 yrs), education ($p = .55$; range 12-20 yrs), or MMSE scores ($p = .39$; range 24-28). Each participant underwent a 1H-MRS scan on a 1.5 T MRI system (STEAM, TE/TM/TR=10/10/5000 ms, 6 cc volume, 112 averages, 2500 spectral width, and 2048 points).

Results: Multivariate analysis of covariance with age as a covariate indicated significant differences in the anterior cingulate profile of the N-acetyl-aspartate to creatine ratio (NAA/Cr) between patients with amnesic and nonamnesic MCI (Pillai's trace = .606, $F(3,9) = 4.61$, $p < .05$). Further examination revealed that these differences were mostly due to higher concentrations of total creatine in the amnesic group ($F(1,14) = 9.63$, $p < .01$).

Conclusions: The neurochemical profile of the anterior cingulate obtained with 1H MRS successfully differentiated between two groups of individuals determined to have amnesic and nonamnesic MCI based on neuropsychological test performance. This finding suggests the possibility of differential neurodegenerative processes in these two groups that warrants further exploration with a larger sample.

Correspondence: *Kathleen Fuchs, PhD, Neurology, University of Virginia, PO Box 800394, Charlottesville, VA 22908-0394. E-mail: klf2n@virginia.edu*

S.S. HARDY. Arm Flexion, Extension, and Relaxation: How Bodily Feedback Can Impact Cognitive Tuning.

Objective: Internal non-affective signals, specifically arm flexion and extension, can impact cognitive processing styles in a manner similar to positive and negative affect. This study aims to delineate the independent effects of each state by introducing a relaxation condition. It's hypothesized that arm flexion cues a global processing style, arm extension cues a detailed processing style, and that both improve performance in comparison to a neutral state.

Participants and Methods: Sixty-six undergraduates were randomly assigned to three experimental groups: arm flexion, extension, and relaxation. While engaged in standardized postures, subjects orally reported their responses on five measures of creative insight and detail-oriented problem solving. Process-oriented observations were also made and analyzed to assess subjects' mode of task engagement.

Results: A MANCOVA and a series of ANCOVA's were run to determine the overall and individual effects of arm position on performance. These controlled for the effects of reported mood, task enjoyment, and task familiarity.

Conclusions: Arm position had a significant overall effect on participants' test performance. Arm flexion improved performance on tests of creative insight; whereas general muscle tension facilitated detail-focused task engagement when compared to muscle relaxation. Arm position also had a significant effect on process-oriented observational data. These findings are discussed in the context of neurological explanations for the relationship between affect, arousal, and cognition. It is suggested that internal non-affective cues, by engendering approach and avoidance states may impact hemispheric influence on cognitive control and the differential release of dopamine in neural regions such as the anterior cingulate and the VTA.

Correspondence: *Shelby S. Hardy, MA, Clinical Psychology, Suffolk University, 41 Temple St, Boston, MA 02114. E-mail: shelebs@hotmail.com*

Y. HASHIMOTO, K. SAWADA, M. MARUISHI & F. MATSUDA. Feedback effects on time estimation in patients with brain damage.

Objective: One of the most important aspects of psychological time is the internal experience of how much time passed since the occurrence of some event. Some previous studies have suggested that the ability of

time estimation in the seconds to minutes associated with various cortical and subcortical areas. In the current study, patients with unilateral lesions due to stroke and patients with TBI were tested on a time production task to investigate the role of feedback that could affect on learning of time estimation.

Participants and Methods: Thirteen patients with brain damage and 11 normal adults participated in this study. Participants were tested on a time production task. The task was consisted of two phases. In the training phase, participants were required to produce 10 s with feedback. The test phase followed five successive precise productions of 10 s in the training phase. In the test phase, participants were required to produce 10 s without feedback.

Results: (a) Three participants of patient group could not reach the learning criterion within 20 trials. Generally, the result revealed that patients needed more trials than the normal adults to learn 10 s duration. (b) To analyze the effect of feedback, the rate of valid trails was calculated in each participant. The valid trial means that the produced duration in the trial became longer (or shorter) than that in the previous trial where the feedback of "too short" (or "too long") was given. The result showed that the average rate of valid trials in the patient group was as high as that in the normal group. (c) In the test phase, the patients could produce 10 s without feedback as precisely as the normal adults.

Conclusions: The findings mentioned in (a) and (b) in the results suggest that it is more difficult for the patients to adjust their produced duration based on the feedback than for the normal adults. According to findings mentioned (c), the ability to learn based on the feedback seems to differ from the ability to retain the learning.

Correspondence: *Yukari Hashimoto, Ph.D, Psychology, Fukuyama University, 1-Sanzo, Gakuenmachi, Fukuyama-city 729-0292, Japan. E-mail: yukari@fuhc.fukuyama-u.ac.jp*

S.C. HEATON, O. PEDRAZA, M. STRAND & J.J. LOYDEN. Confirmatory Factor Analysis of the Test of Everyday Attention for Children (TEA-Ch) in an ADHD Population.

Objective: The goal of the current study is to investigate the latent structure of the Test of Everyday Attention for Children (TEA-Ch) in a sample of North-American children with ADHD in order to better understand the test's construct validity in a clinical population. The 3-factor model obtained with the test's normative sample (selective attention, sustained attention, attentional control) was compared against two alternate models incorporating a fourth factor (divided attention).

Participants and Methods: Study participants were recruited from clinics within a large teaching hospital and consisted of 92 children (ages 6-16) diagnosed with ADHD. Participants completed all nine subtests of the TEA-Ch. Confirmatory factor analysis was conducted using maximum likelihood estimation. The indices used were: relative chi-square (χ^2/df), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), standardized root mean squared residual (SRMR), comparative fit index (CFI), and expected cross-validation index (ECVI).

Results: Although the original 3-factor model of the TEA-Ch provided adequate fit to the data, one of the 4-factor models provided better fit to the data ($\chi^2/df = 1.13$, GFI = .95, AGFI = .88, SRMR = .058, CFI = .97, and ECVI = .79) with a significant difference chi-square ($p < .05$) for nested models.

Conclusions: In the present ADHD sample, a 4-factor model of attention provided a better fit to the data than the original 3-factor model. More specifically, the best model incorporated a divided attention factor, supporting the notion that this is an important aspect of attention. Findings are discussed relative to literature on divided attention skills in ADHD.

Correspondence: *Shelley C. Heaton, Ph.D., University of Florida, Box 100165, Gainesville, FL 32610. E-mail: sheaton@phhp.ufl.edu*

M.S. HELT, P. SNYDER, I. EIGSTI, H.C. BOORSTEIN & D.A. FEIN. When During Childhood Does Contagious Yawning Develop?

Objective: When adult human beings see or hear others yawn, or even read the word “yawn”, we react by yawning ourselves approximately 40-60% of the time (Platek, Critton, Myers 2003; Provine 1989). Neuroimaging research suggests that this phenomenon is not due to conscious imitation (Schurmann et al. 2005) and may actually be a form of subconscious empathy (Platek, Mohammed, & Gallup 2005).

The latter contention is bolstered by the finding that people with schizotypal traits are less susceptible to contagious yawning (Platek et al. 2003) as are very young children (Anderson & Meno 2003).

Participants and Methods: In order to discover when during development contagious yawning comes online, we tested young children’s (n=65) susceptibility to contagious yawning by reading them a story, during which the reader would pause and yawn several times.

Results: We found that when exposed to this type of stimulus 7.7% of two-year-olds yawned at least once, 15.3% of three year olds yawned, 38.4% of four-year-olds yawned, 46.2% of five-year-olds yawned, and 46.2% of six-year-olds yawned.

Conclusions: Our results indicate that contagious yawning appears to follow a protracted development, with susceptibility reaching adult levels by about the age of five years. These findings are consistent with the suggestion that contagious yawning is distinct from spontaneous yawning (which begins in utero) and may be dependent upon the ability to empathize with others and understand what they feel. Preliminary results pertaining to the social and cognitive skills associated with susceptibility to contagious yawning will be discussed.

Correspondence: *Molly S. Helt, BA, Psychology, University of Connecticut, 286 Stearns Rd, Mansfield Center, CT, CT 06250. E-mail: molly.helt@uconn.edu*

J.C. JACKSON, W. OBREMSKY, R. BAUER, R. GREEVEY, B. COTTON, V. ANDERSON, Y. SONG & E. ELY. Long-Term Cognitive, Emotional and Functional Outcomes in Trauma ICU Survivors without Intracranial Hemorrhage.

Objective: Trauma ICU patients without intracranial hemorrhage are considered at low risk for lasting cognitive and emotional deficits and such sequela may be overlooked. We sought to determine the prevalence of and risk factors for persistent cognitive impairment and emotional and functional difficulties in adult trauma intensive care unit (TICU) survivors without intracranial hemorrhage.

Participants and Methods: We queried the Vanderbilt University Trauma Registry for all patients admitted during 2003 with an Injury Severity Score (ISS) >25 and a head CT showing no intracranial hemorrhage. Of 97 patients, 58 were evaluated 12-24 months post discharge with a comprehensive battery. The IQCODE-SF was used to identify patients with possible pre-existing cognitive impairment.

Results: Of 58 patients, 21 (36.2%) had a concussion or skull fracture and 37 (63.8%) had neither. A total of 33 (57%) patients were cognitively impaired (1 test score 2 SDs or 2 test scores 1.5 SDs below the mean), with 1 (.03) of these patients having pre-existing cognitive impairment via the IQCODE-SF. Cognitive deficits occurred primarily in areas of attention, executive functioning, and verbal fluency and were more likely in patients with a concussion or skull fracture than in those without (81% vs. 43%, $p=0.006$). A total of 56% of patients reported depressive symptoms, and 38% significant symptoms of PTSD. QOL scores were lower than in the general U.S. population. A total of 34% of patients were unemployed at follow-up and cognitive impairment was more common among these patients ($p=0.03$).

Conclusions: The majority of trauma survivors without intracranial hemorrhage display persistent cognitive impairment, which is twice as

likely in those with skull fractures or concussions. This cognitive impairment was associated with functional deficits, poor QOL, and unemployment. Future research must delineate modifiable risk factors for these poor outcomes, while additionally evaluating the efficacy of cognitive rehabilitation in these patients.

Correspondence: *James C. Jackson, PsyD, Allergy, Pulmonary, Critical Care/Center for Health Services Research, Vanderbilt University School of Medicine, 6th Floor MCE, Suite 6100, Nashville, TN 37221. E-mail: james.c.jackson@vanderbilt.edu*

S. KARANTZOULIS, A.K. TROYER, S. MURTHA & J.B. RICH. Prospective Memory Impairment May Be Related to Frontal Lobe Integrity in Amnesic Mild Cognitive Impairment.

Objective: Individual differences in frontal lobe (FL) integrity appear to subservise age differences in remembering to carry out intended actions, termed prospective memory (PM), rather than age per se. Amnesic mild cognitive impairment (MCI) is associated with medial temporal lobe decline with some suggestion of compromised FL ability as well. Therefore, group differences between healthy elderly and individuals with amnesic MCI in PM may also be due to differences in FL integrity.

Participants and Methods: PM was assessed using the Memory for Intentions Screening Test (MIST; Raskin, 2004) in 28 individuals with the amnesic variant of MCI (M age = 75) and 28 healthy elderly controls (M age = 73).

Results: As expected, there was a main effect of group in favor of the controls on the MIST. Follow-up analyses revealed that MCI participants classified as below-average based on their scores on a composite battery of executive function (EF) tests performed significantly worse than controls on the prospective component of the MIST, whereas MCI participants with average EFs performed comparably to controls.

Conclusions: Individuals with amnesic MCI with relatively poorer EF abilities appear to carry the group difference in PM. Group analyses thus run the risk of masking individual differences in cognitive ability. More information could be gained by grouping these patients according to their level of functioning in different cognitive domains. This approach may help clinicians to develop more effective cognitive remediation techniques, which ultimately may help improve the quality of the everyday lives of individuals with MCI.

Correspondence: *Stella Karantzoulis, Psychology, York University, 175 East 96th Street, New York, NY 10128. E-mail: skarantz@gmail.com*

A.R. KAUP, T.H. YAMADA, A. LALOGGIA, M.D. MCCOY, S.K. SHIVAPOUR, B.K. LINK, J.E. WOOLDRIDGE, M.D. VOELKER, R.B. WALLACE & N.L. DENBURG. Mild Changes in Cognition among Older Adults Following Chemotherapeutic Treatment for Follicular Lymphoma.

Objective: The current study aims to explore the impact of chemotherapeutic regimens on the cognitive abilities of older adult follicular lymphoma survivors. Indolent non-Hodgkin’s follicular lymphoma (FL) is the most prevalent lymphoma in the elderly and remains incurable, although survival rates are gradually increasing with advancing treatments, such as chemotherapy. Previous research suggests that chemotherapeutic treatment may have deleterious effects on cognition, especially in the domains of attention, executive function, memory, and psychomotor functioning. We hypothesize that aging, which is typically accompanied by a weakened nervous system, may exacerbate the emergence of such cognitive deficits in older cancer patients receiving chemotherapy.

Participants and Methods: In the current study, we examined neuropsychologically the abilities of 20 older patients (aged 56 and above) with FL who had received chemotherapeutic treatment. For comparison purposes, 20 healthy older adults without cancer were matched to the FL patients based on age, gender, and education.

Results: Our hypotheses were partially supported. Specifically, FL patients performed more poorly than the comparisons on measures of anterograde non-verbal memory, attention, and executive function. The psychomotor speeded abilities of the patients were also below expectations. Furthermore, FL patients reported higher levels of depression. Finally, there was a trend for FL patients to display a relative delay in learning on a measure of real-world decision-making.

Conclusions: Taken together, these cognitive weaknesses raise concerns about the integrity of the frontal lobe of the brain in older cancer survivors treated with chemotherapy. The findings are discussed in terms of their impact on the everyday functioning of these patients.

Correspondence: *Allison R. Kaup, B.S., UCSD/SDSU, 8657 Via Mallorca #107, La Jolla, CA 92037. E-mail: allisonkaup@yahoo.com*

E.C. LERITZ, C. BARBER, W. MILBERG & R. MCGLINCHEY. Source Memory and Item Memory in Cerebrovascular and Dementia Risk.

Objective: Alzheimer's disease (AD) and cerebrovascular disease (CVD) are two common dementing disorders that include memory impairments as primary diagnostic criteria. Given the distinctive neuropathological and neuropsychological disease profiles in early stages, it is likely that memory is differentially affected. Individuals at risk for AD versus CVD were administered an experimental item memory (IM) and source memory (SM) task predicted to dissociate medial temporal and frontal lobe mediated memory function, respectively.

Participants and Methods: Seventeen individuals with a family history of AD and varying levels of CVD risk completed an IM/SM task in addition to comprehensive neuropsychological testing. Four of the 17 participants had the APOE polymorphism (high AD risk). CVD risk ranged from 0 (low) to 27 (high) (Wolfe, 1991). IM/SM performance was indexed via recognition memory.

Results: SM discrimination (d') correlated significantly with performance on executive functioning measures (Trailmaking B and the Wisconsin Card Sorting Test) and delayed recall (CVLT-II). IM discrimination (d') was significantly related to story memory (Logical Memory, WMS-III), but not to executive function variables. SM, but not IM, performance was associated with CVD risk.

Conclusions: These findings suggest that SM but not IM is associated with CVD risk and frontal lobe functions such as contextual monitoring and efficient storage of newly learned, unstructured information. This may indicate that CVD risk causes changes to the frontal lobes, leading to a dissociable memory impairment. Data collection is ongoing to increase our high AD risk group in order to directly compare memory functioning across high CVD and AD risk.

Correspondence: *Elizabeth C. Leritz, PhD, GRECC, Boston VA Healthcare System, 150 South Huntington Avenue, GRECC 1S2 JP, Jamaica Plain, MA 02130. E-mail: bleritz@heartbrain.com*

J. PARRISH, E. GEARY & M. SEIDENBERG. Sex Differences in Affective Priming and Memory for Faces and Semantic Information.

Objective: There is considerable interest in characterizing the nature and pattern of sex differences in processing emotional stimuli. Distinct sex differences have been observed in ratings of emotional stimuli, extent of amygdala activation while processing emotional stimuli, and physiologic reaction to emotional stimuli. In the current study, we examined sex differences in the physiologic (SCR) and behavioral (memory) response to neutral versus negative famous face primes on learning of face and identity information (occupation).

Participants and Methods: 61 healthy graduate students (ages 20-35; 30 men, 31 women) were presented with 2 face learning trials. Each

trial consisted of suboptimal (28 msec) presentation of negative or neutral famous face primes, immediately followed by a jumbled face mask, followed by the presentation of an unfamiliar target face (5 sec) while being told an associated occupation. Participants were asked to recognize faces and recall occupations immediately after the learning trials and following a one-week delay. SCR was collected during the 2 learning trials.

Results: There were no significant sex differences in recognition of target unfamiliar faces or associated occupations (all p 's > .05), and both men and women showed a decline in SCR from trial 1 to trial 2 independent of stimulus prime type. However, men showed a significant increase in SCR for correct recognition and recall of occupation compared to just recognition alone. This pattern was not observed in females.

Conclusions: Findings suggest that in men but not women, higher arousal was associated with increased encoding and consolidation of semantic information. Findings are discussed within the context of the broader literature examining sex differences in emotion processing.

Correspondence: *Joy Parrish, Rosalind Franklin University of Medicine and Science, 849 Todd Court, Deerfield, IL 60015. E-mail: jyparrish@netscape.net*

J. POYSKY, J. SHAHED, C. HODGES & J. JANKOVIC. Cognitive and Psychiatric Change Following DBS Surgery for Tourette Syndrome in a 16-year-old Male.

Objective: Tourette syndrome (TS) is characterized by phonic and motor tics and psychiatric co-morbidities. The efficacy and safety of deep brain stimulation (DBS) in movement disorders are established, and its application to neuropsychiatric conditions is expanding. We describe cognitive and psychiatric change following bilateral DBS of the globus pallidus interna (GPi) in a 16-year-old boy with severe, medication-refractory TS.

Participants and Methods: The patient presented with severe TS and psychiatric comorbidities, with marked academic and social impairment. Neuropsychological evaluation assessed suitability for the procedure and established baseline cognitive and psychiatric functioning. Staged, bilateral GPi DBS electrodes were placed using techniques employed for GPi DBS in dystonia. Follow-up testing was completed 6 months after his stimulator was turned on. To estimate effect size, Z-scores for the difference between pre- and post-test results were calculated for each measure, and typical test-retest effects were subtracted.

Results: The patient demonstrated significant improvement on tests of verbal reasoning ($Z = 1.63$), processing speed ($Z = 2.52$), and divided attention ($Z = .50$ to 1.43). Psychiatric symptoms also improved, including depression ($Z = -1.11$) and obsessive-compulsive disorder ($Z = -2.40$). Non-dominant fine motor dexterity ($Z = -1.83$), design fluency ($Z = -.81$), and visual scanning ($Z = -.89$) were significantly worse. There was a non-significant trend toward poorer verbal memory performance ($Z = -.51$).

Conclusions: Our patient demonstrated significant cognitive and psychiatric change following surgery. The cognitive improvements observed may have reflected primary beneficial effects of DBS, although improved mental clarity secondary to reduced co-morbidities cannot be excluded. Poorer performance on certain tasks may have also reflected the primary effects of the surgery or stimulation. Additional research evaluating cognitive and psychiatric changes after DBS surgery in TS is needed.

Correspondence: *James Poysky, PhD, Baylor College of Medicine, 6621 Fannin St., CC 1630.00, Houston, TX 77030. E-mail: jxpoysky@texaschildrenshospital.org*

L. RENTERIA, N.H. PLISKIN, A. DEZZUTTI, S. STEELE & K. KANE. Neuropsychological Functioning in a Non-litigating Chronic Pain Sample: The Effect of Pain Location, Pain Severity, and Pain Related Life Interference.

Objective: Patients who experience chronic pain commonly demonstrate cognitive impairment on measures assessing attentional capacity, pro-

cessing speed, and psychomotor speed (Hart et al. 1995). However, because the experience of pain is influenced by a complex interaction of factors, comprehensive studies are needed to clarify the role of environmental and psychological factors. The aim of this study was to understand how pain location and the subjective experience of pain influences neuropsychological test performance.

Participants and Methods: Participants were 21 non-litigating adults with chronic pain seen for a neuropsychological evaluation prior to spinal cord stimulator placement. The patients did not have a history of TBI, neurological disorders, or a history of past psychiatric difficulties. Participants were administered the West Haven-Yale Multidimensional Pain Inventory (WHYMPI), Trail Making Test A & B, and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). The statistical analyses focused on the attention and processing speed subtests of the RBANS. Pain location (lower back vs. multi-site), pain severity (mild vs. extreme), and pain related life interference (low vs. high) were used as independent variables.

Results: Independent-samples t-tests indicated that pain location, severity, and pain related life interference were not related to cognitive test performance.

Conclusions: Typical pain determinants had no influence on neuropsychological test performance in our non-litigating chronic pain sample. Future studies should look at the relationship between neuropsychological performance in litigating and non-litigating samples to further clarify this relationship.

Correspondence: *Laura Renteria, Ph.D., Psychiatry (MC 913), University of Illinois at Chicago, 912 S. Wood Street, Chicago, IL 60612-7327. E-mail: lrenteria@psych.uic.edu*

M.L. ROHLING. Clinical Neuropsychology Boards: Descriptive Statistics, Comparisons amongst Boards, and Contrasts to Medical Boards.

Objective: Three primary neuropsychology boards exist, making it difficult for consumers to discriminate amongst practitioners who have been credentialed or not. All three boards have indicated that they modeled their process after that used by medicine. This research will compare and contrast each of the three boards to one another, and to that which exists in medicine.

Participants and Methods: Data has been obtained from each of the three boards and pass rates can be compared amongst boards. Data also will be compared to specialties of the American Board of Medical Specialties, to see how well neuropsychology is accomplishing the credentialing task compared to medicine.

Results: For the two largest boards (ABCN & ABPN), results appear identical in terms of overall pass rates. Half of the applicants who begin the process do not complete it. Approximately 2/3 of these clinicians drop-out following an exam stage failure. Another 1/3 drop-out despite having passed the preceding exam stage. As a result, neuropsychology has credentialed just 16% of its clinicians. Furthermore, it appears that the percentage has remained stable for several years. These results are in contrast to that which has been found in medicine, where 89% of physicians are boarded. Furthermore, less than 3% of physicians drop-out of the process. Finally, over the past 15 years, there has been a steady increase in the percentage of boarded physicians, rising from 72% to 89%.

Conclusions: Board certification in clinical neuropsychology has been contentious. Much debate has occurred as to which of the boards is better board. Current data cannot directly answer this question, but it does suggest that each of the boards has room for improvement. Without significant change to the credentialing process, neuropsychology will never reach the level that has been achieved by medicine.

Correspondence: *Martin L. Rohling, Ph.D., Psychology, University of South Alabama, 331 Life Sciences Building, Mobile, AL 36693. E-mail: mrohling@usouthal.edu*

L.A. SCHAEFER, T.M. DE VINCENT, J. SANDHU, D.M. LANGENBAHN & R. SHERR. Rehabilitation of Anosognosia and Anosidaphoria in a Patient with Right Thalamic CVA.

Objective: Awareness of deficits is an essential first step in treatment and rehabilitation following cerebral vascular accident (CVA). Nevertheless, the rehabilitation of anosognosia is not often discussed, and is an area where more research is sorely needed.

Participants and Methods: We present a case study of a 72-year-old man who suffered a right CVA, including right thalamic and intraventricular hemorrhage. Neuropsychological evaluation was performed at the outset of treatment (7 months post-CVA) and repeated one year later. Initial testing revealed severe deficits in visual scanning and attention (but without left neglect), visual memory, and perceptual-motor functioning. Awareness was poor, with underestimation of the extent and severity of his deficits (scoring 8/9 on the Self-Awareness of Deficits Interview, with 9 being the poorest). His wife felt that he was depressed, although the patient denied depression. Neuropsychological rehabilitation consisted of twice-weekly individual cognitive remediation and weekly individual psychotherapy for eleven months, with a focus on increasing awareness. Techniques included education of patient and his wife, experiential exercises (calendar, to-do list, etc.), and reinforcement of behaviors to increase awareness, initiation, and independence (i.e., reviewing a list of goals; having him ask his wife questions).

Results: Upon follow-up, cognitive testing revealed significant improvements in attention, organization, and visual memory. The patient was more aware of his deficits and their functional implications, scoring 2/9 on the Self-Awareness of Deficits Interview. With increased awareness, the patient also began to experience sadness, which was addressed in psychotherapy.

Conclusions: This case offers an example of multi-modal rehabilitation of anosognosia in a medical setting.

Correspondence: *Lynn A. Schaefer, Ph.D., Neuropsychology Service, Outpatient Psychology, Rusk Institute of Rehabilitation Medicine, 400 E. 34th Street, Room RR315, New York, NY 10016. E-mail: lynn.schaefer@nyumc.org*

J. SCHNEIDER, S. MOELTER, P. SCHATZ, H. TORUNIDIS, L. GREENBERG, J. HERBERT, S. PLATEK & E. ZILLMER. Emotional Sequelae of Sports-Related Injuries: Concussive and Orthopedic Injuries.

Objective: Sustaining and recovering from injury can be emotionally difficult for athletes and can disrupt the athletes' sense of well-being. Given the emotional impact of injury on athletes, it is surprising that little attention has been given to the emotional effects of sports-related concussion on athletes. The present study adds to previous research by comparing pre- and post-injury mood disturbances between athletes with concussion to that of athletes with orthopedic injuries. Injured athletes were predicted to experience heightened levels of mood disturbance post-injury compared to pre-injury mood levels. Additionally, athletes with concussive injuries were predicted to experience greater post-injury mood disturbance compared to athletes with orthopedic injuries.

Participants and Methods: Athletes participating on varsity sports teams at Drexel University and Pennsylvania State University completed the current study. Athletes completed measures of emotional functioning pre-season and serially following injury (within 48 hours, within 3-5 days, within 6-10 days) during their sport season.

Results: In contrast to expectations, injured athletes did not experience greater levels of mood disturbance immediately following injury, compared to pre-injury mood levels. Further, trend levels differences in the way athletes with different injury types react to athletic injury were detected, opposite to that predicted. Athletes with orthopedic injuries experienced heightened levels of mood disturbance post-injury and athletes with concussive injuries reported fewer negative mood symptoms post-injury.

Conclusions: The present findings suggest the possibility that injury-specific factors may influence athletes' emotional reactions to athletic injury.

Correspondence: *Jillian Schneider, Ph.D., Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: JillianSchneider@comcast.net*

G.J. SELKE, E.B. FENNELL, S.C. HEATON, G.Z. RECKESS, K.D. FOOTE & M.S. OKUN. Development of an Integrative Approach to Psychological Intervention and Neuropsychological Assessment in Deep Brain Stimulation (DBS) for Childhood Dystonia: A Case Study.

Objective: Dystonia is the third most prevalent movement disorder. Pallidal deep brain stimulation (DBS) has recently emerged as an alternative to surgical ablation. Studies suggest optimal outcomes are associated with younger age, DYT1 mutation, and primary dystonia. However, limited neuropsychological outcome data is available on children undergoing DBS. This case study presents preliminary pre- and post-operative neuropsychological assessment of motor functioning in a child with DYT1+ primary generalized dystonia who underwent bilateral DBS. Additionally, the critical role of the patient's clinical neuropsychologist before, during and after surgery is discussed.

Participants and Methods: The patient is an 8-year-old male with a three-year history of intractable, rapidly progressing primary DYT1+ generalized dystonia. He underwent comprehensive neuropsychological assessment nine months before DBS surgery and follow-up motor testing (grooved pegs, finger tapping, PANESS rapid/sequential movements) at four time-points: 1 week before and 2 weeks after lead implantation; 3 and 6 weeks after battery implantation. Psychotherapeutic interventions were integrated into the patient's medical treatment before, during and after surgery to facilitate emotional and behavioral functioning.

Results: Initial assessment revealed impaired bilateral motor slowing and coordination, contrasted with high-average to superior performance on measures of intelligence, attention, and memory. Follow-up testing indicated worsening of motor functions prior to lead implantation, transient post-operative decline, and progressive improvement at 3 and 6 weeks after battery placement.

Conclusions: The findings support the utilization of traditional neuropsychological motor tests as objective DBS outcome measures. This case also highlights the value of integrating traditional neuropsychological assessment and psychological intervention into a comprehensive pediatric pre- and post-DBS program.

Correspondence: *Gregg Selke, Ph.D., Clinical and Health Psychology, University of Florida, 3601 NW 19th Place, Gainesville, FL 32605. E-mail: gselke@phhp.ufl.edu*

P. SMITH, A. LLORENTE PH.D., C. SMITH PH.D. & J. RIES PSY.D.. An Initial Investigation of the Effects of Recent Changes in CPT Codes on Billing and Reimbursement Rates on Outpatient Neuropsychology Practice.

Objective: To investigate the effects of recent changes in CPT codes on billing and reimbursement rates at a metropolitan pediatric rehabilitation hospital, this investigation reports findings from, such rates obtained from an outpatient neuropsychology service responsible for providing care to children with medical, neurologic, and psychiatric conditions.

Participants and Methods: Billing and reimbursement rates were provided by the hospital's financial department for the periods of January – April of 2005 and January – April of 2006 with a standard waiting period of 90 days to allow for reimbursement to be completed. Billing and rates of reimbursement were separated by type of payor.

Results: A Two-sample unequal variance (heteroscedastic) t-test was used to determine the probability that the two samples of reimburse-

ment rates were from similar populations related to mean reimbursement rate. A non-significant trend at $p < .05$ was obtained. In addition, a Mann-Whitney U test for comparison of the rank order of reimbursement rates, charges submitted, and reimbursement received were not statistically significant.

Conclusions: The rates of reimbursement for services from January - April of 2005 were not significantly different than the rates of reimbursement for January - April of 2006. The type of payor, ranked according to reimbursement rate, charges submitted, and reimbursement received, remained similar between 2005 and 2006. There are several limitations which include the knowledge that some of the 2005 and most of the 2006 rates of reimbursement may increase as waiting period increases. Additional factors, including the overall number of cases, and rates of cancellations and no-shows require further consideration.

Correspondence: *Peter Smith, Psy.D., Mount Washington Pediatric Hospital, 1708 West Rogers Ave, Baltimore, MD 21202. E-mail: psyd0905@gmail.com*

B.E. SNITZ, L.A. MORROW, K.A. HUBER & J.A. SAXTON. Proportion of Older Patients Meeting Cognitive Criteria for Mild Cognitive Impairment in a Primary Care Practice Setting.

Objective: This study examined the number of elderly primary care practice (PCP) patients with Mild Cognitive Impairment (MCI) based on neuropsychological criteria. We hypothesized that the most prevalent MCI subtype would be 'MCI-Multiple Cognitive Domains (MCI-MCD)' due to complex, multifactorial etiologies of cognitive deficits in a general medical practice compared to specialty memory clinics where 'MCI-Amnesic (MCI-A)' is most prevalent.

Participants and Methods: Participants were the first 117 PCP patients without dementia diagnosis (mean age 73.6, mean education 13.9 years) included in a larger study of the utility of cognitive testing and physician feedback in primary care practices. All participants underwent a 3-hour battery of neuropsychological tests and structured interviews. Cases were classified as Cognitively Normal (N), Normal-Questionable (NQ) or MCI by consensus of three neuropsychologists. Cases were adjudicated MCI if test scores fell in the range of -1 to -2 SD below age-adjusted means. Subjective memory complaints, medical chart information and ADL data were also reviewed, but memory complaint and normal ADLs were not required.

Results: Adjudication resulted in 39% N, 21% NQ, 35% any MCI, and 4% dementia. As hypothesized, MCI-MCD was the most prevalent subtype (22% of total), followed by MCI-A (8% of total). Cognitive groups did not significantly differ by age, education, gender, depression score, or IADLs.

Conclusions: Community based studies of MCI have found a wide prevalence range (3% to 17 %). The finding of a higher rate in an elderly population seeking health care treatment is not surprising and is likely due to MCI definition, health status, and age.

Correspondence: *Beth E. Snitz, Ph.D., Neurology, University of Pittsburgh, 3471 Fifth Avenue, Suite S02, Pittsburgh, PA 15213. E-mail: snitzbe@upmc.edu*

A.D. SPADONI, C. PULIDO, A.L. NORMAN & S.F. TAPERT. Do the Effects of Alcoholism Family History on Adolescent Neuropsychological Function Depend on Maternal Education?

Objective: In adolescents with a dense family history (FH) of alcohol use disorders (AUD), examining the combined influence of FH of AUD and moderators, such as maternal education (ME), on adolescent neurocognitive development may help identify youth at greatest risk for AUD.

Participants and Methods: Non alcohol/drug abusing participants (N=109), ages 12-14, were recruited from the local community. Neuropsychological scores were standardized for age and inverted so higher scores reflected better performance. Measures were grouped and scores averaged to define six theoretically-determined domain scores: Medial-Temporal-Diencephalic, Parietal-Occipital, Superior-Temporal, Prefrontal-Associative, Prefrontal-Orbital-Dorsolateral, and Premotor systems. Hierarchical multiple regressions predicted domain scores using FH density, years of ME, and their interaction.

Results: FH did not account for significant variance in any neurocognitive domain. ME predicted performance on the Parietal-Occipital domain ($F(1,99)=12.64$, $p=.001$; $\beta=.15$, $p=.005$). The interaction of FH and ME also predicted Medial-Temporal-Diencephalic scores ($F(1,98)=7.76$, $p=.006$; $\beta=.30$, $p=.006$). Simple regression lines characterized the relationship between Medial-Temporal-Diencephalic scores and ME at low, medium, and high values of FH density. At low levels of FH density, adolescents tended to perform worse with increasing years of ME ($\beta= -.71$, $p<.01$). In adolescents with a dense FH, performance improved with increased ME ($\beta= .76$, $p<.01$).

Conclusions: ME may serve as an important buffer in decreasing the risks associated with a dense FH AUD.

Correspondence: *Andrea D. Spadoni, B.S., The Joint Doctoral Program at UCSD and SDSU, 7707 Eads Ave, La Jolla, CA 92037. E-mail: aspadoni@ucsd.edu*

K. SPENCER & E. JOHNSON. Motor Programming and Working Memory Deficits in Cerebellar Disease.

Objective: The primary purpose of this study was to identify and characterize speech motor programming deficits and verbal working memory deficits in individuals with cerebellar disease and to determine the relationship between these processes. It was hypothesized that individuals with reaction time patterns suggestive of speech motor programming disruption would have greater verbal working memory impairment.

Participants and Methods: Thus far, three adults with ataxic dysarthria from cerebellar damage or degeneration (A1 - A3) and three controls matched for age, sex and education (C1 - C3) have completed the protocol.

Protocol 1 was a speech reaction time task, where participants were required to read aloud heterogeneous syllable strings that appeared on the computer monitor as quickly as possible. This protocol enabled the assessment of speech motor programming via the "sequence length effect". Protocol 2 was a verbal working memory reaction time task with minimal motor programming requirements. The task required participants to remember syllable sequence order over time (1000 and 6000 msec) and recognize the order that the information was initially presented. Dependent measures were accuracy of response and reaction time to press a button on a response box labeled "same" if the order was identical or "different" if the order had changed.

Results: Participant A1, the only participant with speech reaction time patterns suggestive of motor programming disruption, was also the slowest responder during the working memory task (suggesting possible processing difficulties; Gottwald et al., 2003), and had the greatest number of errors during the working memory task.

Conclusions: Results lend preliminary support to a relationship between speech motor programming and verbal working memory. The evaluation and management of individuals with ataxic dysarthria will be enhanced by a better understanding of the motor programming and cognitive contributions to ataxic dysarthria.

Correspondence: *Kristie Spencer, Ph.D., Speech & Hearing Sciences, University of Washington, 1417 NE 42nd St, Seattle, WA 98105. E-mail: kas@u.washington.edu*

M.B. SPITZNAGEL, J.O. CARVALHO, J. GUNSTAD & G. TREMONT. Comparison of Multiple Measures of Awareness in Dementia Patients.

Objective: Although reduced awareness is a frequent and problematic component of the clinical presentation in dementia, there remains question of which methods best measure awareness. The current study sought to compare multiple measures of awareness and determine which measures best predict clinician rating.

Participants and Methods: Participants were 110 individuals diagnosed with questionable, mild, or moderate dementia (CDR=0.5, 1, or 2) during comprehensive neuropsychological evaluation. Awareness of cognitive difficulties was measured by clinician and informant "overall awareness" ratings, patient self-rating of performance on neuropsychological evaluation relative to actual performance, patient and informant responses on the Cognitive Difficulties Scale (CDS), and the discrepancy between informant and patient CDS.

Results: Spearman's rho correlations among all measures revealed that informant awareness rating ($r=0.36$; $p<.001$), informant/patient CDS discrepancy ($r=0.46$; $p<.001$), and patient cognitive performance rating relative to actual performance ($r=0.47$; $p<.001$) were all strongly correlated to clinician rating in the expected direction. Patient CDS was strongly but negatively related to clinician rating of awareness ($r=-0.50$; $p<.001$), indicating that increased patient denial of cognitive problems was associated with greater severity of unawareness rated by the clinician. Stepwise multiple regression revealed the combination of patient denial of cognitive problems ($\Delta R^2=.30$, $F(1,98)=42.76$, $p<.001$) and informant rating of patient awareness ($\Delta R^2=.07$, $F(1,97)=10.71$, $p=.001$) best predicted clinician rating.

Conclusions: These findings suggest reduced awareness may be detected using several methods. However, the combination of patient denial of cognitive problems and informant report of diminished awareness is most closely associated with clinician rating, highlighting the importance of obtaining awareness information from multiple sources. Correspondence: *Mary B. Spitznagel, PhD, Psychology, Summa Hospitals, 444 N. Main St, Suite 405, Akron, OH 44310. E-mail: spitznagelm@summa-health.org*

D. HAMMERS & J. SUHR. The Relation of Substance Use and Abuse to Personality and Executive Dysfunction.

Objective: Substance use is a significant health problem, particularly for undergraduate students, many of whom experiment with alcohol and other substance use as they enter a less structured and supervised situation. However, not all of these students go on to develop substance abuse problems. Prior research suggests that personality traits such as reward drive and impulsivity are related to substance abuse; impairments in decision-making and executive functioning are also observed in substance abusers.

Participants and Methods: In the present study, undergraduates reporting frequent use of alcohol and marijuana were divided into two groups: those who have a high probability of clinical diagnosis with substance abuse (DX) and those who have a lower probability of clinical diagnosis (USER), based on report of polysubstance use and a positive score on the SASSI. Participants who self-reported neurological, psychiatric, or learning disability/ADHD were excluded.

Results: Groups were not different in age, education, or alcohol use, but DX group reported more marijuana use and had higher estimated verbal intellect. Groups were not different in positive or negative affect, but DX group were higher on BIS/BAS Drive and Fun Seeking Scales. DX group also performed worse on the Iowa Gambling Task, the WCST, and were more impulsive on the BART.

Conclusions: Results are generally consistent with prior research on the personality and behavioral correlates of substance abuse, and also suggest that personality and neuropsychological measures can distinguish between young adults who are experimenting with alcohol and substance use and those who are likely to develop clinically diagnosable substance abuse problems.

Correspondence: Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu

J. TANNER, L.K. WEAVER & R.O. HOPKINS. Measuring Reliable Change of Neuropsychological Test Scores in Patients with Acute Respiratory Distress Syndrome.

Objective: With increasing emphasis on outcomes following acquired brain injury, the ability to accurately identify change in neuropsychological scores is an important area of research. Reliable change was assessed in critically ill patients with acute respiratory distress syndrome (ARDS).

Participants and Methods: 74 ARDS patients were administered neuropsychological tests at hospital discharge and 1 and 2 years. In Experiment 1, the ARDS patients' hospital discharge scores were used as baseline data to calculate reliable change using four methods: Reliable Change Index (RCI), RCI adjusted for practice effects (RCI-P), bivariate regression, and multiple regression. In Experiment 2, the RCI and RCI-P were recalculated using published control data.

Results: Experiment 1 – RCI-P, bivariate and multiple regression had similar accuracy. The RCI-P was determined to be more accurate than regression methods due to ease of calculation and parsimony. Using the ARDS baseline data was problematic in classifying reliable change due to the expected cognitive recovery in neuropsychological test scores resulting in low test-retest reliability. Control group data are needed to determine accurate rates of reliable change. Experiment 2 – Using published control data, improvement in neuropsychological scores occurred by 1 year with minimal change between 1 and 2 years in our ARDS patients. 50% of participants improved on all tests by 2 years, however, only 18% improved on the WMS-R General Memory Index. Reliable change in the ARDS participants occurred predominantly during the first year with little change between 1 and 2 years.

Conclusions: These findings support use of the RCI-P to calculate reliable change and illustrate the need for published normative data to assess reliable change.

Correspondence: Jared Tanner, MS, University of Florida, 4037 SW 21st Rd, Gainesville, FL 32607. E-mail: jttanner@gmail.com

T.L. VICTOR, K.B. BOONE, M. ZELLER & A. DEAN. The False Positive Rate for Common Effort Tests in Individuals Diagnosed with Learning Disabilities.

Objective: Unfortunately, there is little established validity for using our current effort indicators with person who are LD, as this special clinical population is typically not found in validation samples.

Participants and Methods: Seventeen credible patients with no motive to feign and who met diagnostic criteria for LD were referred for outpatient neuropsychological evaluation and underwent a comprehensive neuropsychological battery that included ten effort tests.

Results: Only the Warrington Memory Test – Words (cutoff < 33), the Finger Tapping Test (cutoff < 28 for women and < 35 for men), the Rey-Osterrieth Effort Equation (cutoff < 47) and the b-test (using the LD cutoff > 140) reached adequate levels of specificity (at or around .90). The other effort indicators ranged in specificity from 69% (RAVLT effort equation; cutoff < 12) to 82% (Reliable Digit Span; cutoff < 6). Further, over half of this sample failed at least one effort test, and illiterate subjects (i.e., those with < 3rd grade reading level; n=4), failed three or more.

Conclusions: The use of certain standard effort test cutoffs in individuals with LD (especially when illiterate) can lead to unacceptable rates of false positive error on many commonly used effort indicators. The pattern of results specifically suggests that effort tests relying only on the aural presentation of stimuli may not be appropriate for use with this population.

Correspondence: Tara L. Victor, Ph.D., Psychiatry, Harbor-UCLA Medical Center, 1000 West Carson Street, Box 495, Torrance, CA 90509. E-mail: tara@msu.edu

T.L. VICTOR, K.B. BOONE, A. DEAN & M. ZELLER. Vocabulary minus Digit Span as a Function of Education.

Objective: The WAIS-III Vocabulary minus Digit Span age-corrected scale score (VDS) has been used as an indicator of poor effort (cutoff < 5) with good sensitivity (especially in college sample simulation studies), but unacceptably low levels of specificity. Further, the sensitivity of this score appears to be greater in individuals of higher intelligence (although this is difficult to interpret since overall IQ is suppressed as well when the individual is feigning). We hypothesize that the differential sensitivity of the VDS may be a function of education; while most feigners are probably depressing their Digit Span scores, individuals of higher education are likely demonstrating significantly higher vocabulary scores and therefore higher VDS discrepancies.

Participants and Methods: Twenty-six noncredible patients meeting independent Slick criteria for probable malingering, referred for outpatient neuropsychological evaluation, underwent a comprehensive neuropsychological test battery that included the WAIS-III. Noncredible subjects were divided into high (some college) and low (< 12 years) education groups (range: 2 to 18 years; M = 11.5; SD = 3.2).

Results: The VDS was overall insensitive to malingering in this sample, but more sensitive in the high (22%) as compared to the low (6%) education group as predicted. In fact, 76% of the low education group showed the opposite pattern (Digit Span was higher than Vocabulary). Further, the two groups significantly differed on raw mean VDS scores ($p = .01$).

Conclusions: The VDS may be particularly insensitive in individuals of low education and display inadequate specificity in individuals of high education.

Correspondence: Tara L. Victor, Ph.D., Psychiatry, Harbor-UCLA Medical Center, 1000 West Carson Street, Box 495, Torrance, CA 90509. E-mail: tara@msu.edu

M.A. ZELLER, K.B. BOONE, T.L. VICTOR & A.C. DEAN. Different Patterns of Malingering Based on Education.

Objective: The objective of this study is to determine if differences exist in the patterns of malingering of cognitive symptoms between those with high versus low education.

Participants and Methods: Participants were consecutively referred individuals from the Harbor-UCLA Neuropsychology Assessment Clinic who were determined to be non-credible based on litigation- or disability-seeking status, failed performance on at least 2 effort indicators, and at least one behavioral criterion, such as cognitive scores inconsistent with activities of daily living. Nineteen were classified as having high education (13 or more years) and 28 were classified as having low education (12 or less years). Performances of the two groups were compared on the following effort measures: WAIS-III Digit Span (age corrected scaled score, time to repeat 3 digits forward & time to repeat 4 digits forward), WMS-III Logical Memory Rarely Missed Index, Rey-Osterrieth Effort Equation, Rey Auditory Verbal Learning Test Effort Equation, Rey 15-Item + recognition combination Score, Warrington Recognition Memory Test - Words, Dot Counting E-score, B-Test E-score, Rey Word Recognition Equation, and Finger Tapping dominant hand.

Results: Independent t-tests revealed that those with 12 or less years of education were more likely to fail Warrington Words ($p = .006$); mean Warrington Words score in the low education group was 31.84 (SD = 7.10), as compared to 37.21 (SD = 7.37) in the high education group. No other group differences were detected.

Conclusions: These findings suggest that individuals of high versus low education are comparable in their performance on effort tests and that educational level does not appear to alter strategies for feigning.

Correspondence: michelle A. zeller, Psy.D., Psychiatry, VA Greater Los Angeles Healthcare System, Wilshire Blvd, Los Angeles, CA 90095. E-mail: mzeller@mednet.ucla.edu

M.A. ZELLER, P.H. LU, K. TINGUS, S. TAKAYANAGI & J. CUMMINGS. APOE GENOTYPE AND NEUROCOGNITIVE FUNCTION IN A SAMPLE OF PATIENTS DIAGNOSED WITH AMNESTIC MILD COGNITIVE IMPAIRMENT.

Objective: To investigate whether APOE genotype predict cognitive decline over time among a sample of patients diagnosed with Amnesic Mild Cognitive Impairment (a-MCI) and cognitively normal elderly controls (NC).

Participants and Methods: Sixty-four NC participants and 38 a-MCI patients (consensus diagnosis) were drawn from a longitudinal cohort of subjects followed through the UCLA Alzheimer Disease Research Center. Twenty-four of the NC participants were $\epsilon 4$ carriers and 40 were $\epsilon 4$ non-carriers. Among the a-MCI patients, 12 were $\epsilon 4$ carriers and 26 were $\epsilon 4$ non-carriers. All the subjects underwent annual neuropsychological assessment in the domains of information processing speed, language, visuoconstruction, memory, and executive functioning. For each test, a slope was computed to represent change in performance over time (the difference between baseline and most recent test score divided by the number of months elapsed).

Results: Independent t-tests revealed no significant differences in cognitive scores between $\epsilon 4$ carriers and non-carriers in the NC group. Significant group differences in Trails A performance were observed in the a-MCI group with $\epsilon 4$ carriers performing more slowly across time than non-carriers ($p = .026$). The finding remained significant after statistically controlling for age and education.

Conclusions: Declines in cognitive function between $\epsilon 4$ carriers and non-carriers were not expressed until patients were experiencing memory impairment. Although the most common finding among the literature is decline in learning and memory between carriers and non-carriers of the $\epsilon 4$ genotype, cognitive processing speed was the only identified difference between the APOE groups in this particular cohort.

Correspondence: *Michelle A. Zeller, Psy.D., Psychiatry, VA Greater Los Angeles Healthcare System, Wilshire Blvd, Los Angeles, CA 90095. E-mail: mzeller@mednet.ucla.edu*

Poster Session 7: Pediatric Acquired and Developmental Disorders

10:45 a.m.–12:15 p.m.

Child - Acquired Disorder: Other

S.R. BONGIOLATTI, E.B. FENNELL, L. MAHAN & P.R. CARNEY. Symptoms of Sleep Disturbance Among Children with Epilepsy: Comparison to a General Pediatric Clinic Sample.

Objective: Sleep disturbance can negatively impact seizure control and daytime functioning in children with epilepsy. Although sleep complaints have been reported clinically and in a small number of studies, little empirical research has examined the frequency of sleep disturbance among children with epilepsy. To determine the type and frequency of sleep complaints among children with epilepsy, we compared parent report of sleep disturbance symptoms in children with epilepsy relative to a general pediatric clinic sample.

Participants and Methods: The current sample consists of 95 children recruited from a community pediatric clinic and 46 children with epilepsy recruited from a university-affiliated pediatric neurology clinic (ages 7 to 14 years). Parents were administered the Pediatric Sleep Questionnaire during regularly scheduled clinic visits, as part of a larger study on sleep disturbance in pediatric epilepsy.

Results: Data were summarized using frequency counts and compared using χ^2 analyses. Variables related to sleep disordered breathing, para-

somnias, insomnia, bedtime resistance, and daytime sleepiness were included. Results indicated that symptoms of restless sleep, bedwetting, daytime sleepiness, and symptoms of sleep disordered breathing (including frequent snoring) and insomnia (including difficulty falling asleep) were significantly more frequent in children with epilepsy ($p < .05$).

Conclusions: Several symptoms of sleep disturbance, including sleep-breathing difficulties, restless sleep, and daytime sleepiness appear to be more common among children with epilepsy than among the general pediatric population. Given the potential impact of sleep disturbance on seizure control and neurocognitive functioning, these preliminary findings suggest that children with epilepsy should routinely be evaluated for symptoms of sleep disturbance.

Correspondence: *Susan R. Bongiolatti, M.S., Clinical and Health Psychology, University of Florida, P.O. Box 100165, Health Science Center, Gainesville, FL 32610-0165. E-mail: sbongiol@phhp.ufl.edu*

Z. HU & R.C. CHAN. Attributing social meaning to ambiguous visual stimuli and animation in Chinese children with high functioning autism.

Objective: The present study attempted to explore the social attribution ability in Chinese children with high-functioning autism/Asperger Syndrome in Guangzhou. In particular, it aimed to modify the Social Attribution Task (SAT) developed by Klin (2000) by adding more real-life scenarios in the animations.

Participants and Methods: A sample of 20 clinical cases with autistic disorder spectrum (all boys and 9 with high-functioning autism (HFA), 11 with Asperger Syndrome (AS)) was recruited from normal primary school in Guangzhou, China. Another control group was recruited for comparison. All of them received the social attribution tasks (the original and modified versions) and another set of neuropsychological tests.

Results: The ToM-Cognitive and ToM-Affective Index were more specific in pinpointing the deficits in children with HFA/AS. Compared to the original SAT, the modified one would give better discrimination between children with HFA/AS and healthy school-aged children. Moreover, social attribution partly related to executive function in children with HFA/AS. Children with autistic spectrum disorders demonstrated a wide range of deficits in social attribution task, particularly in ToM-Cognitive and ToM-Affective Indices as compared to healthy controls.

Conclusions: These findings confirm our prediction that, despite having the same level of verbal ability, children with autistic spectrum disorder demonstrate a deficit in social attribution ability.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan2003@yahoo.com.hk*

U. CLARK & C.L. TRASK. Impairments on Academic Fluency Measures in Child Survivors of Acute Lymphoblastic Leukemia (ALL) Following Intrathecal Methotrexate CNS Prophylaxis.

Objective: Increased attention has been directed to the neuropsychological deficits for child survivors of ALL who have been treated with CNS directed chemotherapies, especially Methotrexate. Studies of cognitive functions have primarily found deficits in attention, visual memory, and processing speed. In contrast, academic functioning in these children has received less comprehensive examination, often relying on a single task to assess an academic skill area. In an attempt to further investigate the relation between processing speed and academic performance in child survivors of ALL treated with CNS chemotherapies, we present the neurocognitive and academic profiles of 3 children diagnosed with ALL treated with chemotherapy alone.

Participants and Methods: Neuropsychological evaluations were conducted with 3 male survivors of ALL as part of the children's routine follow-up treatment protocols. The children had been treated with IV and in-

trathecal methotrexate, without CNS radiation. The children's ages at diagnosis ranged from 3 1/2 to 6 years, and ages at testing ranged from 8 to 14 years. Time since treatment ranged from 2 to 7 years, with no recurrence of disease. Neuropsychological assessment included the WISC-IV, WJ-III, WRAML2, D-KEFS, and Grooved pegs, as well parent behavior rating scales.

Results: Independent results are described for each child. Similar to previous literature, these children demonstrate more preserved verbal memory skills, with weaknesses in nonverbal memory and processing speed. In addition, associated deficits in academic fluency were noted. **Conclusions:** These case studies illustrate the need to assess both cognitive and academic functioning in children treated with intrathecal chemotherapies. In particular, they highlight the importance of batteries that include measures of academic fluency, which appear more sensitive to changes associated with treatment.

Correspondence: *Christine L. Trask, PhD, Neuropsychology, Rhode Island Hospital/Brown University, 593 Eddy Street, POB Suite 430, Providence, RI 02903. E-mail: ctrask@lifespan.org*

M. CONSTANTINOU. Two Case Studies from Cyprus: Neuropsychological Profile Before and After the Appearance of Fronto-Temporal Epileptic Seizures.

Objective: Two grade school students, a girl and a boy, received neuropsychological assessments for learning disability/ADHD before the commencement of epileptic activity. The two children were again referred for assessment about a year after they started experiencing epileptic seizures (both fronto-temporal). Follow up assessments were administered 1.5 years post, as well. Their pre-post neuropsychological profiles were then compared.

Participants and Methods: About a year after the commencement of their epileptic seizures, both children were administered the same battery of tests they were given pre-morbidly. After parental permission and child assents, they were assessed for a third time 1.5 years post-morbidly.

Results: The "progress" curves and single-case designs revealed significant decline in neuropsychological functioning in both children. The similarity in their decline curve is also marked by this study.

Conclusions: Consistently with past literature, it appears that epileptic seizures are a burden to the neuropsychological functioning of patients experiencing epileptic seizures. Several areas of decline were common in both children, but pre-morbid strengths appear to remain the compensatory mechanisms for those areas of decline in both children.

Correspondence: *MARIOS CONSTANTINOU, PH.D., PSYCHOLOGY, INTERCOLLEGE, 8, SOUNIOU KAIMAKLI, NICOSIA 1022, Cyprus. E-mail: CONSTANTINOU.M@INTERCOLLEGE.EDU*

N. DEKEL, A. TURK & S.K. PATEL. Cognitive Functioning in Pediatric Hematopoietic Stem Cell Transplant Patients.

Objective: Survivors of hematopoietic stem cell transplant (HSCT) are at risk for adverse cognitive sequelae as a result of transplant-related exposure to potentially neurotoxic agents. Two recent prospectively conducted, longitudinal studies failed to detect change in global measures, yet both noted trends in decline in more specific neurocognitive functions. We are prospectively tracking potential changes in such specific neurocognitive functions, along with the school adaptation trajectory. Presently, we are reporting notable findings relevant to the cognitive/academic status of such patients prior to HSCT.

Participants and Methods: The current sample consists of 46 HSCT candidates with refractory leukemia. Mean age at testing time was 9.9 yrs (2.3 – 17.3; SD: 3.8), mean age at diagnosis 8.2 yrs (1.08-15.4; SD: 3.9). Less than 10 % had received prior cranial radiation, but all had prior chemotherapy exposure. The neuropsychological battery was administered within the month prior to HSCT

Results: Although the age at leukemia diagnosis was not significantly associated with lowered IQ or academic performances; the time since diagnosis was for Reading, $r = -.38$, $p < .05$, Spelling, $r =$

$-.39$, $p < .05$, and Arithmetic, $r = -.46$, $p < .01$. Lower scores on the Coding subtest, representing psychomotor speed, but not on the Symbol Search subtest (reduced motor component), was also associated with greater time since the initial diagnosis, but not the age at diagnosis, $r = -.31$, $p < .05$.

Conclusions: Our findings suggest that HSCT candidates are at risk for academic changes even prior to transplantation. Fine motor speed may also be compromised, as previously reported in other studies. The association between academic achievement performance and longer time since diagnosis may partly reflect the impact of school absences secondary to illness, as HSCT candidates tend to have a relatively more severe disease and treatment course prior to transplant. Providing academic and tutoring support in the peri-HSCT period should be helpful.

Correspondence: *Sunita K. Patel, Ph.D., Pediatrics, City of Hope Medical Center, MOB4th floor, 1500 E.Duarte Rd, La Canada, CA 91010-3000. E-mail: supatel@coh.org*

E. FARACE, Z. MELIKYAN & L.J. KIM-CUNNINGHAM. Children With Brain Tumors Have Visual-Spatial and Visual Memory Deficits Which Are Underserved By Most Special Education Programs.

Objective: Neuropsychological deficits in children with brain tumors (BT) are under-reported and underserved by traditional special education (SE) curricula focused on verbal and executive functions. This analysis was to determine if BT kids in SE have additional neuropsychological deficits and if these deficits correlate with poor academic performance.

Participants and Methods: 21 BT children (15 male), age: 4-22 years (Mean=14;SD=5), 1-17 years post-diagnosis. 71% right-handed, 89.5% Caucasian, education: 1-14 (Mean=7;SD=4). Children ≤ 12 years were given NEPSY, older children Digit Symbol, Trails A&B, WCST, Stroop, COWA, RAVLT, BNT, RCFT, Grooved Pegboard, WRAT. Composite T-scores for domains of executive function, attention, language, sensorimotor, visual information processing, visual and verbal memory were calculated. 11 children were in SE and 10 in regular classes. Spearman's correlations and ANOVA were performed.

Results: All neurocognitive domains were mild to moderately impaired in BT children from SE classes compared to BT children from regular classes: visual memory ($F=15.36$, $p=0.001$), sensorimotor functions ($F=16.48$, $p=0.001$), visual information-processing ($F=8.28$, $p=0.01$), executive functions ($F=6.72$, $p=0.02$), spelling ($F=12.90$, $p=0.003$), math ($F=9.38$, $p=0.008$), reading ($F=7.70$, $p=0.02$). In BT children from SE classes, poor visual memory performance was significantly correlated with math performance ($r=0.70$, $p=0.05$).

Conclusions: BT children in SE were moderately impaired neuropsychologically. Significant disturbance of visual, sensorimotor, and visual memory systems, plus the expected deficits in verbal and executive functions were found, and these deficits were related to poor academic performance. Therefore, pediatric BT children may be underserved in a traditional SE curriculum.

Correspondence: *Elana Farace, Ph.D., Neurosurgery, Pennsylvania State University, 500 University Drive, HS: 86, Long Lane 204, Hershey, PA 17033. E-mail: efarace@psu.edu*

N. JAIN, K.R. KRULL, P. BROUWERS, J. HANNAY, P. CIRINO, Z. DREYER, S. BOTTOMLEY & F. OKCU. Attention and Information Processing in Children Treated with Chemotherapy for Acute Lymphoblastic Leukemia (ALL).

Objective: Attention and processing speed have been reported as characteristic deficits in long-term survivors of acute lymphoblastic leukemia (ALL), but no integrative model has been evaluated. The

purpose of this study was 1) to use Cohen's Model of Attention to evaluate patterns of attention and processing speed deficits in long-term survivors of ALL, and 2) to evaluate the effect of treatment intensity (high vs. standard-risk ALL) and gender on the factors of the model.

Participants and Methods: In this study 114 long-term survivors (52 girls/ 62 boys, 40 high-risk/ 74 standard-risk, mean age at diagnosis = 48.0 months, mean time since diagnosis = 87.7 months) completed tests representing the 4 factors of Cohen's Model; sensory selection (Trail Making Part A, Digit Span Forwards), response selection (Trail Making Part B, Gordon Diagnostic System Commission Errors), attentional capacity (Digit Span Backwards), and sustained attention (Gordon Diagnostic System Number Correct).

Results: As expected, high-risk patients demonstrated poorer sustained attention than standard risk patients, ($p < .01$). Boys performed better on measures of response selection ($p < .05$) and sustained attention ($p < .01$), while girls performed better on a measure of attentional capacity, ($p < .01$), irrespective of treatment intensity.

Conclusions: These results suggest that children with a high-risk ALL perform more poorly on select measures of attention compared to children with standard-risk ALL and provide support for continued study of Cohen's Model of attention within this population. This finding may be due to the effect of higher treatment intensity on brain white matter.

Correspondence: *Neelam Jain, Ph.D., Learning Support Center for Child Psychology, Texas Children's Hospital, 6621 Fannin St., CCC 1630.00, Houston, TX 77030. E-mail: neurojain@yahoo.com*

T. KING, R. MORRIS, Y. HSU, D. CHAI & N. KRAWIECKI. Longitudinal Models of Adaptive Behaviors in Children Treated for Brain Tumors.

Objective: Most research to date on children treated for brain tumors has focused primarily on cognitive outcomes. We are interested in building upon this literature by examining change in adaptive outcomes over time. In addition, we predict that similar demographic and treatment variables will predict adaptive performance.

Participants and Methods: One hundred and nineteen children treated for brain tumors participated in a longitudinal study. Parents of these children completed the Vineland Adaptive Behavior Scales (VABS) annually (mean = 4, range = 2-10 evaluations), typically beginning at the time of diagnosis. Fractional polynomial transformation models of adaptive behavior trajectories were employed to identify the demographic and treatment variables that best predict change in adaptive functioning. Communication, Daily Living and Socialization domains were examined separately.

Results: Our findings indicate that there is a significant interaction between greater length of time since diagnosis and radiation treatment on declining adaptive outcomes. This interaction was significant for Communication ($p = .03$) and Daily Living ($p = .00$) domains. Within the same predictive equations, higher SES was associated with better adaptive outcomes over time (Communication ($p = .01$), Socialization ($p = .03$)). Similarly, treatment with surgery was associated with better adaptive outcomes over time (Communication ($p = .03$), Socialization ($p = .02$)). Older females were associated with significantly better scores on Communication ($p = .01$), Socialization ($p = .01$), and Daily Living ($p = .02$) domains.

Conclusions: Taken together, the models of these adaptive behavior domains highlight the importance of considering socioeconomic status, age, gender, and the interaction of radiation treatment and time since diagnosis when identifying predictors of change in adaptive outcomes. These findings are consistent with predictors of cognitive change in children treated for brain tumors. The clinical implications for these findings will be discussed.

Correspondence: *Tricia King, Ph.D., Psychology, Georgia State University, P.O. Box 5010, Atlanta, GA 30302. E-mail: tzking@gsu.edu*

J. MILLER, K. KELLY & L.D. STANFORD. Taser Tots: Neuropsychological Outcome of an Adolescent Taser Victim.

Objective: The use of Taser stun guns as a "non-lethal" alternative for law enforcement has been at the center of an ongoing controversy for years due to questions regarding their safety. Hypoxic encephalopathy secondary to cardiac arrest following Taser administration (50,000 volts of electricity in each discharge) is thought to be a leading cause of death in these incidents. Although Taser International, the manufacturer of Taser stun guns, claims that its weapon is safe to use even on young children, to our knowledge, no data such as ours exists elsewhere on the developmental, cognitive, and/or behavioral effects of Taser use on children or adolescents.

Participants and Methods: The current study presents the case of a 15 year old right handed African American male who was subdued via Taser administered by police after they were called to his group home due to his combative behavior. The patient went into cardiac arrest following the electrical shock, was subsequently resuscitated and intubated for ventricular fibrillation, hospitalized in an intensive care unit, and placed on medication for sedation and paralysis.

Results: Subsequent neuropsychological assessment indicated an overall pattern of performance that was consistent with the pattern of deficits observed in children who have experienced an anoxic event secondary to cardiac arrest. Specifically, the patient displayed suppressed performance (relative to his premorbid performance on similar measures) on measures of intellectual functioning, academic achievement, and higher order executive skills.

Conclusions: The current case illustration argues for the need for immediate investigation into the impact of Taser use on children and adolescents, as they appear to be particularly vulnerable populations.

Correspondence: *Julie Miller, Psy.D., Child Psych Services, LLC, 8587 Mason Montgomery Rd, Mason, OH 45040. E-mail: drjmillier@gmail.com*

M.A. MUMAW, L. ANGELA, T. KING, R. MORRIS & N. KRAWIECKI. Intact Serial Position Effects in Children Treated for Brain Tumors.

Objective: Recent research examining the cognitive effects of brain tumors and their treatment in children has shown different patterns of difficulty in memory or attention dependent upon the location of the brain tumor. Understanding serial position effects (SPE) in this population could help to further clarify the nature of these impairments. It was hypothesized that children with cerebellar tumors would exhibit intact SPE while the children with third ventricle tumors would show diminished primacy effects during the learning trials.

Participants and Methods: Performance on the Rey Auditory Verbal Learning Test examined in 42 children (ages 5-17 years) with cerebellar or third ventricle tumors. The 15 word list was divided into groups of 5 for primary, middle, and recency regions. Ability to recall words in these different regions was compared between groups and across trials.

Results: A $2 \times 3 \times 5$ (tumor group x serial position x trial) ANOVA revealed that children from both groups had intact SPE and did not differ significantly in the number of words remembered per trial or position. A 2×3 (tumor group x serial position) ANOVA examining the delayed recall trial indicated that the recency effects remained but the primacy effects disappeared ($p < .01$), similar to literature with non-clinical groups. There were no significant differences between tumor groups.

Conclusions: These findings illustrate intact SPE during learning and recall of word lists in children treated for cerebellar or third ventricle region tumors. Clinical implications of these findings will be discussed.

Correspondence: *Matthew A. Mumaw, M.A., Psychology, Georgia State University, 8101 Chastain Dr NE, Atlanta, GA 30342. E-mail: mmumaw1@student.gsu.edu*

N. ULLRICH, C. REY-CASSERLY & L. GOUMNEROVA. Neuropsychological Outcome After Endoscopic Third Ventriculostomy in Children With Primary Brain Tumors and Aqueductal Stenosis.

Objective: Endoscopic third ventriculostomy (ETV) is an effective technique for the treatment of obstructive hydrocephalus. The purpose of this study was to determine the neuropsychological sequelae of ETV in children with primary brain tumors or aqueductal stenosis and to evaluate potential predictive factors for adverse neuropsychological outcome. **Participants and Methods:** We retrospectively reviewed all cases of children who underwent ETV for hydrocephalus at our institution and who had undergone neuropsychological testing. We evaluated the contribution of different preoperative factors to neuropsychological outcome. **Results:** Neuropsychological outcomes for our 25 patients varied widely in the group; overall IQ ranged from 62 to 129 (mean 95). Assessment of verbal learning was available for 22 subjects and scores were lower than average. Significant verbal learning problems were seen in a substantial number of patients: 55% scored at or below 1.5 SD's on tests of delayed recall of verbal information. Neuropsychological problems were predicted by a combination of pre- and post-operative factors including ventricular size, symptom duration, age, and radiation treatment, with predictive value 50-85% for a 1-SD decrement in most measures. **Conclusions:** Neuropsychological outcome ranged widely from significantly impaired to well above average. Overall, verbal memory problems appear more prevalent. Patients with the most severe hydrocephalus had more difficulties with immediate memory and decreased memory storage. We identified a group of pre- and post-operative factors that together predicted neuropsychological outcome. This strategy was used to develop a severity score to identify patients at increased risk for poor outcome and who would benefit from closer follow-up and intervention. These results suggest that ETV is relatively safe in terms of long-term cognitive sequelae but that a subset of patients may be at more risk for neuropsychological deficits.

Correspondence: *Celiane Rey-Casserty, Ph.D., Neuropsychology Program, Children's Hospital, 300 Longwood Avenue, Fegan 5, Boston, MA 02115. E-mail: celiane.rey-casserty@childrens.harvard.edu*

S. SCHNOEBELEN, P. STAVINOHA, R. PEREZ, K. HAGAR, S. TAYLOR, C. FRENCH & D. WOOLSTON. The Effect of Processing Speed on Proactive Inhibition in the Learning and Memory of Children Treated for Primary Brain Tumor.

Objective: Research suggests that children treated for pediatric brain tumor demonstrate a variety of neurocognitive deficits, including slowed processing speed. The current study sought to determine whether a slower rate of processing information was related to increased proactive interference on a test of memory and learning.

Participants and Methods: Retrospective data was obtained from chart review of patients referred for a clinical outpatient neuropsychological evaluation subsequent to completion of treatment for brain tumor at Children's Medical Center-Dallas. Patients who had completed the Wechsler Intelligence Scale for Children-Fourth Edition and the California Verbal Learning Test-Children's Edition were included (n=18). A measure of proactive interference (CVLT-C: List B free recall vs. List A Trial 1) was regressed on the Processing Speed Index of the WISC-IV and, to statistically control for the effects of verbal intelligence, the Verbal Comprehension Index of the WISC-IV. A similar regression analysis was completed with a measure of retroactive interference (short-delay free recall vs. List A Trial 5) as the dependent variable.

Results: With the effects of verbal intelligence controlled, slower processing speed was found to be statistically associated with a greater degree of proactive interference ($\beta=.628, p=.006$), but not retroactive interference ($\beta = -.307, p=.231$).

Conclusions: The effect of processing speed on proactive interference may be related to difficulties translating information from short-term

memory to long-term storage secondary to slowed processing speed. Such an effect may have important implications for the manner in which instruction and study time is structured. The confounding effects of various modalities of treatment for brain tumor, e.g. surgery, chemotherapy, and radiation, also must be considered.

Correspondence: *Sarah Schnoebelen, Children's Medical Center, 1935 Motor Street, Neuropsychology Department C03-305, Dallas, TX 75235. E-mail: sarah.schnoebelen@childrens.com*

Child - Acquired Disorder: TBI

L.K. AYR, K.O. YEATES, H. TAYLOR, M. BROWNE, B. BANGERT, A. DIETRICH, K. NUSS, J. RUSIN & M. WRIGHT. Dimensions of Post-Concussive Symptoms 3 Months Post-Injury in Children with Mild Head Injuries.

Objective: We sought to identify dimensions of post-concussive symptoms (PCS) associated with pediatric mild head injuries (MHI) and to compare the dimensions across informants (parent vs. child) and over time (baseline vs. 3 months post-injury).

Participants and Methods: Participants include 186 children with MHI and 99 children with orthopedic injuries (OI), from 8-15 years of age, who were recruited as part of a prospective, longitudinal study. Parents and children complete a 50-item rating scale within 2 weeks of injury and 3 months post-injury, rating the frequency of PCS on a 4-point scale. Common factor analysis with target rotation was used to rotate the ratings to four dimensions, representing cognitive, somatic, behavioral, and emotional symptoms.

Results: The factor analysis of baseline symptoms suggested moderate fit for both parent-reported and child-reported symptoms (RMSEA = 0.08 and 0.06). Using a refined target matrix from the baseline analyses, factor analyses of parents' symptom ratings 3 months post-injury suggested a moderate fit. Cognitive, somatic, and emotional factors were consistent with baseline analyses, but the behavioral factor did not yield any significant loadings. Analyses of child-reported symptoms at 3 months yielded results consistent with baseline ratings. Cognitive and somatic factors had strong factor loadings, the emotional factor had moderate factor loadings, and the behavioral factor had low loadings.

Conclusions: Parent and child ratings of PCS demonstrate two dimensions, cognitive and somatic, which are consistent across raters and time post injury. Moderate evidence exists for an emotional dimension as well, whereas a behavioral dimension has little support.

Correspondence: *Lauren K. Ayr, M.A., Ohio State University, 350 E. Willow Grove Ave. Apt 304, Philadelphia, PA 19118. E-mail: ayr.1@osu.edu*

L. BOEGEHOLD, S.C. HEATON & C. BLOSS. The Relationship between Attention and Memory Skills after Pediatric Traumatic Brain Injury.

Objective: Attention and memory are commonly impaired after childhood traumatic brain injury (TBI). A primary goal of the current study was to examine the degree to which attentional skills predict memory functioning following pediatric TBI. A secondary goal was to determine whether the relationship between these domains varies depending on the severity of injury.

Participants and Methods: A total of 29 children ages 6-16 were administered the Test of Everyday Attention for Children (TEA-Ch) and the Children's Memory Scale (CMS) after sustaining mild (n=10) or moderate/severe (n=19) TBI. Composite scores were calculated from the TEA-Ch subtests for three attentional domains: Sustained, Selective, and Control/Switching. Composite index scores yielded by the CMS included: Learning, General Memory, and Delayed Recognition.

Results: Results of multiple regression analysis revealed that for the entire TBI group, Sustained attention performance was a significant predictor of

General Memory ($p < .05$). Within the mild TBI subgroup, follow-up correlation matrices of attention and memory composite scores revealed significant correlations between Sustained attention and Delayed Recognition ($p < .05$), as well as between attentional Control/Switching and Learning ($p < .05$). In contrast, no significant correlations were observed between the TEA-Ch composite scores and the CMS indices for the severe TBI group. **Conclusions:** Our results suggest that performance in specific sub-domains of attention may predict specific aspects of memory functioning in mild TBI, supporting the use of multidimensional assessment measures. Although this finding was not replicated in our moderate/severe TBI sample, potential explanations and future research directions will be discussed. Correspondence: *Lindsey Boegehold, BS, Clinical & Health Psychology, University of Florida, University of Florida, Box 100165, Gainesville, FL 32610-0165. E-mail: lboegehold@php.ufl.edu*

L. EWING-COBBS, M. PRASAD, L.R. AINSWORTH, D. MENDEZ & P. SWANK. Naturalistic Action in Young Children with Traumatic Brain Injury.

Objective: The purpose of this study was to examine planning and sequencing in a naturalistic action task in young children who sustained traumatic brain injury (TBI) prior to six years of age.

Participants and Methods: The Snack Task was administered to 31 children ages 4-7 years who sustained moderate to severe TBI and to 30 demographically similar community comparison children. Children observed a sequence of 8 action steps involved in creating a snack from attractive ingredients. They were videotaped while watching the examiner and while independently recreating the action sequence. Videotapes were coded to examine the frequency of occurrence of specific indices of action, affect, and task orientation during the observation and performance sections of the task.

Results: Children with TBI omitted more steps than the comparison group ($p=0.003$). The comparison children were significantly more likely to indicate understanding of the steps using either words or gestures ($p=0.019$). Groups were similar on measures of eye contact, affect, focused attention, and impulsivity. Scores on the Snack Task were significantly related to parent ratings of behavior and executive function.

Conclusions: Naturalistic action impairment in has been related to executive dysfunction. Consistent with this observation, children with TBI exhibited difficulty on an ecologically valid, everyday task that required using multiple objects and correctly sequencing steps to achieve a goal. Even when appropriately focused on a task, children with TBI were vulnerable to disruption of action sequences. Future studies should examine neuroimaging and neuropsychological correlates of difficulty planning and executing action sequences in children with brain injury. Supported by NIH R01-NS029462.

Correspondence: *Linda Ewing-Cobbs, PhD, Pediatrics, University of Texas Health Science Center, 7000 Fannin, Suite 2401, Houston, TX 77030. E-mail: linda.ewing-cobbs@uth.tmc.edu*

T.B. FAY, K.O. YEATES & G.H. TAYLOR. Predicting Longitudinal Patterns of Clinically Significant Deficits in Children with Traumatic Brain Injury.

Objective: To examine longitudinal patterns of clinically significant deficits in neuropsychological, behavioral, adaptive and academic functioning in children with traumatic brain injury (TBI), as compared to children with orthopedic injury (OI).

Participants and Methods: Participants included 39 children with moderate TBI, 36 children with severe TBI, and 42 children with OI, aged 6-12 years at time of injury. Their neuropsychological, behavioral, adaptive, and academic functioning was assessed at 6 months, 12 months, and 4 years post injury. Clinically significant deficits (<10th percentile for age) were identified within each domain at each occasion. Almost all children could be classified into four longitudinal patterns of outcomes within domains: no deficits; consistent deficits; improvement (initial deficit followed by no

deficit), and deterioration (no initial deficit followed by later deficit). Demographic variables, premorbid functioning, and injury severity were examined as predictors of patterns of clinically significant deficits in each domain using multinomial logistic regression analysis.

Results: Severe TBI predicted consistent neuropsychological, behavioral, adaptive, and academic deficits. Among children with TBI, longer duration of unconsciousness predicted consistent neuropsychological and adaptive deficits and also predicted improvement in neuropsychological and academic functioning. Lower Glasgow coma scale scores predicted consistent adaptive deficits, as well as deterioration in behavioral adjustment and improvement in adaptive functioning.

Conclusions: Severe TBI yields an increased likelihood of consistent, clinically-significant deficits in children's functioning. Severe TBI also predicts improvement in neuropsychological, academic and adaptive functioning, likely signaling gradual recovery for some children, but deterioration in behavioral adjustment, reflecting the delayed onset of significant behavior problems for some children.

Correspondence: *Taryn B. Fay, M.S., Ohio State University, 314 Buttricks Avenue, Columbus, OH 43215. E-mail: fay.39@osu.edu*

G.A. GIOIA, M. COLLINS, P. ISQUITH & J. OSGOOD. Validation of the Acute Concussion Evaluation (ACE) for Identifying Pediatric Mild TBI.

Objective: Although early diagnosis of mild TBI/ concussion in children is essential for appropriate management and recovery, primary care physicians lack standardized clinical tools. We describe validation of the ACE for early detection of mild TBI.

Participants and Methods: 178 parents of referred patients aged 4-18 years (112 males) completed the ACE, a 22-item dichotomous (presence/absence) signs and symptoms inventory, via phone. At subsequent clinic appointments, parents and patients rated symptom severity for the previous day (post-concussion) and for the day before the injury (retrospective baseline) on the 22-Likert scale based Post-Concussion Symptom Inventory (Lovell et al., 2004). Median times between injury and ACE assessment, and between ACE and clinic appointment, were both 7 days.

Results: ACE ratings significantly predicted parent post-concussion ratings ($r = .63, p < .001$) and patient post-concussion ratings ($r = .42, p = .001$), while correlating less with parent and patient retrospective baseline ratings. Parent and patient post-concussion symptom reports were moderately correlated ($r = 0.56, p < .001$). ACE ratings were also related to demographic and injury variables.

Conclusions: The phone-based ACE predicted both parent and patient post-concussion symptom reports but was less related to pre-concussion baseline ratings, providing evidence of validity for detecting mild TBI. Further, the symptom score from the dichotomous ACE correlated with the score obtained on the graded clinical inventory. The ACE may help clinicians efficiently identify and monitor mild TBI symptoms and inform management. Further examination of the ACE's sensitivity and specificity in detecting post-concussion symptomatology is underway.

Correspondence: *Gerard A. Gioia, Ph.D., Pediatric Neuropsychology, Children's National Medical Center, 14801 Physician's Lane, Suite 173, Rockville, DC 20850. E-mail: ggioia@cnmc.org*

M.W. KIRKWOOD. Identifying Suboptimal Effort in a Pediatric Mild Head Injury Population using Green's Medical Symptom Validity Test.

Objective: Scant attention has been paid to how effort affects neuropsychological test performance after pediatric mild head injury (MHI), despite its demonstrated importance in adult MHI populations and research indicating that children are clearly capable of engaging in suboptimal effort. This study examined performance on Green's Medical Symptom Validity Test (MSVT) in a group of school-aged children with MHI.

Participants and Methods: Participants were selected from a series of consecutive cases referred to an outpatient pediatric concussion program. Forty participants (25 male, 15 female) aged 8 to 17 years were administered the MSVT as part of an abbreviated neuropsychological battery.

Results: Using recommended MSVT cutoffs, 36 out of 40 participants met criteria for good effort. Of the four who did not, three showed additional evidence of suboptimal effort. One participant passed the MSVT but failed another symptom validity test. The sample as a whole performed at adult levels on the MSVT's three primary effort indices.

Conclusions: The results suggest that the MSVT is a potentially useful tool for evaluating effort in older children and adolescents. Like any symptom validity test, the MSVT should not be used in isolation, as false positives and false negatives may occur. In total, 10% of the MHI sample was identified as putting forth insufficient effort. This finding reinforces the idea that children and adolescents can perform suboptimally on neuropsychological testing and that a notable minority likely does under certain circumstances. As such, pediatric neuropsychologists should consider making objective effort testing a routine part of their evaluation procedures.

Correspondence: *Michael W. Kirkwood, PhD, Rehabilitation, The Children's Hospital, 1056 E. 19th Ave, Denver, CO 80218. E-mail: kirkwood.michael@tchden.org*

L. KRIVITZKY & G. VEZINA. Recovery from Alexia without Agraphia in an Adolescent with TBI.

Objective: Alexia without Agraphia refers to a neuropsychological syndrome in which the individual has difficulty with reading, but displays intact writing abilities. From a functional perspective, the person is unable to read because the lesion (classically in the left occipital lobe with extension into the corpus callosum) disrupts the pathway from visual input to language comprehension. Few published case studies have examined this phenomenon and to our knowledge, none have examined it in a pediatric subject. The purpose of this case study was to explore neuropsychological recovery in an adolescent female presenting with Alexia without Agraphia.

Participants and Methods: The subject was a right handed, 14 year-old female who sustained a severe TBI. MRI showed frontal and insular contusions bilaterally and left temporal-occipital contusions. Methods for this case study included neuropsychological evaluation (Time 1: 1 month post-injury, Time 2: 4 months post-injury) and review of neuroradiological studies.

Results: Reading decoding, fluency and rapid naming were all severely impaired at T1 (<1st percentile), with improvements noted in these areas at T2 (2nd to 16th percentile). In contrast, phonological awareness, writing, and spelling were intact at both time points. At T1, she engaged in a "letter by letter" approach to reading single words, which she replaced with a whole word, more fluent approach, at T2. All other areas of neuropsychological functioning were relatively intact at T2, with the exception of expected weaknesses in executive functioning.

Conclusions: This case study demonstrated considerable recovery of neuropsychological functioning in an adolescent with Alexia without Agraphia. It also supports the notion that this syndrome stems from a disruption in the connection between visual input (needed for reading) and language comprehension.

Correspondence: *Lauren Krivitzky, PhD, Neuropsychology Program, Children's National Medical Center, 2548 Ayr Court, Crofton, MD 21114. E-mail: cheeriodog@aol.com*

R. NAKASE-RICHARDSON, A.D. SWEARINGEN, C.C. EVANS, M. SHERER & S.A. YABLON. Symptom Differences Between Confused and Non-Confused Adolescents at One Month Post Traumatic Brain Injury.

Objective: Acute confusion is common among TBI survivors. Individuals experiencing acute confusion manifest a variety of neurobehavioral

and cognitive abnormalities. Studies have examined confusion in pediatric populations recovering from anesthesia and mixed medical diagnoses. Criticism exists that current adult diagnostic criteria for delirium/confusion may not be applicable to pediatric populations. The purpose of this study was to prospectively examine symptom presentation among acutely confused and non-confused adolescents in an exclusively TBI sample.

Participants and Methods: Prospective study involving 50 participants age 18 and under who met study criteria for the TBI Model System from June 1999 through February 2006. The Delirium Rating Scale-Revised-98 (DeIRS-R98) was used to measure neurobehavioral symptoms during inpatient rehabilitation and individuals were evaluated using DSM-IV Delirium Diagnostic Criteria. Evaluations closest to one-month post-injury were utilized.

Results: Results indicate 50% of the sample met DSM-IV criteria for confusion. Both groups were compared on individual items of the DeIRS-R98 using analysis of variance with Bonferroni correction. Adolescents who were confused demonstrated greater cognitive impairment (attention, memory, language; thought processes, orientation), emotional lability, and symptom fluctuation than the non-confused group. Both groups were rated as having equally high levels of sleep-wake cycle disturbance and low incidence of psychotic symptoms. Finally, visuospatial ability, motor agitation, and motor retardation differences between groups were not significant using Bonferroni correction.

Conclusions: Acute confusion is commonly observed in adolescents following TBI. Adolescents manifest symptoms of confusion similar to adult studies; however, psychomotor behavior, visual-spatial abilities, psychotic symptoms, and sleep-wake disturbance may not be sensitive to acute confusion among adolescents post-TBI.

Correspondence: *Risa Nakase-Richardson, Ph.D., Neuropsychology, Methodist Rehabilitation Center, 1350 East Woodrow Wilson Drive, Jackson, MS 39216. E-mail: nakase@aol.com*

M.R. PRASAD, J. JOY, J. ALLOWAY & L. EWING-COBBS. Caregiver and Child Interactions in Infants and Toddlers with Traumatic Brain Injury.

Objective: The purpose of this study is to examine caregiver-child interactions in children under the age of 36 months with moderate to severe traumatic brain injury (TBI).

Participants and Methods: Infants and toddlers with moderate to severe TBI (n=33) and normal comparison children (n=30) were videotaped playing with their caregivers. The videotapes of the caregiver-child interactions were coded for both caregiver behavior and child behavior. Caregivers were rated on the following behaviors: cognitive stimulation, detachment, flatness, intrusiveness, and sensitivity. Children were rated for the following: attention, interest, mood, and engagement.

Results: Caregivers of children with TBI were found to engage in less stimulating behaviors ($p=.01$). Children with TBI were found to be less attentive ($p=.0006$) to their caregivers and less interested ($p=.0034$) in the activities. The groups did not significantly differ on the remaining variables.

Conclusions: The quality of mother-child interactions has been found to be related to cognitive outcome in normally developing children and children with neurodevelopmental disabilities. These findings indicate that caregivers of children with moderate to severe brain injury engage in less cognitive stimulation such as labeling, demonstration, and problem-solving than caregivers of healthy children. Children with TBI tend to be less attentive and interested in interacting with their caregivers and these behaviors may make it more challenging for adults to engage them in stimulating activities. These findings suggest that caregivers may need more guidance in how to engage young children with TBI in cognitively stimulating activities.

Correspondence: *Mary R. Prasad, Ph.D., Pediatrics, University of Texas Medical School-Houston, 7000 Fannin, Suite 2401, Houston, TX 77025. E-mail: mary.r.prasad@uth.tmc.edu*

C. RONCADIN, B. BALA, S. BLASER, H.S. LEVIN & M. DENNIS. Stroop Performance After Childhood Closed Head Injury.

Objective: The Stroop task involves suppressing a highly automatic response (i.e., word reading) in favor of a more controlled one (i.e., color naming) and serves as a valuable tool for assessing inhibitory control. We examined Stroop performance in children who sustained a closed head injury (CHI) at least 2 years prior to the testing.

Participants and Methods: Thirty-one children with CHI and frontal lobe damage, 23 with mild CHI, and 32 control children were administered the classic Stroop task after all had demonstrated fluent decoding ability on a test of reading achievement.

Results: Color naming speed, which was tested separately from Stroop performance, was significantly faster in the control group compared to both CHI groups. Therefore, we derived latency measures by subtracting mean color naming speed from RT on congruent, incongruent, and ignored repeated trials (i.e., for which the controlled action was the suppressed action on the previous trial), and submitted the data to a repeated-measures MANOVA. All groups demonstrated a Stroop effect (i.e., slower performance when suppression of word reading was required) and a negative priming effect (i.e., slower performance when the previous trial's suppressed response was required). The control group outperformed both CHI groups on all trial types; the CHI groups did not differ from each other.

Conclusions: Contrary to our hypothesis that the group with documented frontal lobe injury would demonstrate greater Stroop and negative priming effects compared to both the mild CHI and control groups, the findings reveal nonselective long term deficits in activation and inhibitory functions after childhood CHI of varying severity.

Correspondence: *Caroline Roncadin, Psychology, Peel Children's Centre, 55A Aventura Court, Mississauga, ON L5T 2Y6, Canada. E-mail: croncadin@peelcc.org*

M. SHAPIRO, G. GIOIA, D. GOLDBERG & O. MILGROM. Recovery Trajectories After Pediatric Mild TBI.

Objective: The objective of this paper is to demonstrate the nature and trajectory of the recovery process of children who have experienced a Mild Traumatic Brain Injury (mTBI) and to examine the concordance of parent and child symptom reports.

Participants and Methods: 221 children (mean age 13.42 years) referred to a hospital-based concussion evaluation clinic over a 2-year period met criteria for concussive injury. Children and their parents completed a 26-item inventory of cognitive, behavioral, and affective symptoms pre- and post-injury over 3 visits post-concussion. Median days post-concussion injury was 14.2 days before the initial visit. Children returned for follow-up evaluations until symptoms abated.

Results: Growth curve models of total number of post-concussive symptoms demonstrated a sharp decrement in total symptom reports. Both the mean intercept and slope for parents and children were highly concordant. Although LOC and retrograde amnesia did not account for significant variance in post-injury recovery trajectories, anterograde amnesia and immediate post-injury complaints of headache, fatigue, and feeling "different" were significant predictors.

Conclusions: Following a concussion or mild TBI in children and adolescents, the objective assessment of symptoms is critical but challenging. Identification of specific predictive factors for recovery are essential for appropriate clinical management and intervention planning.

Correspondence: *Marla Shapiro, PhD, CNMC, 14801 Physician's Lane, Rockville, MD 20850. E-mail: mashapir@cnmc.org*

M. SWARTWOUT, H. TAYLOR, N. WALZ, K.O. YEATES, S. WADE & N.M. MINICH. Acute Neuropsychological Outcomes Following Pediatric Traumatic Brain Injury.

Objective: This study assessed the effects of traumatic brain injury (TBI) of varying degrees of severity on the neuropsychological skills and academic achievement of young children.

Participants and Methods: Eighty five children with TBI (16 severe, 22 moderate, 34 complicated mild, 13 mild) were compared to 119 children with orthopedic injury (OI). All children were between 3 and 6 years of age at injury, with testing conducted approximately one month post injury. Outcomes assessed were general ability, language, memory, executive function, and academic achievement. Analysis of covariance was used to examine group differences between each TBI subgroup and OI controls, with age at injury and a composite measure of socioeconomic status (SES) included as covariates.

Results: The severe TBI group had lower scores than the OI controls on measures of general ability, executive function, and academic achievement, and the moderate TBI group performed less well on measures of general ability, language, and memory (all $p < .05$). Marginally significant weaknesses were also observed in the complicated mild TBI group on measures of language, memory, and academic achievement, and in the mild TBI group on a measure of executive function.

Conclusions: The findings demonstrate global sequelae of more significant TBI in young children, as well as the promise of tests of executive function as measures of more subtle impairments. The consequences of TBI in this age range imply a need for acute post-injury assessments for early and extensive rehabilitation programs.

Correspondence: *Maegan Swartwout, B.S., Psychology, University of Houston, 4800 Calhoun Road, Heyne Building 126, Houston, TX 77204-5022. E-mail: maegan619@gmail.com*

S. WADE, W. YUAN, N.C. WALZ, S. HOLLAND, P. KARUNANAYAKA & L. MICHAUD. White Matter Damage following Pediatric Brain Injury as Assessed using DTI.

Objective: Traumatic brain injury is a leading cause of acquired disability in children resulting in cognitive, behavioral, and motor impairments. Diffusion tensor magnetic resonance imaging (DTI) characterizes the directionality of water diffusion in white matter tracts providing evidence regarding the integrity of the underlying tissue structure. We examined the sensitivity of DTI in measuring changes following TBI in young children relative to a comparison group of children hospitalized for orthopedic injuries. We also examined the relationship between Glasgow Coma Scale (GCS) scores and fractional anisotropy (FA) within the TBI group.

Participants and Methods: Eight children with moderate to severe TBI (ages 6-9) and 12 children with orthopedic injuries (ages 6-9) successfully completed MRI/DTI scanning at least 12 months post injury. Differences between the TBI and the orthopedic injury comparison groups were tested on a voxel-by-voxel basis using a two-tailed Mann Whitney U-test, controlling for the child's verbal IQ and gender and correcting for chance associations.

Results: The TBI group had significantly lower FA values than the orthopedic injury group in a number of white matter tracts including: the anterior commissure, genu of the corpus callosum, internal capsule, external capsule, longitudinal superior fasciculus, occipital-frontal fasciculus, centrum semiovale, and optic radiation. Additionally, GCS scores correlated significantly with FA values within the TBI group.

Conclusions: These findings suggest that DTI may provide a sensitive and non-invasive tool for quantifying injury severity and white matter integrity in young children with TBI.

Correspondence: *Shari Wade, Ph.D., Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave., MLC 4009, Cincinnati, OH 45229-3039. E-mail: shari.wade@cchmc.org*

S.E. WOODROME, K.O. YEATES & H.G. TAYLOR. Coping Strategies as a Predictor of Post-concussive Symptoms in Children with Mild Closed-Head Injury.

Objective: To determine whether children's coping strategies predict post-concussive symptoms (PCS) following either mild closed-head injury (CHI) or orthopedic injury (OI).

Participants and Methods: Participants were 285 children who sustained mild CHI or OI between 8 and 16 years of age and their parents. PCS were assessed through interviews and rating scales, which were completed by parents and children shortly after injury (baseline) and at 3-months post-injury. Parents also reported on pre-injury symptoms. Children rated their preferred strategies for coping with their injuries at baseline.

Results: Repeated-measures analyses of variance examined the relationship between coping strategies at baseline and PCS, after controlling for age, race, socioeconomic status, and group membership. Analyses of parent-reported PCS also controlled for pre-injury symptoms. Interaction terms were tested to determine whether coping moderated the effects of mild CHI on PCS. Coping strategies did not predict parent reports of PCS. Coping strategies that emphasized problem- and emotion-focused disengagement and emotion-focused engagement were positively related to children's ratings of cognitive and somatic symptoms, but the relationships decreased over time. Coping strategies moderated the effects of mild CHI, such that group differences in PCS persisted among children with higher levels of problem- and emotion-focused disengagement, but resolved among those with lower levels.

Conclusions: Coping strategies that are emotion-focused and emphasize disengagement predicted higher ratings of PCS by children but not parents, among both groups. Disengagement moderated the effects of mild CHI on children's reports of PCS, suggesting that children's coping strategies are associated with the outcomes of mild CHI.

Correspondence: *Stacey Woodrome, Columbus Children's Hospital, 4th Floor, Timken Hall, 700 Children's Drive, Columbus, OH 43205. E-mail: woodroms@chi.osu.edu*

Child - Developmental Disorders

G. ARAUJO. Response Monitoring in Children with Phenylketonuria.

Objective: Children with phenylketonuria (PKU) exhibit subtle impairments in executive abilities. We examined a specific aspect of executive ability, response monitoring, using analysis of errors made during a go-no-go task and responses occurring on trials following these errors.

Participants and Methods: Data from 110 children (43 children with PKU, 67 control children) ranging from 7 to 18 years of age were analyzed using ANCOVA. In the go-condition, children were to press a key as quickly as possible following presentation of three specified shapes. In the no-go-condition, children were to inhibit key presses in response to a fourth specified shape.

Results: Children with PKU made more errors than controls in number of go-condition omission errors (PKU = .66, Control = .17, $p < .01$) and in number of no-go-condition commission errors (PKU = 5.0, Control = 3.6, $p < .05$). In addition, on trials subsequent to commission errors children with PKU were slower than controls in responding to go-trials (PKU = 779 ms, Control = 689 ms, $p < .05$). In contrast, no significant between-group difference was identified for go-condition RTs in general.

Conclusions: In addition to supporting previous findings of impairment in inhibitory control in children with PKU, findings from our study indicate that the ongoing performance of children with PKU is more adversely affected by the commission of errors than is the case for control children. In other words, recovery following errors is poorer in children with PKU.

Correspondence: *Gabriel Araujo, Psychology, Washington University, 1 Brookings Dr., Campus Box 1125, St. Louis, MO 63130. E-mail: gearaujo@artsci.wustl.edu*

H.C. BOORSTEIN, M.S. HELT, E. ESSER, L. WILSON, J. PANDEY, A. VERBALIS, S. SUTERA, M. ROSENTHAL, S. HODGSON, M.L. BARTON, T. DUMONT-MATHIEU & D. FEIN. Regressive Autism: A Distinct Phenotype?

Objective: According to the literature, regression occurs in 20-49% of children with autism spectrum disorders (ASD) (Bernabei, Cerquiglini, Cortesi, & D'Ardia, 2006). Research has been equivocal as to whether children who regressed differ developmentally and phenotypically from children who did not. This study examined the rates and types of regression reported in a sample of young children with ASD. In addition, differences between those children with ASD who regressed and those who did not were investigated.

Participants and Methods: The participants were 83 children who were diagnosed with ASD at approximately two years of age. At time of diagnosis, they received standardized assessments of cognition, adaptive functioning, and autistic symptoms.

Results: In this sample, 39.8% of the children regressed in one or more areas: 31.7% lost language after developing communicative speech, 20.3% became less socially responsive, 8.8% lost play skills, 3.8% regressed in adaptive skills, and 2.5% lost motor skills. The mean age of loss was 16 months (SD=4.2). Children who regressed had more DSM-IV-TR symptoms of autism than those who had not; specifically, they exhibited more repetitive and stereotyped behaviors and less pretend play. In addition, children who experienced a regression scored lower on measures of overall cognitive functioning and communication, both at initial diagnosis and at two-year follow-up.

Conclusions: Although regression in language skills was the most frequent, children lost skills in various domains. Those who regressed were more impaired in multiple areas than children who had not regressed. This suggests that autistic regression produces a different phenotypic profile than non-regressive autism.

Correspondence: *Hilary C. Boorstein, B.A., Psychology, University of Connecticut, 406 Babbidge Road, Unit 1020, Storrs, CT 06469. E-mail: h_boorstein@yahoo.com*

T.E. BAKER, K.C. BROCKI, K.A. KERNS, C.B. HOLROYD & S. SEGALOWITZ. Performance Monitoring In Children with Behavioral Dysregulation: An Electrophysiological Study.

Objective: Performance monitoring refers to online cognitive processing of behavioral performance through either internal or external feedback. Such processes are thought to play an important role in behavioral self-regulation. In this study, performance monitoring was hypothesized to be atypical in clinical child populations characterized by significant self-regulatory impairments. Electrophysiological measures were used to investigate performance monitoring in children with Attention Deficit Hyperactivity Disorder (ADHD), Fetal Alcohol Spectrum Disorders (FASD) and typically developing children.

Participants and Methods: We examined the error-related negativity (ERN), a component of the event-related brain potential (ERP) associated with performance monitoring, in children with ADHD, (N=14), FASD (N=14) and controls (N=14). ERN tasks included both a novel T-Maze task (external feedback processing) and a Flanker task (internal feedback processing). Additionally, parent report measures of executive function (BRIEF), inattention/impulsivity (Conners PRS-S), and a new measure of transfer for learning were collected.

Results: Results revealed that ERP components related to performance monitoring such as the feedback ERN and P200 were morphologically different for FASD and ADHD children compared to controls. Specifically, the FASD children differed significantly from ADHD and control participants with respect to the fERN ($F = 4.08, p < .05$), however ADHD children did not differ from control participants with respect to this component.

Conclusions: Although children with ADHD and FASD demonstrate similar behavioral patterns, our ERP results suggest important differences underlying the neural etiology of these disorders. These results can be understood in terms of the observed correlations between the ERP component amplitudes and particular behavioral indices

Correspondence: Karin C. Brocki, Phd, Department of Psychology, Uppsala University, Box 1225, Uppsala SE-751 42, Sweden. E-mail: karin.brocki@psyk.uu.se

K.C. BROCKI, L. NYBERG, L.B. THORELL & B. GUNILLA. Early Concurrent and Longitudinal symptoms of ADHD and ODD: Relations to different types of Inhibitory Control and Working Memory.

Objective: The aim of the present study was to investigate how three different types of inhibitory control – interference control within task, interference control outside task, and prepotent motor inhibition – and two types of working memory – verbal and spatial – would relate to early symptoms of ADHD and ODD, both concurrently and longitudinally.

Participants and Methods: Seventy-two preschoolers, 1/3 who had been identified as being at risk for developing ADHD and/or ODD, completed neuropsychological tasks designed to measure inhibitory control and working memory. Behavioral symptoms were measured through parental and teacher ratings of the DSM-IV criteria for ADHD and ODD.

Results: Our results suggest distinct types of inhibitory control, as opposed to a global inhibitory construct, as being important in the early neuropsychology of ADHD, rather than ODD. Further, associations between working memory and ADHD in the preschool period appear to be accounted for by the overlap between inhibitory and working memory processes.

Conclusions: This study emphasizes the need to isolate complex executive processes and break them down into components in order to properly understand the neuropsychological roots involved in ADHD and ODD.

Correspondence: Karin C. Brocki, Phd, Department of Psychology, Uppsala University, Box 1225, Uppsala SE-751 42, Sweden. E-mail: karin.brocki@psyk.uu.se

V. CARMEAN & B.A. CORBETT. Stress and Anxiety Measures in Children with Autism.

Objective: Autism is a neurodevelopmental disorder characterized by impairments in social interaction, verbal and nonverbal communication, and a markedly restricted repertoire of activities and interests. Stress occurs as a reaction to an idea or situation, while anxiety is an anticipatory feeling that can cause uneasiness. Both stress and anxiety can be specific or generalized and have behavioral and biological consequences. The literature on reported stress and anxiety in autism has focused primarily on parents, while few studies have investigated the reported stress of children with autism. The aim of this study is to compare and contrast measures of stress and anxiety in children with autism and typical development.

Participants and Methods: Children 7 to 12-years of age with and without autism participated in the study. Measures included: the Stress Survey Schedule (SSS), the Multidimensional Anxiety Schedule for Children (MASC), the Behavior Assessment System for Children (BASC), the State-Trait Anxiety Inventory for Children (STAIC), and the Parental Stress Index (PSI).

Results: Correlational analyses suggest varying degrees of relationships between the measures. Several variables of stress and anxiety were correlated together with the exception of the MASC, which was not correlated with any other index. Interestingly, parental stress correlated with all of the measures except the MASC. Discriminant function analysis was performed to determine the contribution of the measures in classifying the groups. Collectively, measures of stress (SSS, PSI) were better able to discriminate the groups than measures of anxiety (STAIC, BASC Anxiety, MASC).

Conclusions: The contribution of these measures in a comprehensive neuropsychological assessment will be discussed.

Correspondence: Blythe A. Corbett, Ph.D., Psychiatry and Behavioral Sciences, University of California, Davis, M.I.N.D. Institute, 2825 50th Street, Sacramento, CA 95817. E-mail: blythe.corbett@ucdmc.ucdavis.edu

N.A. CROCKER, E.P. RILEY & S.N. MATTSON. Comparison of Verbal Learning and Memory in Children with ADHD with or Without Heavy Prenatal Alcohol Exposure.

Objective: Children with fetal alcohol spectrum disorders (FASD) often have a comorbid diagnosis of attention deficit hyperactivity disorder (ADHD). However, few studies have directly compared these two groups and those that have, have had inconsistent results. The current study compared verbal learning, recall, and retention in children with ADHD with or without heavy prenatal alcohol exposure.

Participants and Methods: The California Verbal Learning Test – Children's Version was administered to four matched groups of children: (1) fetal alcohol syndrome (FAS, n=19), (2) heavy prenatal exposure to alcohol but without FAS (PEA, n=17), (3) nonexposed with ADHD (ADHD, n=22) and (4) nonexposed typically developing (CON, n=22).

Results: On learning trials, the CON group recalled more words than: the FAS group on Trials 2-5, the PEA group on Trials 1-5, and the ADHD group on Trials 2-3. The ADHD group produced more words than the FAS group on Trials 4 and 5. On the long delay free recall trial (LDF), the CON group recalled more words after the 20-minute delay than all three clinical groups, which did not differ from each other. However, none of the groups differed on amount of information retained (LDF adjusted for Trial 5) over time.

Conclusions: These data suggest that both children with heavy prenatal alcohol exposure and nonexposed children with ADHD show deficits in verbal learning and recall although retention appears relatively intact. Overall, performance of these clinical groups was similar although the subtle differences observed in learning may aid in differential diagnosis. Supported by NIAAA grants AA10437 and AA10820.

Correspondence: Sarah N. Mattson, Ph.D., Psychology, San Diego State University, 6363 Alvarado Court, Suite 209, San Diego, CA 92120. E-mail: smattson@sunstroke.sdsu.edu

K.S. DAVIS, M. SEMRUD-CLIKEMAN & J. CODY. Parenting Stress in Families of Children with Genetic Disorders.

Objective: Impairments associated with the Chromosome 18q deletion are stressful to parents of 18q- children. Research on families of handicapped children suggests that parents experience additional stress related to increased caregiving demands, changes in social support, and financial burdens. This study examines the influence of a child's diagnosis on parenting stress. It is hypothesized that parents of children with 18q- experience greater stress than parents of children with Down Syndrome (DS) or typically developing children.

Participants and Methods: This study compared parenting stress in families of children with and without disabilities. Group 1 included 24 primary caregivers of children with 18q-. Group 2 included 32 caregivers of children with DS. Group 3 included 32 caregivers of typically developing children. Participants completed the Parenting Stress Index (PSI). Groups were compared to investigate differences on the Isolation, Spouse, and Competence subscales.

Results: A between groups MANOVA was conducted and revealed a significant difference between groups, $F(6,166) = 2.217, p=.044$. The DS group reported significantly more stress than the Control group on the Isolation ($p=.035$) and Spouse ($p=.022$) subscales. The 18q- group was not significantly different from the Control or DS group.

Conclusions: The DS group experienced significantly more stress than the control group on the Isolation and Spouse subscales. Primary caregivers in the DS group appear more socially isolated from relatives and other emotional support systems than the Control group. Additionally, DS primary caregivers experience significantly more spouse-related stress than the Control group. Findings provide information about the role of parenting stress in families of children with disabilities.

Correspondence: *Kim S. Davis, M.A., Educational Psychology, University of Texas at Austin, 1 University Station, D5800, Austin, TX 78712. E-mail: ksDavis@mail.utexas.edu*

A. DELLA ROSA, J. FOSS-FEIG, P.S. LEE & L. GILOTTY. Generativity in Autism Spectrum Disorders: The Influence of Task Structure.

Objective: Children with autism spectrum disorders (ASD) have been found to show deficits in generativity, or the ability to produce novel responses. However, these deficits have been noted using measures with rules that may produce additional cognitive demands (e.g., verbal fluency tasks in which responses must begin with a specific letter). Therefore, it is unclear whether observed generative deficits are confounded by the presence of these additional demands. We hypothesized that children with ASD would show lesser generative deficits when task structure was minimized.

Participants and Methods: 21 children with ASD (19 male) and 21 control children (17 male) between ages 9-12 years participated in this study. Participants were administered the design fluency task (Jones-Gotman & Milner, 1977). In the structured condition, participants created drawings using 4 straight lines while in the unstructured condition, they drew designs they "[had] never seen before". Responses given were coded for rule violations and repetitions.

Results: For the structured condition, the ASD group gave a significantly lower percentage of acceptable responses ($p=.006$) and a significantly higher percentage of repetitive responses ($p=.03$), though total responses did not differ from controls. In contrast, there were no group differences for the unstructured condition in total responses or percentage of acceptable or repetitive responses.

Conclusions: Our findings indicated that while children with ASD show difficulty on a structured generative task, these difficulties were not apparent when the constraints were lifted. This suggested that task demands influenced generative abilities for this population.

Correspondence: *Anne Della Rosa, Neuropsychology, Center for Autism Spectrum Disorders, Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: adellaro@cnmc.org*

M. DZIUK, J. GIDLEY-LARSON, A. APOSTU, E. MAHONE, M.B. DENCKLA & S.H. MOSTOFKY. Motor Dyspraxia Not Completely Accounted for by Basic Motor Deficits in Children with Autism.

Objective: To examine the contribution of basic motor skill deficits to dyspraxia seen in children with autism and assess the association of dyspraxia with the impairments that define autism.

Participants and Methods: 47 high-functioning children with autism and 47 typically-developing controls, ages 8-14 years, completed: (1) the PANESS, an examination of basic motor skills, and (2) a praxis examination including gestures to command, imitation, and with tool-use. Hierarchical regression was used to examine the association of appendicular motor skill performance (summed times to complete repetitive limb movements) with praxis (total percent correct gestures). Linear regression was used to assess the relationship of praxis performance with the defining features of autism, measured using the Autism Diagnostic Observation Scale.

Results: After accounting for age and IQ, there was a significant effect of motor skill performance on praxis (R^2 change=0.079, $p=0.002$). There remained a significant effect of diagnosis on praxis after accounting for motor skill performance (R^2 change=0.088, $p=0.001$), with the autism group showing greater percent errors. There was a significant correlation between total ADOS score and total percent correct gestures on the praxis examination ($R^2 = 0.34$, $p < 0.001$).

Conclusions: The results indicate that dyspraxia in autism cannot be accounted for by impairments in basic motor skills alone. This suggests that a deficit in neural systems, outside of those that would account for basic motor skill deficits, likely contribute to dyspraxia in children with

autism. The results also show impaired praxis performance in children with autism is broadly correlated with the social, communicative, and repetitive behavioral impairments that define autism, suggesting that dyspraxia may be a core feature of autism, or a marker of the neurologic deficits that underlie the disorder.

Correspondence: *Melissa Dziuk, Johns Hopkins Medical Institutions, 406 Amberdale Oak, San Antonio, TX 78249. E-mail: dziukm@hotmail.com*

L.K. FARRAN & D.L. ROBINS. Screening for Autism Spectrum Disorders: A Collaboration Between Neuropsychologists and Primary Care Providers.

Objective: Screening for autism spectrum disorders (ASD) in toddlers may promote early diagnosis, early intervention, and improved functional outcomes. Primary care providers need a standardized tool to assist with referrals to specialists (e.g., neuropsychologists) who can diagnose ASD. The purpose of this study is to investigate the utility of the Modified Checklist for Autism in Toddlers (M-CHAT; Robins et al., 2001) as a Level 1 screening tool.

Participants and Methods: 3024 toddlers (14.23-26.97 months) were screened in metro-Atlanta at 40 private practices and 2 public clinics. Parents of toddlers at risk for ASD were administered the Structured Follow-up Interview. Toddlers who continued to score at risk qualified for a diagnostic evaluation which includes the Mullen, Vineland-II, ADOS, ADI-R, and CARS.

Results: Four groups of participants were identified: (1) did not warrant follow up telephone interview ($n=2737$); (2) warranted follow-up telephone interview but not clinical evaluation ($n=161$); (3) evaluated but not diagnosed with ASD ($n=11$); and evaluated and diagnosed with ASD ($n=8$). Comparisons between evaluated groups (ASD vs. nonASD) revealed medium to large effect sizes for the follow-up interview critical score, $p=.02$, $\eta^2 = .29$, and some of the clinical scores: Mullen motor, $p=.03$, $\eta^2 = .25$; cognitive, $p < .001$, $\eta^2 = .52$; and language skills, $p=.003$, $\eta^2 = .42$; and Vineland social skills, $p=.06$, $\eta^2 = .19$.

Conclusions: Results suggest that the M-CHAT is a promising Level 1 screening instrument for the early identification of ASD, facilitating early referral to neuropsychologists and other specialists who diagnose ASD. Correspondence: *Lama K. Farran, MS-CCC, Psychology, Georgia State University, 5075 Tahoe Pines Way, Alpharetta, GA 30005. E-mail: lama_farran@bellsouth.net*

M.S. GAFFREY, F.J. GALLO, K.D. PHILLIPS, N.M. WESLEY, K.T. LI-BARBER & B.P. KLEIN-TASMAN. Parental Ratings of Executive Behavior in Children with Williams Syndrome: Developmental Stability and Change.

Objective: Williams syndrome (WS) is a rare genetic neurodevelopmental disorder resulting from a hemizygous microdeletion on chromosome 7q11.23. A large body of literature has pointed to a consistent profile of cognitive abilities for children with WS. However, little is known about the development of attention and executive functioning in WS. The current study compares executive behavior of younger and older children with WS using the Inhibit (INH), Shift (SH), Emotional Control (EC), and Working Memory (WM) subscales of the BRIEF (Gioia et al., 2000) and BRIEF-Preschool (Gioia et al., 2003).

Participants and Methods: Participants were 35 children with WS, aged 4-15. Each child was administered a brief measure of cognitive ability (KBIT-II), and a BRIEF-P (≤ 5 yrs; $N=12$) or BRIEF (≥ 6 yrs; $N=23$) was completed by parents.

Results: Significantly greater elevations were found for the older child group on the SH ($F(1, 35) = 7.8$, $p = .009$) and EC ($F(1, 35) = 4.85$, $p = .035$) subscales. No significant group differences were found for the INH and WM subscales. Overall profiles revealed elevations on subscales for the majority of each age group. Cognitive ability was not correlated with subscale ratings in either age range.

Conclusions: Based on parental report, the current results indicate that children with WS demonstrate a pattern of executive behavior that may change over time. Individual group profiles and implications for the understanding of executive behavior of children with WS will be discussed. Correspondence: *Michael S. Gaffrey, M.A., Psychology, University of Wisconsin - Milwaukee, 224 Garland Hall, 2441 E. Hartford Ave., Milwaukee, WI 53211. E-mail: mgaffrey@uwm.edu*

A. GUSTAFSON-DEBASTOS, S. RAZ, J. NEWMAN, S. MEACHEN, J. PERRY, P. ELLIOT & D. BATTON. The Relationship Between Nucleated Red Blood Cell Counts at Birth and Neuropsychological Outcome in Preterm-Birth Preschoolers.

Objective: Our main objective was to examine the relationship between a putative marker of antenatal hypoxia, nucleated red blood cells (nRBCs) in circulating neonatal blood obtained shortly after birth, and motor, memory and intellectual development at preschool age in children with history of preterm birth (gestational ages 24 - 34 weeks).

Participants and Methods: Children with congenital disorders and children who had experienced ante-, peri- or neonatal conditions that may confound the relationships between the haematological marker of interest and neuropsychological outcome were not included. Following additional exclusion of children with severe motor disorders or uncorrected sensory deficits, 162 children (95 males, 67 females) were available for the current study.

Results: Analyses with MANCOVA (using initial white blood cell count, socioeconomic status, sex, gestational age and total days on oxygen as covariates) revealed a significant moderate relationship between the absolute nRBC count and motor outcome (Wilks' $\Lambda = .93$, $F(2, 149) = 5.48$, $p < .01$). Specifically, an increase in nRBC count was associated with poorer fine motor skills ($F [1, 150] = 7.20$, $p < .01$) and gross motor skills ($F [1, 150] = 8.64$, $p < .01$). A trend for a significant relationship between the absolute nRBC count and general intellectual ability was also found (Wilks' $\Lambda = .97$, $F(2, 152) = 2.41$, $p < .10$).

Conclusions: The findings suggest that antenatal hypoxia, as represented by the number of nRBCs in the initial complete blood count obtained within 12 hours after birth, is associated with compromised neuropsychological outcome in the preterm infant.

Correspondence: *Angela Gustafson-DeBastos, MA, Psychology, Wayne State University, 2412 Rowland, Royal Oak, MI 48067. E-mail: akdebastos@wayne.edu*

T. HALL & D. SIKORA. The Relationship Among Scores from the GARS, CBCL and the ADOS-G Classifications of Autism, Autism Spectrum, and Non-spectrum.

Objective: The purpose of the present study was to provide information regarding the clinical utility of the Gilliam Autism Rating Scale (GARS) and the Child Behavior Checklist in the evaluation of autism spectrum disorders (ASDs).

Participants and Methods: This study examined GARS, CBCL and ADOS-G data for 192 preschool children. The participants were divided into three groups based upon their ADOS-G classification. The AQ from the GARS and T-scores from the DSM-oriented scale of PDP and the syndrome scale of Wd on the CBCL were chosen for analysis.

Results: A multivariate analysis of variance procedure (MANOVA) was used to examine group differences between ADOS-G classifications on the GARS AQ, CBCL Wd T-score, and the CBCL PDP T-score. Significant multivariate effects were obtained between groups (Pillai's Trace = .131, $F [6, 376] = 4.39$, $p < .000$). Analyses of univariate effects demonstrated significant effects and small to moderate effect sizes between groups for the CBCL Wd T-score and the CBCL PDP T-score; no differences were observed for the GARS AQ. Pair wise comparisons utilizing a Bonferroni correction revealed significant differences between CBCL PDP T-scores of those ADOS-G

classified as Autism and those ADOS-G classified as non-spectrum ($p = .019$). Moreover, additional analysis revealed significant differences between CBCL Wd T-scores of those ADOS-G classified as Autism and those ADOS-G classified ASD ($p = .002$) and non-spectrum ($p = .000$).

Conclusions: Overall results confirm the hypothesis, suggesting that, taken together, the CBCL Wd and PDP T-scores have better discriminant validity than does the GARS AQ in distinguishing children with the ADOS-G classification of autism from children with ADOS-G classifications of Autism Spectrum and Non-spectrum. These results suggest that the CBCL may be used in both primary care clinics as a screening tool for ASDs and as part of a more comprehensive autism evaluation. Correspondence: *Trevor Hall, PsyD, Pediatrics, Oregon Health & Science University, 12095 SW Bruce Ln, Beaverton, OR 97008. E-mail: halltr@ohsu.edu*

S. JAMES, A. CHENG & M. SEMRUD-CLIKEMAN. Do Working Memory and Fluid Reasoning Predict the Severity of Asperger Syndrome?

Objective: The role of executive functioning in children with Asperger's Syndrome has been widely debated, while fluid reasoning has been un-researched. It is hypothesized working memory and fluid reasoning scores predict severity of symptoms and these scores have an inverse relationship with Asperger's screener scores.

Participants and Methods: Participants: 29 participants, ages 6-15, who met criteria for Asperger's based on parent completion of a structured interview.

Procedure: Each subject completed fluid reasoning subtests of the WJ-III and working memory subtests of the Wechsler Intelligence Scales for Children IV. Scores were combined into working memory and fluid reasoning cluster scores. Multiple regression was used to determine influence of cluster scores on screener scores.

Results: Working memory and fluid reasoning clusters accounted for 31% of the variance in Asperger's screener scores ($F[2,26] = 5.90$, $p < 0.01$). Fluid reasoning had a statistically significant effect on number of Asperger symptoms ($\beta = -0.079$, $t[26] = -0.778$, $p = .005$) while working memory was nonsignificant ($p = .444$).

Conclusions: These findings suggest that children with Asperger's Syndrome who have higher fluid reasoning abilities may experience less severe symptoms of the disorder. A child's ability to manipulate and use information in a reasoning process may play an important role in our understanding of Asperger's Syndrome. We did not find a significant effect for working memory on the screener score, though current research suggests working memory is closely associated with the impairments of Asperger's Syndrome. The relationship between working memory and fluid reasoning warrants further investigation to pinpoint the contributions of each to the disorder. Correspondence: *Sarah James, University of Texas at Austin, 8310 Winterstein Dr, Austin, TX 78745. E-mail: sarahh@mail.utexas.edu*

S.A. JONES, S. KEMP, M. KORKMAN & M.R. BASSO. Patterns of Performance in Children on the Autism Spectrum.

Objective: Children with autism spectrum disorders (ASD) experience problems with executive function, theory of mind, facial recognition and emotion identification. It is uncertain whether these deficits are uniform across ASD groups. The present study evaluated whether children with ASD may be distinguished on NEPSY-II measures relevant to these constructs.

Participants and Methods: Participants were children with high-functioning AU ($n=12$; $IQ > 80$), AS ($n=19$), and 31 matched controls. Raw scores from six subtests relevant to executive function, theory of mind, facial recognition, and affect recognition were entered into two discriminant function analyses (DFA).

Results: Scores on Theory of Mind, Comprehension of Instructions, and Animal Sort subtests distinguished an ASD group from the controls ($p = .001$) in the first DFA. Overall classification accuracy of the function

was 90% and 74% upon cross-validation. On the second DFA, the AU group was separated from the AS and control groups ($p < .0001$) on the first function defined by the same subtests. The second function failed to distinguish groups significantly. Overall classification accuracy of the functions was 71%, and 60% upon cross-validation.

Conclusions: These findings indicate that the preliminary raw scores of NEPSY-II subtests are sensitive to neurobehavioral deficits of ASD. Additionally, the results imply that impairment in executive function, theory of mind, and language are specific to the high functioning AU group. AS children performed comparably to the control group, when raw scores were used. The NEPSY-II appears an effective tool for contributing to the diagnosis of autism spectrum disorders in general, and autistic disorder, specifically.

Correspondence: Sarah A. Jones, Master of Art, Dept. of Psychology, The University of Tulsa, 2221 W. Mobile Place, Broken Arrow, OK 74011. E-mail: sarah-jones@utulsa.edu

K.A. KAYSER, K.P. RIDLEY, A.L. WINTER, J. WALKOWIAK & M. SEMRUD-CLIKEMAN. Comparing Social Skills and Perceptions of Children with Social Competence Disorders and Attention Deficit-Hyperactivity Disorder.

Objective: Children with social competence disorders (SCD) experience difficulty in perception of their own social skills. It was hypothesized that when measured across two social ability scales, children with SCD would overestimate their social ability compared to ADHD and control populations.

Participants and Methods: Participants: 3 groups aged 9-16: Social Competence Disorder (N=59), ADHD (N=77), control subjects (N=79). No comorbid diagnoses were included.

Procedure: The parent and self-report forms of the Behavior Assessment System for Children and the Social Skills Rating System were administered as estimates of social competence. Univariate ANOVA's were conducted to determine group differences.

Results: Average scores on the parent ratings of social skills significantly differ across all groups ($p = .000$). The SCD group performed significantly lower than the control group ($p = .000$) and the ADHD group (SSRS $p = .000$, BASC $p = .005$). In addition, there was a significant difference in scores between the ADHD and control groups ($p = .000$).

Conclusions: These findings suggest that the social skill dimension reliably distinguishes varying levels of social ability between SCD, ADHD, and control groups. The controls were reported having the highest level of social competence, followed by the ADHD group. The SCD group was reported having the most difficulties. These findings support current definitions and research on SCD and ADHD that indicate symptoms of impaired social ability.

Controls self-reported the highest competency, followed by the ADHD and SCD group. Children with SCD, as well as ADHD, show awareness of their symptoms of social deficits. Children with SCD did not report difficulties to the same extent as their parents reported.

Correspondence: Kim A. Kayser, BA, Educational Psychology, University of Texas at Austin, 2600 Lake Austin Blvd., Apt. # 9305, Austin, TX 78703. E-mail: kim.kayser@mail.utexas.edu

K.A. KERNS, S.J. ASTLEY & H. CARMICHAEL OLSON. Impact of Differing Patterns of Prenatal Alcohol Exposure on Working Memory and Inhibition in Children.

Objective: Fetal Alcohol Spectrum Disorders (FASD) have been associated with varied cognitive deficits. Growing evidence suggests that the absence of facial features characteristic of the full syndrome may not necessarily signal less debilitating functional impairment. This study examined this and other questions in the important areas of inhibitory

control and working memory by including matched groups of alcohol-exposed children with significant CNS dysfunction, with and without evidence of the facial phenotype, children with only a positive report of significant prenatal alcohol use, and a group of typically developing children.

Participants and Methods: A cognitive battery including four novel measures assessing components of inhibition and working memory was administered to 3 groups of children with known prenatal alcohol exposure ($n = 20$ /group) ages 8-15 years diagnosed using the University of Washington 4 Digit Diagnostic Code including 1) FAS/pFAS; 2) static encephalopathy (SE); 3) neurobehavioural disorder (ND); and non-exposed typically-developing (TD) controls ($n = 20$).

Results: Group differences in inhibitory control and working memory are complex. In general, alcohol exposed children with FAS/pFAS and children with SE were not significantly different in performance. Children with ND usually (but not always) performed better than the other alcohol-exposed groups. All groups with prenatal alcohol exposure demonstrated more difficulty on cognitive tasks than did TD.

Conclusions: We will describe patterns of performance on tasks of inhibitory control and working memory in children with varying indices of prenatal alcohol exposure. Certain tasks may be more sensitive to the impact of alcohol on cognitive function in late childhood and early adolescence.

Correspondence: Kimberly A. Kerns, PhD, Psychology, University of Victoria, PO Box 3050 Stn CSC, Victoria, BC V8W 3P5, Canada. E-mail: kkerns@uvic.ca

N.S. KOUSHIK & C.D. SAUNDERS. Subtypes of Psychopathology in a Clinic-referred Sample of Children with Mental Retardation.

Objective: The present investigation examined patterns of psychopathology on the Personality Inventory for Children-Revised (PIC-R) in a clinic-referred sample of children with Mental Retardation.

Participants and Methods: The sample comprised 112 children (67 male and 45 female) between the ages of 6 and 14 years inclusive who had been referred to a children's mental health center in Southwestern Ontario for neuropsychological assessment. Full Scale IQ scores on the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) ranged from 45 to 70 ($M = 66.50, SD = 8.2$).

Results: Two-stage cluster analysis yielded six subtypes of psychopathology. However, closer examination of profile patterns suggested four unique and reliable subtypes: cognitive deficits without psychopathology, cognitive deficits with social skills deficiencies, cognitive deficits with internalizing psychopathology, and cognitive deficits with combined internalizing/externalizing psychopathology.

Conclusions: The subtypes corresponded well to previously established subtypes of child psychopathology (Gdowski, Lachar, & Kline 1985; Saunders, Hall, Casey & Strang, 2000). Moreover, the results also provided some support to the validity of previously identified cognitive subtypes of children with Mental Retardation (Ahmad et al., 2004). The significance of these findings in relation to cognitive and adaptive functioning is discussed.

Correspondence: Nikhil S. Koushik, M.A., Psychology, University of Windsor, 2645 Bridgeway Blvd., Lasalle, ON N9H 2L2, Canada. E-mail: koushik@uwindsor.ca

J.C. LARSON, A.J. BASTIAN, O. DONCHIN, R. SHADMEHR & S.H. MOSTOFKY. Children with High Functioning Autism Demonstrate Impaired Motor Sequence Learning with Spared Adaptation on Tasks Requiring the Cerebellum.

Objective: To examine motor adaptation and motor sequence learning in children with autism.

Participants and Methods: Participants included twelve high-functioning children with autism (HFA) and thirteen typically-developing

children. Motor sequence learning was examined using a Rotary Pursuit task consisting of four blocks of four 20-second trials, during which subjects tracked a moving light. A circular pattern was presented during blocks 1, 2, and 4; in block 3 a square pattern was presented. Learning was assessed by examining change in time-on-target across successive blocks of trials. Motor adaptation was assessed using two tasks: 1) Prism Adaptation, in which subjects were instructed to throw a ball at a target while wearing prism goggles creating a 10° horizontal optical shift, and 2) Reaching Adaptation in which subjects moved a planar two-joint manipulandum to a visually-displayed target, with either a force or visual perturbation applied. All adaptation tasks consisted of baseline, adaptation, and post-adaptation phases; dependent measures were adaptation rates, learning indices, and post-adaptation after-effects.

Results: For Rotary Pursuit, repeated measure ANOVA indicated a significant “diagnosis x block” interaction ($p=0.027$), with the HFA group showing less improvement across successive blocks than did controls. No significant group differences were found on the tasks of motor adaptation.

Conclusions: The findings suggest that children with autism have intact ability to adapt their movements, but are impaired in learning more complex motor sequences. Spared adaptation with impaired motor sequence learning may explain autism-associated difficulties with acquiring complex social/communicative gestures and the tendency to instead display more stereotyped patterns of behavior.

Correspondence: Jennifer C. Larson, M.A., *Developmental COgnitive Neurology, Kennedy-Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: larsonj@kennedykrieger.org*

T. LENTZ, C. LYNCH, K. KERNS, L. PURVES & N. VIRJI-BABUL. Attentional Basis of Adaptive Function Deficits in Developmental Coordination Disorder.

Objective: The nature of adaptive functioning impairments in Developmental Coordination Disorder (DCD) has generated controversy in the field. DCD, a pervasive, developmental motor disorder, is characterized by impaired fine and gross motor skills and high comorbidity rates with Attention-Deficit Hyperactivity Disorder, various learning disorders and socio-emotional problems. Reports of impaired adaptive functioning are common in this population; however, it is unclear whether the impairment is due to the motor aspects of DCD or the high comorbidity of attention deficits.

Participants and Methods: Tests of motor skills (Bruininks-Oseretsky Test of Motor Proficiency, MABC) were administered to twenty-four children diagnosed with DCD, who were participants of a school-based DCD therapy study. Parents of the participants also filled out measures of attention (Behavior Assessment System for Children Monitor for ADHD) and adaptive functioning (Scales of Independent Behavior-Revised).

Results: Results indicate that measures of attention were predictors of social and community adaptive functioning as well as overall independence score. Impaired attention predicted poor adaptive functioning. On the other hand, motor impairments predicted only adaptive motor function.

Conclusions: The results suggest that the adaptive functioning impairments in DCD, other than motor impairments, may be in fact due to comorbid attention deficits and interventions focused on increasing the adaptive functioning of children with DCD, in addition to rehabilitating the motor impairments, need to also focus on treating the attention deficits.

Correspondence: Tanya Lentz, M.A., *Psychology, University of Victoria, P.O. Box 3050, Victoria, BC V8W 3P5, Canada. E-mail: tlentz@uvic.ca*

J. LI, L.E. CUTTING, A. MATEREK, C. PRAHME, T.M. LEVINE, M.B. DENCKLA & M. MAHONE. Pause Time Variability on Rapid Naming Predicts Reading Fluency and Comprehension in Children Without Word Reading Difficulties.

Objective: The “slowing” observed among children with ADHD on rapid automatized naming tests (i.e., RAN) has been hypothesized to be related to one of the fundamental aspects of executive function that would underlie processing speed—response preparation.

Participants and Methods: 20 children ages 9-14 (9 controls, 11 with ADHD) completed the Gray Oral Reading Test-IV (GORT-IV) and RAN tests. The ADHD group was screened for basic reading difficulties, and removed from stimulant medication. Using item-based analysis of three RAN trials, we examined group differences, as well as prediction of reading scores for pause time, articulation time, and consistency (i.e., variability in latency) of pauses and articulations.

Results: There were no significant differences between control and ADHD groups on any GORT-IV or RAN variable. For RAN Colors, pause ($\Delta R^2=.20$, $p=.03$) and articulation times ($\Delta R^2=.12$, $p=.06$) both predicted GORT-IV Fluency. For RAN Letters, pause time ($\Delta R^2=.16$, $p=.05$) and pause time variability ($\Delta R^2=.27$, $p=.003$) predicted Fluency, while pause time variability ($\Delta R^2=.31$, $p=.008$) predicted Comprehension.

Conclusions: RAN pause variability is a strong predictor of reading fluency and comprehension, even among children without word reading difficulties. RAN pause and articulation times both contribute unique variance to reading fluency. Assuming naming speed is dependent on the arcuate and/or inferior longitudinal fasciculus, it could involve connections between frontal and posterior brain regions; or, both of these regions. Thus, a “breakdown” could occur either “towards the front”, “towards the back”, or “in between” (or both a brain region and a connection). In children with ADHD, a breakdown may be more “towards the front.”

Correspondence: Mark Mahone, Ph.D., *Neuropsychology, Kennedy-Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

E. MATUTE, M. ROSSELLI, N. PINTO & A. ARDILA. Memory Skills in Spanish Speaking Children with Dyscalculia.

Objective: This study examined the memory and mathematical skills of two subgroups of children with developmental dyscalculia (DD): one group with DD-only and a second group with DD plus reading disorders (RDD).

Participants and Methods: Fifty 11-12 year old children were selected from public schools in Guadalajara, Mexico. Seventeen children had DD and no reading disorder, thirteen had DD plus a reading disorder and twenty were normal controls. Testing included 10 calculation and six memory subtests taken from the Evaluación Neuropsicológica Infantil (Matute, Rosselli, Ardila & Ostrosky, in press).

Results: Results showed that children with DD and children with RDD demonstrated a similar pattern of mathematical impairment. Both subgroups had significantly lower scores than the control group in working memory tasks. In addition, the RDD group had significantly lower scores than the control group in Visual Learning and Semantic Memory. Although the RDD group scored lower than the DD group in most memory tests, this difference did not reach significance.

Conclusions: Working Memory tests (Digits Backwards and Sentence Repetition) appeared to be the best predictors of mathematical test scores and may represent a major cognitive defect in children with specific difficulties in mathematics.

Correspondence: Esmeralda Matute, PhD, *Instituto de Neurociencias, Universidad de Guadalajara, Francisco de Quevedo 180, Guadalajara 44130, Mexico. E-mail: ematute@cenar.udg.mx*

C.L. MCGEE, O.A. BJORKQUIST, E.P. RILEY & S.N. MATTSON. Language Performance in Young Children with Heavy Prenatal Alcohol Exposure.

Objective: One goal in the field of alcohol teratogenesis is to determine a profile of cognitive strengths and weaknesses associated with heavy prenatal alcohol exposure, since cognitive and behavioral effects may be more indicative of alcohol's teratogenicity than the physical abnormalities traditionally associated with this exposure. The aims of this study were to evaluate language abilities of young children with heavy prenatal alcohol exposure and to determine if these abilities represent a relative strength or weakness for this population.

Participants and Methods: Two matched groups of children (ages 3 to 5) completed the Clinical Evaluation of Language Fundamentals, Preschool version: 25 children with heavy prenatal alcohol exposure (ALC) and 26 non-exposed controls (CON). Consistent with previous research, the CON group had significantly higher full scale IQ scores (FSIQ) than the ALC group. A 2 x 2 repeated measures ANOVA was conducted to compare the receptive and expressive language skills of the two groups.

Results: The ALC group had significantly poorer language skills than the CON group and both groups tended to have better receptive than expressive abilities. Language performance did not significantly deviate from what would be predicted by FSIQ for either group, indicating that the observed language impairments in the ALC group are consistent with intellectual functioning.

Conclusions: Combined with relative performance in other cognitive domains these findings may help determine a profile associated with prenatal alcohol exposure that will improve differential diagnosis and intervention design. Supported by NIAAA grants AA10437, AA10820, and AA16047.

Correspondence: *Christie L. McGee, M.S., UCSD/SDSU Joint Doctoral Program in Clinical Psychology, 6363 Alvarado Rd Suite 200, San Diego, CA 92122. E-mail: cmcgee@projects.sdsu.edu*

S.H. MOSTOFSKY, M.P. BURGESS & J.C. GIDLEY LARSON. Increased Motor Cortex White Matter Volume Predicts Motor Dysfunction in Autism.

Objective: Motor abnormalities, such as those documented in autism, afford valuable insights into developmental disorders. Motor signs are highly quantifiable and reproducible and can serve as markers for deficits in parallel systems important for socialization and communication. Correlations of motor signs with anatomic MRI measures therefore offer an important means of investigating brain abnormalities contributing to autism. In this study, we examined whether motor cortex gray and white matter volumes predict impaired motor performance in children with autism.

Participants and Methods: Subjects were 20 children with autism and 36 typically developing (TD) controls, 8-12 years old. Regional tissue volumes were measured in BrainImage using an automated tissue classification algorithm followed by a semi-automated parcellation method based on a pediatric Talairach grid. Motor performance was assessed using the Physical and Neurologic Examination of Subtle Signs (PANESS), with higher scores indicating poorer performance.

Results: Children with autism showed significant motor impairment with total PANESS scores higher than those of controls ($p < 0.0001$). There were no significant group differences in motor cortex (total, left, and right) volumes of white or gray matter. Independent linear regression analyses revealed that for controls there was a significant negative correlation between total PANESS score and left motor cortex white matter volume ($R^2 = 0.15$, $p = 0.02$). In contrast, children with autism showed a robust positive correlation between total PANESS score and left motor cortex white matter volume ($R^2 = 0.60$, $p < 0.0001$).

Conclusions: The findings suggest that for TD children, increased white matter connections within the motor cortex are associated with improved motor skills. Conversely, for children with autism, increased white matter volume predicts poorer motor performance; this may be attributable to early aberrant increases in localized (radiate) white matter (Herbert, 2004).

Correspondence: *Melanie P. Burgess, Bachelor of Science, Developmental Cognitive Neurology, The Kennedy Krieger Institute, Suite 232, 700 N. Broadway, Baltimore, MD 21205. E-mail: burgessm@kennedykrieger.org*

T.J. NEAL & R.S. DEAN. Predicting the cognitive profile of Pervasive Development Disorders and Attention-Deficit Hyperactivity Disorder.

Objective: Pervasive Developmental Disorders (PDDs) are not rare conditions with circumscribed boundaries. Presentation of additional symptoms and disorders not accounted for within the PDD diagnostic criteria often occurs with emphasis on attention problems and Attention-Deficit Hyperactivity Disorder (ADHD) being included within the exclusionary criteria. Importance of accurate diagnosis increased with emphasis on empirically-validated treatments. While studies have established the reliability and validity of components comprising the Dean-Woodcock Neuropsychological Battery (DWNB), the efficacy of the Woodcock-Johnson Tests of Cognitive Abilities, Third Edition (WJIII-COG) in discriminating between PDD and ADHD deserves further attention.

Participants and Methods: A discriminant analysis evaluated the best set of independent variables in the correct classification and maximum differentiation between the two groups (PDD versus ADHD) for the standard and extended portions of the WJIII-COG. All participants ($N = 2460$; Mean Age = 12.72 years; $SD = 5.82$ years) were administered the entire WJIII-COG as part of a comprehensive neuropsychological test battery.

Results: By analyzing discriminant analysis results, the ability of the WJIII-COG to differentiate between the PDD and ADHD subjects was significant, Wilks' Lambda = .694, Chi-square transformation (19 , $N = 2460$) = 41.046, $p < .01$. Subsequent analysis determined the relative contribution of each predictor variable in discriminating between groups, with six subtests maximizing the separation among the groups.

Conclusions: Results add to the validity of the WJIII-COG relative to its ability to differentiate between PDD and ADHD individuals. Subsequent analyses provide evidence regarding the utility of the subtests to differentiate between the two groups. This poster will discuss the results of this study and the implications for practitioners and researchers. Correspondence: *Tiffany J. Neal, MA, Educational Psychology, Ball State University, PO Box 121, Mt. Summit, IN 47361. E-mail: tjmccall@bsu.edu*

J. OLDS, E. FITZPATRICK, E. GLENNIE, A. DURIEUX-SMITH, R. GAINES, K. RABJOHN & D. SCHRAMM. Working Memory and Neurocognitive Outcome after Cochlear Implantation.

Objective: Cochlear implantation (CI) has become a treatment option for children with severe to profound hearing loss, and children enrolled in oral communication programs have been demonstrated to have positive outcomes relative to those enrolled in other programs. Outcome research has focused on primarily on audiological functioning, speech and language. There has been less examination of neurocognitive outcomes, although working memory has been demonstrated to be a source of difficulty. The objective of this study was to examine neurocognitive abilities, including working memory, after pediatric CI and auditory-verbal therapy.

Participants and Methods: All CI recipients, followed at a regional, pediatric CI centre, were potential candidates. Additional criteria were: at least 6 years old, cochlear implant use for at least 1 year, rehabilitation focused on oral language, education in English, and absence of global developmental delay. Participants ($N = 29$) were administered a battery of cognitive, language and reading measures.

Results: A significant difference between verbal (VCI and WMI) relative to nonverbal (PRI and PSI) IQs was found. Reading and spelling of individual words was within the average range, while reading comprehension was lower, and correlated with language measures. Working memory was related to language-related measures. Within working memory measures, memory span was significantly lower, and had a different relationship to outcomes in auditory, linguistic and academic functioning.

Conclusions: These results indicate that after pediatric CI and oral rehabilitation, there is variation in language and literacy skills in the presence of average nonverbal abilities. Language and verbal reasoning abilities were related to reading comprehension. Auditory working memory was an area of specific difficulty, particularly on measures of memory span, and these measures had different relationships to language and literacy. These findings have implications for remedial programs for children after CI.

Correspondence: *Janet Olds, Ph.D., Psychology, Children's Hospital of Eastern Ontario, 401 Smyth Road, Ottawa, ON K1H 8L1, Canada. E-mail: olds@cheo.on.ca*

L. PARKS, D.E. HILL, R.J. THOMA, M. EULER & R.A. YEO. Neural Correlates of Communication and Symptom Severity in Autism: A Voxel-Based Morphometric Analysis.

Objective: Impaired communication is one of the defining features of autism yet the manifestation of this impairment is extremely variable within the disorder. Brain region-of-interest measurements have shown atypical language organization in autistic individuals with disordered language. However, it is unknown whether other regions not typically associated with language play a role in impaired communication.

Participants and Methods: In this study, we used a voxel-based morphometric (VBM) analysis to examine the neuroanatomical correlates of communication skills and symptom severity within a heterogeneous group of autistic children. Participants included children with a diagnosis of autism ($n=33$, 25 of which were male) ranging in age from 3.4 to 11.4 years (mean = 6.5 years) recruited from Salt Lake City and the surrounding area.

Results: Results revealed that increased gray matter is correlated with better communication skills in numerous frontal regions when total GM is not controlled ($p<0.01$, FDR corrected). Similarly, increased white matter volume in the cingulate gyrus and middle frontal gyrus is associated with better language skills ($p<0.01$, FDR corrected). With respect to symptom severity, more gray matter in the right inferior frontal gyrus ($p<0.05$, FDR corrected) is associated with more mild symptoms of autism. However, increased total gray matter volume is correlated with more severe symptoms of autism (though this result did not reach statistical significance) suggesting that while increased total GM volume is generally bad, local increases in GM volume result in milder symptoms.

Conclusions: Our results suggest that communication and symptom severity are separate aspects of autism and reiterate the importance of studying differences within the autistic population.

Correspondence: *Lauren Parks, University of New Mexico, Department of Psychology, Albuquerque, NM 87131. E-mail: lparks1@unm.edu*

K.D. PHILLIPS, K.T. LI, F.J. GALLO, J. BEHAGEN & B.P. KLEIN-TASMAN. Performance of Children and Adolescents with Williams syndrome on the Social Responsiveness Scale.

Objective: Williams syndrome (WS) is a rare genetic neurodevelopmental disorder resulting from a hemizygous microdeletion on chromosome 7q11.23. Individuals with WS have more pragmatic language impairments, restricted interests, and impaired social relationships than do typically developing children (Laws & Bishop, 2004). Young children with WS show socio-communicative deficits on observational measures, indicating overlap with the autism spectrum (Klein-Tasman et al., under review). This study examined performance of children with WS on the Social Responsiveness Scale (SRS; Constantino & Gruber, 2005), a parent-report measure of social reciprocity difficulties and other behaviors characteristic of autism spectrum disorders. We hypothesized that children with WS will show difficulties with social responsiveness.

Participants and Methods: Participants were 31 children with WS aged 4-15. Parents completed the SRS.

Results: Based on the SRS total score, 42% of participants showed difficulties in the mild/moderate range of severity. An additional 45%

showed difficulties in the "severe" range. Only 13% did not show significant difficulties. Elevations were noted for most participants on the Social Cognition (94%), Autistic Mannerisms (90%), Social Communication (81%), and Social Awareness (65%) subscales. Only 22% were elevated on Social Motivation. Age was negatively correlated with Social Awareness standard score ($r=-.48$, $p=.006$). Cognitive ability was negatively correlated with Autistic Mannerisms raw score ($r=-.42$, $p=.020$) and total raw score ($r=-.40$, $p=.025$).

Conclusions: Parents of children with WS observe several behavior characteristics that overlap with those commonly seen for children with autism spectrum disorders. Implications of these findings for the understanding of socio-communicative behavior of children with developmental disabilities will be discussed.

Correspondence: *Kristin D. Phillips, MS, Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford, Milwaukee, WA 53211. E-mail: kdp@uwm.edu*

A.S. PRESTON, E.B. FENNEL, S.C. HEATON, C.I. KIMBERG, S. REED & B. RUISE. Attentional Performance in Adolescents with Spina Bifida.

Objective: Since many attentional measures include significant motor and visual-motor demands, it is difficult to assess attentional deficits in children with motor impairments, such as spina bifida. The current study compared adolescents with spina bifida to healthy controls on measures of selective attention, sustained attention, and attentional control. We hypothesized that adolescents with spina bifida would perform worse than healthy controls even after controlling for motor demands.

Participants and Methods: The current study included 15 children with spina bifida and 17 healthy controls aged 10-16. There were no significant differences between the groups for age, grade, gender, or ethnicity. Participants completed the Sky Search, Score!, and Opposite Worlds subtests from the TEA-Ch and the D-KEFS Trailmaking subtest. A One-way ANOVA compared children with spina bifida to healthy controls. A second ANOVA compared groups on while controlling for the motor demands.

Results: When motor demands were not controlled, children with spina bifida performed significantly worse than healthy controls in all attentional domains. However, after controlling for motor demands, significant differences remained for selective and sustained attention but not for tests of attentional control/switching. Effect sizes were large between groups on tests of selective and sustained attention and small on attentional control/switching.

Conclusions: Although motor demands explain some impaired performance on attentional tests in children with spina bifida, deficits in selective and sustained attention persist even after controlling for motor demands. These results suggest that motor demands are an important consideration in evaluating attentional deficits in spina bifida but that other underlying factors should be addressed.

Correspondence: *Andrew S. Preston, M.S., Psychiatry and Human Behavior, Brown University, 68 Parkview Drive, #1S, Pawtucket, RI 02861. E-mail: apreston@phhp.ufl.edu*

D. RACHES, L. CHAPIESKI, M. HISCOCK & A. GRILLS-TAQUECHEL. Behavioral Implications of Epilepsy in Children with Sturge-Weber Syndrome.

Objective: Sturge-Weber Syndrome (SWS) is a rare neurocutaneous disorder associated with a high incidence of epilepsy. Although not all affected individuals have seizures, no study has determined whether the syndrome is associated with cognitive and behavior problems, independent of seizures. This study strove to assess the degree to which epilepsy contributes to the pattern of developmental, academic, attentional and mood problems described in this population.

Participants and Methods: Data for children with SWS ($n=20$ with seizures and $n=14$ without seizures) were collected as part of a survey conducted for the National Sturge-Weber Foundation. Data for children

with epilepsy (n=29) and normal controls (n=21) were collected as part of a study of cognitive and behavioral functioning of children with epilepsy. Data for all participants were obtained from parent reports (Personality Inventory for Children; PIC) and teacher reports (Comprehensive Behavior Rating Scale for Children; CBRSC).

Results: Children with SWS did not represent a homogeneous group. The presence of seizures was associated with significantly greater parent and teacher reported academic, developmental and attentional problems in children with SWS. There were no significant differences between children with SWS without seizures and the normal control group regarding academic, developmental and attentional difficulties. Greater developmental delays and academic difficulties were reported in children with SWS and seizures compared with children with epilepsy alone. Comparable levels of attentional problems and internalizing behaviors were reported between the two groups with seizures.

Conclusions: Children with SWS who remain seizure free are likely to have developmental courses, academic progress and internalizing behaviors comparable to other children their age. Children with SWS and seizures are likely to have attentional and internalizing behaviors comparable to individuals with epilepsy alone, and are at risk for greater developmental difficulties.

Correspondence: *Merrill Hiscock, Ph.D., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu*

M.A. SHANAHAN, H.D. BARNARD, L.E. SANTERRE-LEMMON, E.G. WILLCUTT & B.F. PENNINGTON. Executive and Motivational Impairments in ADHD: A Double Deficit?

Objective: Research on the neuropsychology of ADHD has consistently found evidence for impairments in executive inhibition, which is believed to tap dorsolateral prefrontal functioning. Alternative models have been proposed that support non-executive, motivational explanations of the disorder, which likely involve the orbitofrontal cortex and/or subcortical structures. In the current study, tasks that measure inhibition and motivation were given to children with and without ADHD to test for group differences in task performance and proportion of children in each group with deficits.

Participants and Methods: Participants included 23 children with ADHD (ages 8-14) and a comparison group of 49 children. Executive inhibition tasks included the Gordon Diagnostic System and the Stop Task, and motivational tasks included the Cambridge Gambling Task (CGT) and an object reversal task which has been found to differentiate children with ADHD from controls (Itami & Uno, 2002).

Results: ADHD deficits were found in both the executive and motivational domains, and persisted when Full Scale IQ was covaried. To test for double deficits, we defined a "deficit" on a given task as a score that fell below 1.5 standard deviations from the control mean. In the ADHD group, 13% demonstrated an executive deficit only, 21% had a motivational deficit only, and 39% had double deficits, compared to 10%, 14% and 8%, respectively, in the control group.

Conclusions: These results suggest that single deficits in either the executive or motivational domains confer less risk for ADHD than a double deficit, and that such deficits are not solely attributable to general intelligence. The implications of these results for the neuropsychology of ADHD will be discussed.

Correspondence: *Michelle A. Shanahan, M.A., Psychology, University of Denver, 2155 S. Race Street, Denver, CO 80205. E-mail: mshanah2@du.edu*

J. SILVERS, G. WALLACE, L. KENWORTHY, R. CARAVELLA & A. MARTIN. Articulatory Suppression Impairs Tower Performance in Typically Developing Boys but Not in Boys with High-Functioning Autism.

Objective: Since Vygotsky's theory of development (1962), a body of literature has emerged suggesting that inner speech during problem solv-

ing may facilitate logical reasoning (Baldo et al., 2005) and executive functioning. Children with autism spectrum disorders (ASD) demonstrate impaired executive functioning, as supported by difficulty with tasks like the Tower of London (TOL) (Ozonoff & Jensen, 1999). It has been suggested that impaired inner speech may contribute to cognitive deficits in children with ASD (Whitehouse, Mayberry, & Durkin, 2006). This claim is supported by evidence that children with ASD perform comparably to typically developing (TD) children on tasks requiring nonverbal rule use, but perform worse than TD children on tasks requiring verbal rule use (Russell, Jarrold, & Hood, 1999).

Participants and Methods: The present study investigated how articulatory suppression of inner speech (AS) affected performance on an adapted version of the TOL in 12 high-functioning boys with ASD and 19 age- and IQ-matched TD boys. Half of the TOL trials were administered under the AS condition and half were administered under standard procedures.

Results: As expected, AS interfered with tower performance for the TD boys ($t(18)=2.13, p<.05$). In fact, TD performance under AS was equivalent to ASD performance under standard conditions. Moreover, AS had no effect on ASD tower scores ($t(11)=.05, p=.96$).

Conclusions: These results suggest that TD children rely on inner speech to a much greater degree than ASD children and that inner speech impairments may be responsible for some executive function deficits observed in ASD. If confirmed, this finding has important implications for intervention. Correspondence: *Jennifer Silvers, NIMH/NIH, 10 Center Drive 4C104, MSC #1366, Bethesda, MD 20892. E-mail: silversj@mail.nih.gov*

S. SUTERA, E.L. ESSER, J. PANDEY, L. WILSON, M.A. ROSENTHAL, A. VERBALIS, H.C. BOORSTEIN, M. HELT, M.L. BARTON, S. HODGSON, T.M. DUMONT-MATHIEU & D.A. FEIN. Predictors of Optimal Outcome in Children with an ASD Diagnosis.

Objective: A small percentage of children diagnosed with an autism spectrum disorder (ASD) eventually reach an "optimal outcome" and cease to meet diagnostic criteria. In this study, children who reached an optimal outcome were compared to children who continued to meet ASD criteria over time and to children never diagnosed with an ASD.

Participants and Methods: As part of a larger study using the Modified Checklist for Autism (M-CHAT; Robins, Fein, Barton, & Green, 2001), 74 children who were diagnosed with an ASD at age 2 were reevaluated at age 4. At reevaluation, 14 children no longer met criteria for an ASD diagnosis. Cognitive and adaptive skills were assessed at age 2 using the Bayley Scales or the Mullen Scales, and the Vineland Adaptive Behavior Scales. The Childhood Autism Rating Scale (CARS) was used as a measure of symptom severity.

Results: Independent samples t-tests revealed no difference in initial symptom severity between the groups. However, the optimal outcome group had higher motor scores by direct testing and by parent report, as well as a trend toward higher cognitive ability and daily living skills at age 2.

Conclusions: Although small differences, particularly in the area of motor skills, may distinguish those who reach an optimal outcome from those who do not, these children are difficult to differentiate initially from one another based on behavioral measures.

Correspondence: *Saasha Sutera, Clinical Psychology, University of Connecticut, 406 Babbidge Road, Unit 1020, Storrs, CT 06269. E-mail: saasha.sutera@uconn.edu*

L. SZE, S. CHAN, M. CHEUNG & L. WONG. Hyper Intrahemispheric Theta Coherence in Children with Autistic Spectrum Disorder.

Objective: The present study attempted to examine the electroencephalogram (EEG) coherence pattern of children autistic spectrum disorder (ASD). Functional imaging studies have showed that ASD demonstrated abnormal functioning in many brain regions, particularly the frontal lobe. In specific, our previous study has revealed abnormal alpha and delta relative power of children with ASD. It is therefore hypothesized that the frontal lobe of children with ASD will be less synchronized than normal control (NC).

Participants and Methods: Five-minute quantitative EEG data (at 32 channels) during resting eyes-open condition were obtained from 16 children with high-functioning ASD and 38 age-matched NC. Some intrahemispheric coherence pairs were computed and then grouped into 5 regions (frontal, frontal-temporal, frontal-central, frontal-parietal and frontal-occipital) for between-group comparisons.

Results: Repeated measures ANOVA and independent t-tests were performed to compare the intrahemispheric coherence between NC and ASD group. Results suggested that ASD group yielded significantly higher theta (4-8Hz) coherence on both hemispheres than NC, but the difference was more pronounced on the left side. Besides, the hyper-coherence pairs in ASD group involved more long distance frontoposterior linkage on the left hemisphere, but more short distance pairs (primarily frontal and frontal-central regions) on the right hemisphere.

Conclusions: The present study found that children with ASD demonstrated intrahemispheric hyper-coherence at theta band than normal children. Their particularly robust difference in the long distance pairs on the left hemisphere may be suggestive of their abnormal connection between the frontal lobe and other posterior regions.

Correspondence: *Lai Man, Sophia Sze, Master, Psychology, CUHK, Room347, Sino Building, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong nil, Hong Kong. E-mail: lmsze@psy.cuhk.edu.hk*

R. TARAZI, E. MAHONE & T. ZABEL. Development of Executive Function in Children with Myelomeningocele and Shunted Hydrocephalus Based on Parent Behavior Ratings.

Objective: Previous research has suggested that adolescents with myelomeningocele and shunted hydrocephalus (MMH) have difficulties with aspects of executive functioning and, in turn, with functional independence. There is little research examining age-related changes in executive function in this population. The goal of this cross-sectional study was to compare age-related changes in parent ratings of executive function in children with MMH and typically developing peers.

Participants and Methods: Parents of 35 individuals with MMH and 35 typically developing peers, ages 10-13 years, completed the Behavior Rating Inventory of Executive Function (BRIEF). The BRIEF is organized into eight scales and two primary indices (Metacognition [MCI], Behavioral Regulation [BRI]). Effects of group, age, and group-by-age interactions on the mean raw scores of the MCI and BRI were examined.

Results: There were significant group effects ($p < .05$) for both the BRI and MCI, with the controls having significantly lower mean ratings than the MMH group. There was also a trend for age-by-group interaction on the BRI ($p = .06$). Specifically, although mean raw scores on the BRI for the MMH group remained stable across ages, mean raw scores in the control group decreased as age increased.

Conclusions: Healthy children have age-related decreases in parent-reported executive dysfunction, particularly behavioral control; in contrast, children with MMH demonstrate no age-related decreases in parent ratings of these behaviors across adolescence. Therefore, children with MMH may continue to require targeted interventions and modifications to address executive dysfunction into young adulthood in order to promote functional independence.

Correspondence: *Reem Tarazi, Ph.D., Kennedy Krieger Institute, 2611 Parrish Street, Philadelphia, PA 19130. E-mail: ratarazi@yahoo.com*

J.M. VAN ADEL, N. VIRJI-BABUL, C. O'NEILL & K. KERNS. Anticipatory Control During Bimanual Coordination in Children with Down Syndrome.

Objective: Functional activities involving coordination between hands requires feedforward and feedback control during the movement. Few studies have investigated these processes in children with 'motor control' difficulties, such as seen in Down syndrome (DS).

Participants and Methods: This study examined bimanual coordination requiring asymmetric engagement of the hands: lifting the lid of a spring-loaded box with one hand (lift hand) and pushing a button in the box with the other (task hand). 6 children with DS (7-12 years) and 6 typically developing (TD) children (6-12 years) participated. Coordination was assessed using a Vicon motion analysis system.

Results: Compared to children with DS, TD children moved the task hand shortly after initiating the lift hand and overlap time was greater, while goal synchronization time was shorter (mean = .33 s). Velocity profiles showed the lift hand had 2 large peaks during reaching and lifting of the handle. Children with DS were slower and displayed greater segmentation between the hands. The velocity profile of the lift hand was asymmetric with a large peak during the reach phase and smaller peak during the lift phase, while the task hand was more irregular during the initial reaching phase.

Conclusions: Differences observed may be due to underlying abnormalities between online analysis and execution of a movement leading to reduced bimanual coordination. Implications for anticipatory planning processes, feedback control and intervention programs will be discussed, as will the utility of this procedure for investigating bimanual coordination in clinical populations.

Correspondence: *James M. Van Adel, Psychology, University of Victoria, 1630 Quadra St. Apt 2, Victoria, BC V8W 3J5, Canada. E-mail: mikevanadel@hotmail.com*

S.N. MATTSON, L. VAURIO & E.P. RILEY. Can children with FASD be distinguished from children with ADHD using measures of attention?

Objective: Children with fetal alcohol spectrum disorders (FASD) often have a comorbid diagnosis of attention deficit hyperactivity disorder (ADHD). We previously reported the ability to distinguish children with FASD from typically developing controls using the WISC-III FD index and the CBCL Attention scale. However, at that time we were unable to test this model using a clinical comparison group of ADHD children. Thus, to test the validity of this model, we attempted to classify children with FASD, non-exposed children with ADHD, and non-exposed controls.

Participants and Methods: We used two subject groups, an FASD group that included alcohol-exposed children with (n=19) and without (n=18) a diagnosis of FAS and a comparison group (the CON group) that included both non-exposed, typically developing children (n=22) and non-exposed children with ADHD (n=22). Children were assessed using a neuropsychological test battery that included the WISC-III and the CBCL. Parents of all children were interviewed using the DISC and all children with ADHD or FASD met DSM-IV criteria for ADHD. The two variables from our previous study (FD and CBCL Attention) were analyzed using backward logistic regression.

Results: Classification accuracy was 84% overall (model Chi-square = 52.11, $p < .001$). Specifically, 78.4% of the FASD group and 88.6% of the CON group were accurately classified. Classification accuracy did not significantly change when FSIQ was entered into the model before the attention variables. An additional logistic regression was run excluding the nonexposed non-ADHD participants (ADHD vs. FASD); overall classification accuracy was 81.4% (model Chi-square = 23.06, $p < .001$) and 83.8% of the FASD group and 77.3% of the ADHD group were accurately classified.

Conclusions: These data indicate that children with heavy prenatal alcohol exposure can be distinguished from non-exposed controls with a high degree of accuracy even when the CON group includes children with ADHD. Research supported by NIAAA grants AA10820 and AA10437. Correspondence: *Sarah N. Mattson, Ph.D., Psychology, San Diego State University, 6363 Alvarado Court, Suite 209, San Diego, CA 92120. E-mail: smattson@sunstroke.sdsu.edu*

J. WASSERSTEIN, N.P. VADHAN, K. BARBOZA & G.A. STEFANATOS. Nonverbal Learning Disabilities: A Study of Adult Outcomes.

Objective: This descriptive study from an out-patient setting adds to the limited literature regarding the developmental course of NLD. The uniquely high aptitude and higher SES sample permits examination of adult outcomes in the context of greater personal and environmental resources.

Participants and Methods: Subjects were selected from a computerized data bank of all adult patients evaluated by the first author over a 10 year period. After excluding those who had acquired forms of brain damage, a final sample of 48 were selected who had: 1) either VIQ greater than PIQ by at least 15 points and/or VCI greater than POI by 15 points, and 2) various functional complaints dating back to childhood. Math and/or social-emotional problems were not used as criteria in order to determine if they necessarily co-existed with the usual cognitive criteria. Demographic, neuropsychological and functional observations were tabulated and intercorrelated as possible.

Results: This young adult sample was highly educated and professionally accomplished. Social success varied widely, ranging from isolation to prominence. Academically most had some form of LD, but not necessarily in math. The most common diagnosis was ADHD/primarily inattentive type, although mood and anxiety disorders were frequent. The most common neuropsychological deficit was inattention and executive dysfunction, although visual-motor deficits were also frequent. Both math and social weakness were correlated with markers for right-brain dysfunction, but not with each other. **Conclusions:** NVLD does not necessarily lead to social isolation, math dysfunction and adaptive delay. Outcomes are likely moderated by environmental and personal factors. Nevertheless NVLD is associated with ADHD, consistent with early studies in this population and with current right hemisphere models for attention regulation.

Correspondence: *Jeanette Wasserstein, Ph.D., Mount Sinai Medical School, 1160 Fifth Ave., suite 112, New York, NY 10029. E-mail: cnsnyc@aol.com*

L.B. WILSON, T. DUMONT-MATHIEU, J. KLEINMAN & D. FEIN. Screening for Autism Spectrum Disorders in Low- and High-Risk Samples.

Objective: Children at high-risk for an Autism Spectrum Disorder (ASD) (i.e., those receiving early intervention services) were compared to a group of low-risk children (i.e., those presenting to their pediatrician for a well-child care visit) to determine differences on an ASD screening instrument (the Modified Checklist for Autism in Toddlers; M-CHAT), cognitive and adaptive functioning, and ASD symptomatology.

Participants and Methods: The current sample of 173 children (22% low-risk, 78% high-risk), between 16 and 30 months of age, screened positive on the M-CHAT and received a developmental and diagnostic evaluation.

Results: Of the children from the low-risk sample, 47% were diagnosed with an ASD, 45% with language or global developmental delay, 2.6% with other disorders, and 5.3% received no diagnosis. Of the 135 children from the high-risk sample, 78.5% were diagnosed with an ASD, 17.8% with language or global developmental delay, 2.9% with other disorders, and .74% received no diagnosis. For both the low- and high-risk samples, the sensitivity, specificity, and positive and negative predictive power of the M-CHAT with telephone follow-up were good. Although the overall high-risk sample failed more M-CHAT items, the low- and high-risk children diagnosed with an ASD did not differ from each other on any measure (e.g., autistic symptomatology as measured by the ADI, ADOS, or number of DSM-IV symptoms; cognitive functioning as measured by the Mullen Scales of Early Learning; or, adaptive functioning as measured by the Vineland Adaptive Behavior Scales).

Conclusions: This supports the use of the M-CHAT as a screening instrument for ASD in both settings.

Correspondence: *Leandra B. Wilson, M.A., Psychology, University of Connecticut, 26 Pinney Street, Apt 1, Ellington, CT 06029. E-mail: leandra_wilson@hotmail.com*

A.L. WINTER, K.A. KAYSER, K.P. RIDLEY, J. WALKOWIAK & M. SEMRUD-CLIKEMAN. Analyzing the Correlation Between Severity of Disorder and Social Perception Abilities in Children with Social Competence Disorders.

Objective: Research indicates that children with Social Competence Disorders (SCD) such as Asperger Syndrome, Nonverbal Learning Disabilities, and Pervasive Developmental Disorders have difficulty with social perception. It was hypothesized that as the severity of Social Competence Disorder increases, performance on the measure of social perception would decrease. It was also hypothesized that children with SCD would have difficulty on tasks that require perception of nonverbal cues as well as emotional recognition.

Participants and Methods: Two groups of children, aged 9-16, were assessed (SCD, n=67; controls n=89). No comorbid diagnoses were allowed. Measures were individually administered and included a measure of the participant's ability to recognize emotions in others through the use of videotaped vignettes. Each participant's parent was interviewed for deficits in social competence using a structured interview.

Results: Univariate ANOVAs were examined to determine if a significant difference between group responses occurred as well as correlations between measures. A significant difference was found between the control and the SCD groups on a measure of knowledge of nonverbal ($p = .000$) and emotion cues ($p = .000$). In addition, as severity of SCD increased, performance on both measures decreased significantly.

Conclusions: These findings indicate that children with SCD have more difficulty perceiving both emotions and nonverbal cues than typically developing children. The results also suggest that as the severity of symptoms of social competence disorders increases, ability to perceive emotions as well as nonverbal communication in others decreases.

Correspondence: *Amanda L. Winter, B.A., School Psychology, University of Texas at Austin, 800 South 1st St, Apt C, Austin, TX 78704. E-mail: awinter@mail.utexas.edu*

Genetic Disorders

B.J. BUTCHER, D.A. GARRISON, K.S. DAVIS, M. SEMRUD-CLIKEMAN & J. CODY. Adaptive Behavior of Children with Chromosome 18q Deletion Predicts Parental Stress Levels.

Objective: Research on stress related to parenting children with mental retardation and genetic disorders has revealed high parental anxiety regarding maladaptive behavior of these children, and also found that lower levels of adaptive functioning in children predict higher levels of parental stress. There have been no studies that evaluate family functioning in children with Chromosome 18q deletion who are also mentally handicapped. This study examined the influence of a child's adaptive skill level on levels of parenting stress.

Participants and Methods: This study included 33 children between the ages of 1 and 15 years old with a deletion on the long arm of the 18th chromosome (18q-) and a primary caregiver for each child. The participants came from the Chromosome 18 Research Center at the University of Texas Health Science Center in San Antonio, a study investigating the clinical and educational effects of chromosome 18. It is hypothesized that parents of children with lower adaptive skill levels will experience greater amounts of parenting stress.

Results: Participants' three adaptive behavior domains (socialization, communication, daily living skills) were examined as predictors of parental stress levels using multiple regression analyses. Adaptive Behavior of children with Chromosome 18q deletion was a significant predictor of parental stress ($R^2 = 0.716$, $F[3,22] = 7.729$, $p = .001$). Of the three adaptive behavior domains, socialization was the only variable that contributed significantly to lower parental stress ($b = -1.021$, $t[22] = -2.129$, $p = .045$).

Conclusions: The finding that socialization levels of the child contributed significantly to lower parental stress indicates that social skill

interventions are an important part of treating children with 18q-. While treatment often includes physical therapy, speech therapy, and academic interventions, the importance of social skills on family functioning should not be overlooked when creating a comprehensive treatment plan for these children.

Correspondence: *Brianne J. Butcher, B.A., Educational Psychology - School, University of Texas at Austin, 1 University Station, D5800, Austin, TX 78712. E-mail: briannebutcher@hotmail.com*

L. ISAAC. The Relative Contribution of Featural vs. Configural Face Processing Strategies in Williams Syndrome.

Objective: Previous work has forced discrete outcomes of a featural versus a configural processing strategy in Williams Syndrome. This study has resolved some of the contradictory findings by offering a relative contribution of the dual-processing strategies in Williams Syndrome.

Participants and Methods: Participants: 20 Williams Syndrome, 10 Developmental Delay (IQ Control Group) and 10 Normal Controls participated in this study.

Stimuli was presented in digitized format on a computerized stimuli program (PsyScope) to standardize display time, response time, response style, and proximity of faces as they are presented.

Participants were presented with a target face in the upper part of the display. Below this image two response choice faces of the same individual appeared for

200 ms. Participants were instructed to identify which of the two faces matches the target face. In half of the trials all faces were presented upright, and in the other half, inverted. The side of the correct response choice was balanced.

Results: Data was analyzed using a 4-way, between groups, analysis of variance (ANOVA): Group (Williams Syndrome/DD/Normal Controls) x Presentation (Thatcherized Face/Non-thatcherized Face) x Orientation (Upright/Inverted) x Affect (Happy/Neutral). Specifically, analysis of variance with one between factor (group) and three within factors (presentation, orientation, and affect) planned pairwise comparisons among groups will be completed on the dependent variable (response accuracy).

Conclusions: Results in our study show that controls have a configural bias for processing faces. This is evidenced by poorer response accuracy in the inverted and thatcherized conditions which force a featural processing mode. Our data provides evidence for Williams Syndrome participants employing a face processing strategy that is comparable to the typically-developing sample, namely a configural strategy.

Correspondence: *Linda Isaac, MS, MA, Laboratory for Cognitive Neuroscience, The Salk Institute, 630 Berkeley Avenue, Menlo Park, CA 94025. E-mail: isaac linda1@yahoo.com*

B.J. KELLEY, G.E. SMITH, R.J. IVNIK, B.F. BOEVE, W.N. HAIDAR, M. BAKER, A.R. FRANK, D.S. KNOPMAN, K.A. JOSEPHS, M. HUTTON, S.M. PICKERING-BROWN, J. ADAMSON, K.M. KUNTZ & R.C. PETERSEN. The Spectrum of Neuropsychological Deficits Associated with Mutations in Progranulin.

Objective: To report the variance in neuropsychological testing among patients who were proven to have mutations in progranulin (PGRN) associated with neurodegenerative disease.

Participants and Methods: Ten affected members in six kindreds with mutations in PGRN underwent neuropsychological evaluation on one or more occasions, which included standard assessments of learning and memory, language functioning, attention/executive functioning, and visuospatial skills. Mayo Older American Normative Studies (MOANS) norms were used to determine scaled scores for these tests, and results at or below 1.5 standard deviations from the mean were considered abnormal.

Results: Mean age at first testing was 62.6 years, and mean formal education was 13.2 years. Two had a profile of significantly impaired language functioning with relative sparing of other domains. Two individuals initially manifested significant amnesic difficulties without deficits on attention/executive tasks. Three individuals exhibited early prominent

visuospatial deficits to a degree not typical of frontotemporal dementia. Although all patients ultimately developed executive dysfunction, this was not a marked feature in the initial testing of four subjects. Deficits in four members of one large kindred varied widely, including one with predominant language impairment resembling PPA, one with predominantly amnesic impairment, and two with predominantly executive impairment. **Conclusions:** Mutations in PGRN are associated with a varied spectrum of deficits on neuropsychological testing. This heterogeneity is unlikely to be explained by the presence of different PGRN mutations since all known mutations are thought to create null alleles, and heterogeneity exists within kindreds as well.

Correspondence: *Brendan J. Kelley, M.D. M.S., Neurology, Mayo Clinic, Gonda 8 South, 200 1st St. SW, Rochester, MN 55905. E-mail: kelley.brendan@mayo.edu*

A.P. KEY, S.M. WILLIAMS, S. MATHIESEN, E. ROOF, E. PANTINO, R. KOSSLER & E. DYKENS. "Are You Going To Eat This?": ERP Indices of Food Perception In Adults With Prader-Willi Syndrome.

Objective: Prader-Willi syndrome (PWS) is a genetic disorder characterized in part by unusual eating behaviors and risks of obesity. The current study was the first to examine differences in brain activity associated with evaluation of foods differing in suitability for consumption.

Participants and Methods: Visual ERPs were recorded from 16 adults with PWS (17-27 yrs) and 16 age- and sex-matched controls. Stimuli included color photographs of food items (single foods, proper and odd combinations, contaminated). The participants evaluated each stimulus regarding whether they would consider eating presented food.

Results: ERP analysis noted that food stimulus evaluation began as early as 50ms and continued through 600ms after stimulus onset. The two groups differed in the processing strategies as reflected in the types of discrimination and scalp topography. The controls consistently discriminated stimuli into "good"- "bad" categories based on visual properties (50-180ms) and cognitive evaluation (130-430ms). Participants with PWS grouped the stimuli into "single"- "combined" categories, did so quickly (50-180ms), and did not engage in any further classification.

Conclusions: Even in the absence of explicit responses, ERP results indicated that the two groups processed food stimuli differently. Unlike the controls, adults with PWS evaluated food exclusively in terms of quantity. This finding is especially interesting because persons with PWS typically can verbalize good/bad food choices but reported hypothalamus abnormalities resulting in impaired satiety signals may override their learned opinions about food. Further work needs to relate ERP findings to food preferences and real-life eating behaviors in those with PWS.

Correspondence: *Alexandra P. Key, PhD, Vanderbilt University, Peabody Box 74, 230 Appleton Place, Nashville, TN 37203. E-mail: sasha.key@vanderbilt.edu*

A.P. KEY, S.M. WILLIAMS, S. MATHIESEN, E. ROOF, E. PANTINO, R. KOSSLER, T. LERNER & E. DYKENS. Visual Memory and Spatial Processing In Young Adults With Williams Syndrome.

Objective: Williams syndrome (WS) is a genetic disorder characterized in part by deficits in visuo-spatial processing. Previous behavioral findings noted abnormal performance on a variety of visual tasks. The current study examined differences in brain activity associated with visual memory and contour closure tasks in persons with WS as measured by event-related potentials (ERPs).

Participants and Methods: Visual ERPs were recorded from 9 adults with WS (age 17-32 yrs) and 9 age- and sex-matched controls. Stimuli included line drawings from the Motor Free Visual Perception Test. In the visual memory task, participants viewed a single picture (2000ms) and matched it to another image presented for 2500ms after a 3-sec delay. In the contour closure task, participants viewed pairs of stimuli consisting of complete and unfinished figures (2500ms) and decided whether the two drawings could be the same.

Results: In the memory task, controls demonstrated the typical “old/new” effect within 300-600ms. Participants with WS showed only an early recognition effect (150-190ms), but their accuracy was reasonable (76% correct). The contour task was more difficult (64% correct) and the ERPs indicated stimulus evaluation beginning at least 50ms later and lasting up to 200ms longer than in controls.

Conclusions: The results suggest that performance differences in visuo-spatial tasks are due to altered perceptual mechanisms in WS. Increased reliance on early perceptual processes and difficulties with later stages may lead persons with WS to utilize simplified strategies. These strategies may be successful in simpler tasks but insufficient for more complex situations.

Correspondence: *Alexandra P. Key, PhD, Vanderbilt University; Peabody Box 74, 230 Appleton Place, Nashville, TN 37203. E-mail: sasha.key@vanderbilt.edu*

T.M. LEVINE, S.L. RIMRODT & L.E. CUTTING. Reading Disability and Language Differences in Children with Neurofibromatosis Type 1.

Objective: Neurofibromatosis Type 1 (NF-1) is a genetic disorder characterized by a high incidence of visuospatial impairment, but other neuropsychological and academic impairments have also been reported including reading disabilities (RD). RD is characterized by single word reading deficits that are believed to arise from weaknesses in phonological processing. For this study, we investigated the neuropsychological profile of children with NF-1.

Participants and Methods: Children with and without RD as well as those with and without NF-1 (RD=24, CNT=26, NF=12, NF-RD=13) were compared on basic reading, fluency, reading comprehension, and language tasks.

Results: Results revealed that the NF and CNT groups performed similarly on most measures; however, consistent with findings indicating that NF is associated with language weaknesses, the NF group, regardless of RD status, performed lower on a receptive language measure than the CNT group. Comparisons between the NF-RD and RD groups revealed that the NF-RD group performed comparably to the RD group on basic reading, fluency, and language tasks; however, the NF-RD group performed significantly better than the RD group on one comprehension measure (Gates-MacGinitie Comprehension Task, $p < 0.009$) and an inferential language measure (The Test of Language Competence - Expanded, Ambiguous Sentences subtest, $p < 0.026$).

Conclusions: Overall, our findings suggest that our NF-RD group performed similarly to our RD group. Nevertheless, children with NF-RD performed better than children with RD on tasks involving more complex language suggesting that, although they have poor word reading, some of their higher-level language processing skills may be relatively spared.

Correspondence: *Terry M. Levine, M.S., Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 North Broadway, Suite 232, Baltimore, MD 21205. E-mail: levine@kennedykrieger.org*

D.J. MARCUS, M. SHAPIRO, L. SELDIN-SOMMER, G.A. GIOIA & J. JANUSZ. Everyday Executive Functioning as a Predictor of Behavioral, Emotional, and Adaptive Functioning in Children with Neurofibromatosis Type 1.

Objective: Children with Neurofibromatosis, Type 1 (NF1) are at-risk for cognitive deficits such as executive functioning (EF) problems, as well as impaired behavioral, emotional, and adaptive functioning. Although EF problems are common in NF1, the relationship of these impairments to other behavioral outcomes has not been well studied.

Participants and Methods: 48 children with NF1 were recruited from hospital clinics and a summer camp for children with NF1. Measures included the Behavior Rating Inventory of Executive Functioning (BRIEF), Behavior Assessment System for Children (BASC), and Adaptive Behavior Assessment System (ABAS-II).

Results: Almost half the participants (45.8%) were elevated on the Global Executive Composite scale of the BRIEF. Index scores were higher for metacognitive problems than behavioral regulation. Children with global EF deficits were elevated on the Hyperactivity, Attention Problems, Internalizing Problems, and Behavior Symptoms scales of the BASC. Children without EF deficits were not elevated on any BASC scale. Group comparisons using MANOVA indicated the EF deficit group had more attentional and affective problems, as well as greater externalizing problems and behavior symptoms overall. The EF deficit group also scored below average on 8 of 10 adaptive scales of the ABAS-II. Children without EF deficits were impaired on only 1 scale. The EF deficit group scored worse on all scales except Social Problems.

Conclusions: Many children with NF1 do not have problems with behavioral or adaptive functioning, and deficits in everyday executive functioning may be a useful factor for identifying which children are more likely to show these impairments.

Correspondence: *David J. Marcus, Ph.D., Neuropsychology, Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: dmarcus@cnmc.org*

E.G. SHAPIRO, K. BJORAKER, K. DELANEY & C. WHITLEY. A comparison of neuropsychological function in two forms of MPS I.

Objective: Few diseases of early life are specific to hippocampal dysfunction. Recently, a clinical study of an attenuated form of mucopolysaccharidosis (Hurler-Scheie, and Scheie syndromes) found decline in cognition, poor memory encoding, and poor visual spatial ability despite enzyme replacement therapy (ERT). In the severe disorder, Hurler syndrome, children slow in language acquisition over the first three years and then lose milestones if not treated with hematopoietic stem cell transplant (HSCT).

Participants and Methods: We compared the neuropsychological profiles of 6 patients with attenuated MPS and 6 patients with Hurler syndrome (with HSCT at age two or earlier) matched for Full Scale IQ. Memory encoding, visual spatial ability, reading ability, vocabulary, and recognition memory, verbal and performance IQs were measured.

Results: No differences were found on IQ measures (verbal and performance), reading ability and vocabulary. Significant differences were found on memory encoding using Mann Whitney U ($Z = -2.31$, $p \leq .02$), and on visual spatial ability ($Z = -2.68$, $p \leq .004$).

Conclusions: We conclude that attenuated MPS patients show differential memory and visual spatial impairment despite ERT, compared to IQ matched severe Hurler patients who had HSCT. Hippocampal damage, hypothesized to underlie such deficits may be averted by early transplant in Hurler syndrome with enzyme crossing the blood brain barrier. The difficulties in encoding new information and in visual spatial perception in attenuated MPS I are not ameliorated by enzyme replacement as the enzyme does not cross the blood brain barrier. After completion of a current ongoing MRI/neuropsychological study to explore the hippocampal basis of these disorders, future clinical trials may examine the effects of direct intrathecal infusion of enzyme on the preservation of memory and other cognitive abilities.

Correspondence: *Elsa G. Shapiro, PhD, Pediatrics, University Of Minnesota, MMC 486, 420 Delaware St., Minneapolis, MN 55455. E-mail: shapi004@umn.edu*

J. WARD, A. INSCORE, B. SHPRITZ & J. BRANDT. Cognitive Differences in Pre-Clinical Gene-Positive Individuals Who Develop Huntington's Disease An Average of Seven Years Following Baseline Evaluation.

Objective: To compare the baseline cognitive test performance of pre-symptomatic gene-positive subjects who became symptomatic with Huntington's disease (HD) to that of pre-symptomatic non-converters and gene-negative control subjects.

Participants and Methods: Participants were 21 pre-symptomatic gene-positive subjects who “converted” to HD an average of 6.3 years from baseline visit, 21 gene-positive subjects who remained pre-symptomatic, and 42 gene-negative control subjects matched to converters on age and education. Each subject underwent comprehensive neurological and neuropsychological evaluation.

Results: Analyses of variance revealed significant differences between converters and control subjects in performance on Stroop Color Naming and the Wisconsin Card Sorting Test at baseline visit. Converters differed significantly from non-converters on baseline measures of the Symbol Digit Modalities Test (SDMT) and the Block Design subtest of the WAIS-R. However, the difference in SDMT performance was no longer significant after co-varying for minor motor findings. Yet, step-wise logistic regression showed that the addition of the SDMT score to a rating of chorea resulted in better prediction of HD status (i.e., 80.5% group classification) than that provided by chorea score alone (73.2%).

Conclusions: Cognitive alterations can be seen in “pre-symptomatic” gene carriers as early as 7 years prior to conversion to HD. A combination of neurologic and neuropsychological variables (i.e., chorea rating and SDMT) provided optimal prediction of HD status (i.e., converter vs. non-converters). Correspondence: *Julianna Ward, Ph.D., Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine, 600 N. Wolfe St., Meyer 215, Baltimore, MD 21287. E-mail: jward24@jhmi.edu*

Hydrocephalus

B.A. PYYKKONEN, M.D. OLIVEIRA, S.J. HUNTER, E.R. LARSON, M. LACY, D. MOTTLOW & D. FRIM. Interaction between intellectual and academic functioning in congenital hydrocephalus.

Objective: The extant literature reports impaired IQ (Billard et al., 1985; Hirsch, 1992; Lindquist et al., 2005; Dennis et al., 1981; Ito et al., 1997) and academic deficits as hallmark concerns in patients with hydrocephalus (Fletcher et al., 2002; Barnes et al., 2001). Few studies directly examine the relationship between IQ and achievement in this population. The current study examines IQ and achievement in children with hydrocephalus selected for inclusion based upon careful controls for a number of disease factors.

Participants and Methods: Participants were administered the WISC-III and 4 subtests needed from the Woodcock-Johnson-III to compile a broad achievement index score. Individuals (n=41) with hydrocephalus (shunted within the first year of life) were compared to 16 controls. Any undue effect of extremely low cognitive functioning was limited by excluding individuals functioning greater than one year below grade level (per patient report).

Results: A 2 (Domain) x 2 (Subject Type) MANOVA evaluated the effect of intellectual functioning on academic achievement between groups. Domain x Subject type interaction was significant [$\Lambda = .907$, $F(1, 57) = 5.87$, $p = .019$]. Univariate analysis assessing domain was also significant [$\Lambda = .760$, $F(1, 57) = 17.99$, $p = .000$]. Significant group differences were observed for FSIQ [$t(57) = 3.93$, $p < .000$], but not for overall academic achievement [$t(57) = 1.48$, $p = .144$].

Conclusions: Despite evidence of deficits in IQ, children with early shunted hydrocephalus performed similar to peers in regard to Academic functioning. Implications for individuals with cognitive difficulties secondary to hydrocephalus are considered in terms of academic performance.

Correspondence: *Benjamin A. Pyykkonen, Illinois Institute of Technology, 515 Kipling Court, Wheaton, IL IL. E-mail: pyykben@iit.edu*

B.A. PYYKKONEN, E.R. LARSON, S.J. HUNTER, M.D. OLIVEIRA, M. LACY, D. MOTTLOW & D. FRIM. Cognitive performance in congenital hydrocephalus.

Objective: The extant literature reports cognitive impairment secondary to hydrocephalus, with some authors suggesting primary non-dominant hemisphere involvement. However, the literature is inconclusive in this regard. A number of disease related factors, such as age at shunting may contribute to the heterogeneity of these results. The current study examined cognitive performance in children shunted within the first year of life, specifically examining the extent to which their profiles suggest non-dominant hemisphere dysfunction.

Participants and Methods: All participants were administered a neuropsychological battery assessing a number of cognitive domains. Children with hydrocephalus (n=41) were compared to a group of healthy controls (n=18) using domain scores.

Results: Cognitive data revealed significant differences between groups on tests of executive functioning, language, and verbal memory. Contrary to previous research, there were no significant group differences in attention, visuospatial memory, visuospatial perception, and processing speed. Hierarchical regression revealed executive functioning as the only significant predictor of group membership, $R(\text{squared}) \text{ change} = .204$, $F(1, 47) = 12.04$, $p = .001$.

Conclusions: The current study reveals that patients with early treatment of absorptive hydrocephalus exhibit deficits on measures of executive functioning, language, and verbal memory, with executive functioning presenting as a primary deficit. Some of these findings are inconsistent with previous studies. The current research controlled for a number of disease related variables, and the discrepancy noted between our findings and others suggests there may be subgroups of patients with hydrocephalus who display qualitatively different patterns of cognitive impairment. Implications are discussed in light of previous research.

Correspondence: *Benjamin A. Pyykkonen, Illinois Institute of Technology, 515 Kipling Court, Wheaton, IL IL. E-mail: pyykben@iit.edu*

B.A. PYYKKONEN, T. DO, S.J. HUNTER, E.R. LARSON, M. LACY, M.D. OLIVEIRA, D. MOTTLOW & D. FRIM. Intellectual functioning in children treated for hydrocephalus with nonsiphoning shunts.

Objective: The existent research suggests that intellectual impairment is a common outcome of hydrocephalus (e.g., Billard et al., 1985; Hirsch, 1992; Lindquist et al., 2005; Dennis et al., 1981; Donders et al., 1991; Ito et al., 1997). Yet, there is evidence suggesting that etiological and treatment factors play a significant role in cognitive outcomes. The present study methodologically addresses factors related to intellectual functioning evident in the literature, including: a) diverse etiology, b) undue effect of very low functioning patients, c) age of intervention, and d) shunt revision and/or infection history.

Participants and Methods: 41 hydrocephalic patients perinatally shunted were compared to 16 healthy controls. Intellectual functioning was assessed using the WISC-III.

Results: Significant group differences were noted on FSIQ (WISC-III FSIQ; $t = 3.867(55)$, $p < 0.000$), VIQ (WISC-III VIQ; $t = 3.985(55)$, $p < 0.000$), and PIQ (WISC-III PIQ; $t = 2.863(55)$, $p = 0.006$) with patients performing below healthy participants. Number of shunt revisions and number of shunt infections were not significantly correlated with IQ ($p > .10$). To examine the correlation between VIQ and PIQ within the hydrocephalus group, a Spearman's Rho rank order was conducted. Test results were significant ($r_s = .685$, $p < .000$), suggesting a high degree of correlation between VIQ and PIQ in these hydrocephalic patients.

Conclusions: Current findings reveal poorer IQ functioning in patients with hydrocephalus than in healthy participants. Yet, contrary to previous research, there was no significant VIQ-PIQ split noted. Further analyses of results evidenced no noticeable subgroups, indicating that our control of disease variables yielded a relatively homogenous group. Implications for future sampling are discussed.

Correspondence: *Benjamin A. Pyykkonen, Illinois Institute of Technology, 515 Kipling Court, Wheaton, IL IL. E-mail: pyykben@iit.edu*

M.D. OLIVEIRA, B.A. PYYKKONEN, M. LACY, E.R. LARSON, S.J. HUNTER, D. MOTTLOW & D. FRIM. Cognitive outcome as a function of endoscopic third ventriculo-cisternostomy in hydrocephalus.

Objective: Hydrocephalus results from a build up of cerebrospinal fluid (CSF) in the brain causing increased intracranial pressure and resulting brain dysfunction. The current treatment of hydrocephalus typically consists of the implantation of an extracranial CSF shunting device, which leads to improvement in a number of cognitive domains, particularly memory functioning and language fluency (Erickson et al., 2001). However, the development of modern neuroimaging and endoscopic technologies has facilitated the emergence of endoscopic third ventriculo-cisternostomy (ETV) as a treatment alternative to standard shunting procedures for obstructive hydrocephalus (Burtscher et al., 2003). This technique involves a surgical bypass of the area of obstruction to CSF flow. Although the clinical response to ETV has been reported, its relation to higher cortical functioning is not well understood. The current study examined the impact of ETV on cognitive outcome.

Participants and Methods: 4 participants with idiopathic aqueductal stenosis (post ETV treatment) underwent a neurocognitive battery assessing global cognitive status, executive functioning, attention, memory, and mental processing speed.

Results: Participants with hydrocephalus were found to have deficits in memory, visuo-construction, and executive functioning when scores were compared to normative data adjusted for age.

Conclusions: Adults with hydrocephalus due to idiopathic aqueductal stenosis continue to display reduced cognitive functioning following ETV. Since ETV may result in fewer post operative complications, it is essential to better understand the sequelae of this treatment. Future studies may compare the cognitive outcome of ETV and standard shunting procedures.

Correspondence: *Benjamin A. Pyykkonen, Illinois Institute of Technology, 515 Kipling Court, Wheaton, IL IL. E-mail: pyyken@iit.edu*

Learning Disabilities/ADHD

L.J. ALTMANN, L.J. LOMBARDINO, C. PURANIK, K. SHEPHARD & S. EIDSON. Do the Memory and Vocabulary Deficits in Dyslexia Persist into Adulthood?

Objective: Children with developmental dyslexia (DD) have deficits in memory and vocabulary; however, it is unclear whether these deficits persist into adulthood. This study compares 16 college students with DD to memory and vocabulary-matched normal readers (NR) on a variety of memory and vocabulary tasks.

Participants and Methods: 105 college students with normal reading and 16 with DD completed 6 memory and 3 vocabulary tasks. 2 subgroups matched to the DD group on memory (M-match) or vocabulary (V-match) were identified. Vocabulary tasks included: WAIS-R, Shipley (reading), Word-reading (from the Woodcock-Johnson and WRAT word attack lists) accuracy and RTs. Memory tasks included: digit span forward and backward, digit ordering, and three levels of an n-back task, each with 85 fillers and 15 critical trials. V-Match NR were matched on the WAIS-R and Shipley vocabulary tests. M-Match NR were matched on digit span forward and digit ordering.

Results: All NR: DDs scored poorer than all NRs on all measures except WAIS vocabulary and the 2-back.

V-match: There were significant multivariate effects of group on word reading accuracy and RTs and, separately, on memory measures. DD scored poorer on all tasks except 1 and 2-back.

M-match: The multivariate effect of group was not significant for vocabulary or memory analyses. Only word reading times and 0-back were significantly poorer among DDs.

Conclusions: Deficits in expressive and reading vocabulary apparently resolve in DD adults attending college, although word reading continues to be impaired.

Vocabulary scores overall were similar to those of M-match NR, suggesting that poor memory may impair the acquisition of vocabulary in both groups.

Memory scores of DD participants were low on most measures; however, poor performance on the 0-back was unexpected. We postulate that slow letter recognition in DDs may hamper response inhibition in this task.

Correspondence: *Lori J. Altmann, PhD, Communication Sciences and Disorders, University of Florida, 336 Dauer Hall, Box 117420, Gainesville, FL 32611-7420. E-mail: laltmann@ufl.edu*

L. ANLLO-VENTO, V. LÓPEZ-HERNÁNDEZ, G. GILLINGHAM, M. KATZ & D.C. DELIS. Neuropsychological Performance of ADHD Adults on the Delis-Kaplan Executive Function System.

Objective: Reports of neuropsychological impairments related to executive function in ADHD have been based on classic neuropsychological tests, which have often failed to selectively separate the cognitive operations required for successful task performance. Here, we used several subtests of the Delis-Kaplan Executive Function System (D-KEFS) to assess executive function in adults diagnosed with ADHD and a non-ADHD comparison group.

Participants and Methods: Potential participants were screened over the phone and later evaluated by means of structured clinical interviews (SCID-IV and K-SADS), self-report and parent questionnaires, and estimates of IQ and reading ability. Subsequently, they were administered the Trail Making Test (TMT), Verbal Fluency Test (VF), Design Fluency Test (DF), Color-Word Interference Test (CWI), and Tower Test (TT) of the D-KEFS. The ADHD group included 23 subjects (56% males, mean age=29 [19-48]), while the control group included 17 subjects (41% males, mean age=32 [19-56]).

Results: The Letter Fluency component of the VF test best discriminated between groups, while Category Fluency and Category Switching did not differ as a function of ADHD status. ADHD subjects committed a higher proportion of set-loss errors in the VF Test. In addition, the Naming and Word Reading conditions of the CWI Test also helped differentiate between groups. In contrast, performance on the TMT, DF, and TT did not vary as a function of group membership. No deficits were evident in the switching or inhibition components of these executive tasks.

Conclusions: Our data support recent reports that call into question the idea that the core deficit in ADHD is one of executive function. It appears that initial performance, particularly in comparatively novel and effortful tasks, is significantly diminished in ADHD adults. Switching and inhibition seem to be unaffected. In addition, verbal tasks show greater deficits than their non-verbal counterparts. The data are discussed in light of recent developmental theories of ADHD.

Correspondence: *Lourdes Anllo-Vento, Ph.D., Neurosciences, University of California, San Diego, 9500 Gilman Drive, MC 0608, La Jolla, CA 92093-0608. E-mail: lanllo@ucsd.edu*

S. BRAUN, A. LAMACCHIA, M. KIBBY & G. HYND. Planum Temporale Morphology in Children with Developmental Dyslexia and its Relationship to Phonological Processing.

Objective: Dyslexia is often characterized by poor phonological processing and sometimes atypical morphology in the planum temporale. The purpose of this study was to examine the planum and its relationship to phonological processing in children with and without dyslexia.

Participants and Methods: Participants included 25 children with dyslexia and 25 without it, ages 8-12 years. Neuropsychological test data and MRI scans were collected as part of a larger project (R01 HD26890-07), with MRI measurements being conducted as part of a subsequent project (R03 HD048752-01). The planum, temporal (PT) and parietal (PP) banks, was manually traced following procedures similar to Leonard et al. (1993). Phonological processing was assessed using the CTOPP, with Numbers Forward and Backward from the CMS being included as measures of phonological memory.

Results: Children with and without dyslexia were comparable in age, gender, race, FSIQ and PIQ. They differed on VIQ, with the dyslexia group scoring lower. Using ANCOVA with VIQ as a covariate, groups were comparable in gray-matter volume for all structures (right PT, right PP, left PT, left PP). However, when symmetry of the right PP and PT occurred (PT = PP), it occurred solely in the dyslexia group. For the non-dyslexia group, phonological awareness and phonological memory were correlated with left hemisphere asymmetry (greater PT than PP volume associated with better performance). Rapid naming was negatively correlated with right PT volume. For the dyslexia group, phonological memory was correlated with right PP volume.

Conclusions: Implications will be discussed, along with the relationship between children's planum morphology and their parents'.

Correspondence: *Stacy J. Braun, Psychology, Southern Illinois University-Carbondale, 305 Robinson Circle, APT BF, Carbondale, IL 62901. E-mail: sbraun@siu.edu*

L.A. CARR, T. CARR & J.T. NIGG. Temporal Acuity and the Effect of Subtype in Adults with ADHD.

Objective: Temporal processing is a potential core neuropsychological weakness in ADHD involving corticocerebellar and corticostriatal systems. This study examined auditory temporal perception in adults with ADHD.

Participants and Methods: Participants were evaluated through a multi-stage, multi-informant process, including normative rating scales and semistructured clinical interviews (SCID and KSADS). A multidisciplinary diagnostic team arrived at reliable best estimate diagnostic assignment after reviewing all file information. The final sample of 92 participants (18-38 yrs old, $m=24$ yrs) included 46 controls and 46 ADHD (23 inattentive type (ADHD-PI) and 21 combined type (ADHD-C)). An auditory temporal discrimination task was administered via computer with tones presented binaurally. Participants indicated by button press if a second tone was longer or shorter than the standard for two sets: short (< 400 ms) and long durations (> 400 ms). Individual thresholds were estimated using the PEST procedure. Standard deviation (mean difference threshold) was used as the dependent measure.

Results: Omnibus ANOVA revealed higher thresholds overall (lesser acuity) in the ADHD group compared with controls ($F(1,89)$, $p=.016$), but no interaction with duration set. The three-group effect was marginally significant ($p=.051$), but revealed a significant interaction of group and duration ($p=.029$). Pairwise comparisons in univariate tests suggested that ADHD-C was worse than controls for long durations ($p=.006$), and ADHD-PI was deficient at short durations ($p=.024$). Direct comparison of subtypes yielded a significant interaction with duration ($p=.017$).

Conclusions: Results confirm poorer temporal information processing for ADHD in adulthood, and provide evidence that ADHD subtypes may reflect meaningful differences in basic patterns of temporal processing weakness.

Correspondence: *Laurie A. Carr, MA, Psychology, Michigan State University, Psychology Bldg, Rm 292, East Lansing, MI 48824. E-mail: carrlaur@msu.edu*

M.A. COLLETTE, S. GRANT, E. GELLINEAU & M. WEEKS. Organization and Quality of Stories Written by NLD Students as a Function of Response Modality: Keyboarding on the Computer Versus Handwriting.

Objective: Individuals with Nonverbal Learning Disorder often have difficulty with organization, including of expressive language output and

story writing. This study investigates whether writing stories by keyboarding on a computer helps NLD students to write with a higher quality level than when they handwrite their stories. It is hypothesized that the NLD students' keyboarded stories will be better organized and of higher quality than their handwritten stories.

Participants and Methods: Twenty-six 8 to 15 year old boys and girls (11 Female, 15 Male) diagnosed with NLD who were serial admissions to an out-patient pediatric neurological clinic were given the Test of Written Language Development-II subtest of Thematic Maturity (TOWL).

Each participant wrote two stories in response to picture prompts in the TOWL, which were scored according to the norms of the test.

Students were diagnosed with NLD in the clinic and all had significantly higher WISC-III Verbal IQ's relative to Performance IQ's and scores below average and IQ-based expectations on the Rey Osterrieth Complex Figure Drawing Test.

Results: The hypothesis received strong support from the analysis: on the T Test for Related Samples t was 7.46 (sig. .001). The Computer-written mean score on the TOWL was 66.42, whereas the mean score in the Handwritten condition was 25.81.

Conclusions: Students with NLD in this clinical population performed significantly better in story writing for organization and quality when they wrote on a computer rather than in handwriting. It is suggested that NLD students be taught keyboarding earlier and that computer use be considered in teaching them writing skills. Further study should be directed to assessing the role of gender, cognitive level, and whether frontal or posterior findings on neuropsychological evaluation are related. Further research is needed both to determine whether the current findings hold for the non-clinical and neurotypical populations and to find out why the stories written by computer are better organized.

Correspondence: *Martha A. Collette, phd., Boston Psychological Assoc., 24 neptune st, Beverly, MA 01915. E-mail: marthacollette@comcast.net*

M.A. COLLETTE. Nonverbal Learning Disordered Students Write Better Stories with computers: relation to frontal versus posterior neuropsychological findings, intelligence and gender.

Objective: In recent research, NLD students wrote better organized stories on a computer rather than by handwriting. The role of frontal dysfunction compared to posterior dysfunction (as determined by neuropsychological testing) in the lower quality of handwritten stories will be explored, as well as gender and intelligence.

Participants and Methods: Twenty-six 8 to 15 year olds ($F=11$, $M=15$) diagnosed with NLD as serial admissions to an outpatient neurological clinic were given the Test of Written Language Development-II subtest of Thematic Maturity (TOWL). Each participant wrote 2 stories in response to picture prompts in the TOWL, yielding percentile scores. All had significantly higher WISC-III Verbal IQ's relative to Performance IQ's and scores below IQ-based expectations on the Rey-Osterrieth Complex Figure Test. Performance on the TOWL was compared for girls versus boys and for those with higher IQ's (WISC-III FS IQ's above 103) versus lower IQ's (WISC-III FS IQ's below 104). Scores on the TOWL were also compared for those with more frontal/motor test findings and those with more posterior/sensory test findings on Reitan's Sensory-Perceptual Examination.

Results: Neither gender, preponderance of frontal versus posterior neuropsychological test findings nor IQ accounted for the superiority of the stories written in the computer keyboarding condition. T Tests for Related Samples yielded non-significant comparisons in each condition and significantly higher scores on the TOWL-II stories for the computer written stories.

Conclusions: It appears that writing using a computer is helpful for story writing for male and female NLD students as well as for those with higher and lower cognitive test scores. It also helped those whose neuropsychological test findings were frontal and those with more posterior findings. Further research will be needed to see how general this finding is, whether it occurs in the neurotypical population, other LD populations and why it occurs.

Correspondence: *Martha A. Collette, phd., Boston Psychological Assoc., 24 Neptune St., Beverly, MA 01915. E-mail: marthacollette@comcast.net*

A.E. GERRARD-MORRIS, M. SEMRUD-CLIKEMAN & D. ZANGER. Internalized Socioemotional Functioning among Children with Social Competence Disorders, ADHD, and Reading Learning Disability.

Objective: Individuals with social competence disorders (SCD), including Nonverbal Learning Disability (NVLD) and Asperger's Syndrome (AS), are classified by a variety of social problems. Rourke (1989) has hypothesized that the neuropsychological deficits that characterize these individuals result in social problems and subsequent impaired socioemotional functioning. This study was guided by three questions. First, do children with social competence disorders experience greater levels of internalizing socioemotional problems than children with Reading Learning Disability (RLD) and Attention Deficit/Hyperactivity Disorder (ADHD)? If so do these problems worsen with age? Finally, do visual-spatial skills, one neuropsychological skill set, predict internalizing socioemotional functioning.

Participants and Methods: Seventy-one children, ranging from age 8 to 14, participated in this study and were administered the Judgment of Line Orientation. Their parents completed the Behavior Assessment System for Children- Parent Form.

Results: Using an ANOVA, group means were compared and results indicated that children with NVLD and AS were significantly more likely to exhibit internalized socioemotional problems as compared to children in the other diagnostic groups. Regression analysis also indicated a non-significant trend for the social competence group that showed increasing levels of internalized socioemotional problems as they become older. There was not a significant relation between visual-spatial skills and internalized socioemotional functioning.

Conclusions: Although neuropsychological underpinnings of their socioemotional problems were not evidenced by this study, it is clear that such problems exist for children with social competence disorders. Regardless of their origin, the social problems that these children continuously face warrant further attention by mental health professionals and educators.

Correspondence: *Aimee E. Gerrard-Morris, M.A., Educational Psychology, University of Texas at Austin, 3800 NE 19th Ave, Portland, OR 97212. E-mail: gerrarda77@yahoo.com*

M.E. KRAMER, J.N. EPSTEIN, N.P. MILLS, M. ALTAYE, C.M. ADLER, S.M. STRAKOWSKI & M.P. DELBELLO. Performance of ADHD Adolescents and Normal Controls on a Parametric Continuous Performance Test (CPT).

Objective: Continuous performance tests (CPTs) are widely used in clinical and research settings to measure deficits in attentional performance. Numerous studies have found that CPT performance measures differentiate Attention Deficit Hyperactivity Disorder (ADHD) patients from normal controls. However, not all studies have documented group differences, and controversy exists as to the appropriateness and efficacy of using CPT performance to characterize ADHD groups.

Participants and Methods: In this study, a parametric Continuous Performance Task-Identical Pairs (CPT-IP) task was administered to 17 adolescents with ADHD and 21 healthy control adolescents to determine if performance parameters would be affected by task difficulty or ADHD status. The task was performed in a magnetic resonance (MR) scanner as part of a larger functional MRI study. Subjects

viewed random single-digit numbers presented at a fixed interval and were instructed to press a button as quickly and accurately as possible each time the same digit appeared twice in succession. Three levels of attentional demand (0%, 25%, and 50% stimuli degradation) were presented.

Results: Performance measures included discriminability, hit rate, false alarm rate, and reaction time. Results indicated that both groups performed similarly on the task. There were no statistically significant differences in performance measures by group, degradation level, or group by degradation level. However, within the ADHD group, reaction time significantly increased as degradation level increased.

Conclusions: These findings suggest that even as task difficulty increased, adolescents with ADHD were as accurate as controls on the CPT-IP, although their reaction time suffered more in comparison to control participants as degradation level increased.

Correspondence: *Megan E. Kramer, M.A., Psychology, University of Cincinnati, 2624 Clifton Ave, Dyer Hall Room 429, Cincinnati, OH 45221. E-mail: kramerm2@email.uc.edu*

L. LESUEUR & K.E. BEKKEN. Rehabilitating the classification of learning dysfunction.

Objective: The success of any rehabilitation, whether it is pursued as post-insult or as learning remediation, will always depend on the strength of its underlying theoretical approach. Rehabilitation assumes re-learning, so any approach to rehabilitation must at least be consistent with our fundamental learning theories and categories of dysfunction. However, increasingly within the practice of diagnosing learning dysfunction, we see great confusion regarding the current diagnostic categories, particularly as they relate to what is described as the "autistic spectrum." These confusions vary, but can be generally described as uncertainties about the considerable overlaps in symptoms across categories, and about the conceptual nature of each category as defined in the literature. The extensive uncertainty surrounding the actual practice of diagnosing individuals suffering learning dysfunction suggests that the classification of these disorders is in a state of flux and potentially misled and misleading.

Participants and Methods: This observation prompted an ad hoc descriptive review of 150 assessment profiles representing a broad range of ages and learning dysfunctions (e.g., Asperger's, NLD, LLD, ADD, developmental academic disorders, etc.), across a list of 60 specific symptoms.

Results: Results showed abundant shared symptoms, and no isolated instances of any diagnostic category. Moreover, the pattern observed for the autistic spectrum provided a key to understanding the interconnectedness of these classifications, as well as to appreciating behavioral symptoms and diagnoses.

Conclusions: This descriptive review forced a radical reconceptualization of the classification of learning dysfunction, offering considerable implications for understanding learning dysfunction at both the remediation and rehabilitation levels, and therefore also for treatment approaches.

Correspondence: *L. Lynn LeSueur, Ph.D., private practice, 70 Washington St., Suite 322, Salem, MA 01979. E-mail: llynnl@mac.com*

A.D. MATEREK, T.M. LEVINE & L.E. CUTTING. Differences in Language, Fluency, and Executive Function Amongst Children with Word Reading Deficits versus Normal Word Reading/Poor Comprehension.

Objective: Reading disability (RD) typically consists of deficits in word reading accuracy (WRD) and/or reading comprehension (RCD), and it is well known that the presence of WRD often impairs comprehension. However, less is understood about the group of children who exhibit normal word reading accuracy (NWR), but nevertheless develop

RCD (RCD/ NWR). It has been hypothesized that RCD/ NWR may arise from slow reading rate, language deficits, and/ or deficits in executive functioning; the present study sought to determine which of these specific skills were differentially associated with RCD/NWR versus WRD.

Participants and Methods: Sixty-three children (23 RD, 23 Control, 17 RCD/NWR), ages 9 to 14, completed measures of fluency and language while a subset (23 RD, 23 Control, and 10 RCD/NWR) completed the Tower of London (TOL).

Results: Results indicated that both Controls and RCD/NWR subjects tended to read isolated words at a faster rate than WRD participants, regardless of Full Scale IQ (FSIQ). Additionally, on the TOL, children with RCD/NWR demonstrated more excess moves and a greater percentage above optimal strategy than both children with WRD and Controls. On measures of vocabulary and inferential language, scores did not differ significantly between children with WRD versus RCD/NWR, whereas on a grammatical comprehension subtest, RCD/NWR subjects tended to score statistically higher than those with WRD.

Conclusions: Results suggest that children with RCD/NWR appear to struggle more with executive tasks and less with reading rate than participants with WRD and that certain language skills may differ between children with RCD/NWR versus WRD.

Correspondence: *April D. Materek, M.S. Clinical Psychology, Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway ste. 232, Baltimore, MD, MD 21205. E-mail: materek@kennedykrieger.org*

D.G. NEMETH, L.R. SCHECHTER, K.S. MARCEAUX & A.M. LEWIS. Detecting Non-verbal Learning Disorders in Gifted Children.

Objective: To identify Non-verbal Learning Disabilities (NLD) and/or underlying seizure disorders in gifted children.

Participants and Methods: This case study involves a thorough neuropsychological and neurodevelopmental evaluation of an 8 year old Caucasian male. He was referred by his 2nd grade gifted teacher. This child had been classified as gifted with a Full Scale IQ at the 99th percentile when he was age 5 and in kindergarten. Because of his excellent Verbal Skills and cooperative nature, the difficulties this child had with non-verbal skills went unnoticed. Due to the child's symptoms of chronic head banging at bedtime and rocking back and forth while singing to himself after school, his parents sought out neurological consultations. No EEGs or neuroimaging studies, however, were ordered.

Results: Results of a comprehensive neuropsychological evaluation revealed difficulties with attention, concentration and right hemisphere functions, involving primarily visual-spatial skills. Results were positive for NLD. The child was referred to a child psychiatrist for appropriate psychopharmacology for his attentional difficulties and for consultation regarding the value of running a series of EEGs to rule out an underlying seizure disorder.

Conclusions: All too often neurologists discount the symptoms presented by prepubescent children, to the frustration of their parents and teachers. By collecting the aforescribed data and referring to a child psychiatrist for consultation and medication, the possibility of this child's having an underlying seizure disorder was able to be more thoroughly explored. Without the involvement of a neuropsychologist, this child's symptomatology would have been viewed as strictly behavioral.

Correspondence: *Darlyne G. Nemeth, Ph.D., The Neuropsychology Center of Louisiana, LLC, 4611 Bluebonnet Blvd, Ste. B, Baton Rouge, LA 70809. E-mail: dgnemeth@aol.com*

E. STRASSNER & M. SEMRUD-CLIKEMAN. The Relation Between Severity of ADHD Symptoms and Empathic Responding while Reading.

Objective: Children with ADHD have difficulty responding empathically in social situations due to a reduced ability to take the per-

spective of others (Barkley, 1997b; Braaten & Rosen, 2000; Westby & Cutler, 1994). Comprehension of a narrative involves understanding the psychological cause-effect relations in a narrative achieved through perspective taking (Westby, 1999). Thus, children with ADHD may experience difficulty responding empathically while reading.

Many individuals who would not meet the criteria for a DSM-IV diagnosis of ADHD may nevertheless display significant levels of ADHD symptoms at a subclinical level (Sharps et al., 2005). Therefore, it was hypothesized that severity of ADHD symptoms would predict a decreased ability to respond empathically while reading.

Participants and Methods: Forty-five students participated in this study with varying degrees of ADHD symptoms as measured by the SIDAC. Empathic responding while reading was assessed using the Empathic Response Task (Ricard & Kamberk-Killici, 1995). Participants received a score for matching the character's emotions, as well as an interpretation score.

Results: Regression analyses indicated that overall severity of ADHD symptoms significantly predicted both ERT Match and Interpretation scores. Additional examination of symptom severity indicated that symptoms of inattention predicted both ERT Match and Interpretation scores, whereas symptoms of hyperactivity/impulsivity only predicted lower ERT Interpretation scores.

Conclusions: These results suggest that it is important for educators to understand that children with subclinical symptoms of ADHD may have difficulty inferring a character's emotions and motivations while reading. Specifically, it appears that difficulties with attention, even if not diagnosable, negatively affect the ability to empathize with others.

Correspondence: *Emily Strassner, Ph.D., University of Texas at Austin, One Hermann Museum Drive, Apt. 3006, Houston, TX 77004. E-mail: missemmas@earthlink.net*

J. SUHR, E. ZIMAK & L. FOX. Self-reported "ADHD" Symptoms in Adults with ADHD, Mild TBI, or Psychological Disorders.

Objective: Young adults increasingly present for concerns that they have Attention Deficit Hyperactivity Disorder (ADHD). Diagnosis of ADHD in adulthood is particularly problematic, as it may be difficult to document childhood symptoms and impairment. Furthermore, ADHD symptoms are frequently endorsed by individuals with other disorders.

Participants and Methods: In the present study, undergraduate students were selected from a larger nonclinical sample for four groups: 1) history of mild TBI, no childhood diagnosis of ADHD, 2) history of childhood ADHD, no history of TBI, 3) no history of TBI or childhood ADHD, current depression/anxiety (PSY), and 4) controls (no TBI, childhood ADHD, or psychological diagnosis).

Results: On the Wender Utah Rating Scale (WURS), ADHD scored higher than controls. On the CAARS (Connors Adult ADHD Rating Scale) DSM-IV subscales, controls were lower than all other groups in inattentive and total symptoms and were lower than TBI on hyperactive/impulsive symptoms. Controls were lower than PSY on the ADHD Index. ADHD were not different from other clinical groups on any of the scales. Using clinical cutoffs, a higher percentage of TBI, ADHD, and PSY scored in the clinical range on inattention, hyperactivity/impulsivity, and total scores on the CAARS, and a higher percentage of ADHD and PSY scored in the clinical range on the ADHD index. Although a higher percentage of ADHD scored in the clinical range of the WURS, 22% of the TBI and PSY group also did.

Conclusions: Results emphasize the lack of differential diagnostic utility of self-report measures in adult ADHD, even in a non treatment-seeking sample.

Correspondence: *Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

W. WATSON, T. CONWAY & S.C. HEATON. Prediction of Performance on “High Stakes” Measures of Reading Comprehension.

Objective: This study examined how reading skills of children with dyslexia influenced performance on the Florida Comprehensive Assessment Test’s (FCAT) reading comprehension subtest.

Participants and Methods: Reading abilities of children with developmental phonological dyslexia (31 in grades 3-5 and 44 in grades 6-8) were assessed at two successive school years. Computed composite scores represented phonological, orthographic, and semantic processing domains. Hierarchical regressions identified both unique and shared contributions of these domains to FCAT reading comprehension performance.

Results: Despite within and between groups t-tests revealing no significant differences on reading measures, significant improvement on FCAT performance was found. Regression analyses demonstrated semantic skills significantly predicted FCAT performance in both grade groups at initial assessment and in the younger grades group at second assessment. However, phonological processing accounted for more variance only in the older grades group at second assessment. Post hoc analyses of differences between grade groups at the second time point examined the relative contribution of specific reading skills by subdividing composite domains into rapid naming, decoding, word reading efficiency, and phonological awareness composites. Decoding skill predicted comprehension skills at the second assessment.

Conclusions: Semantic, phonological and decoding skills show varying contributions to FCAT comprehension performance. Changes in FCAT performance without changes in reading abilities may reflect variation in FCAT test construction. A multifaceted approach to reading instruction may best prepare children with reading difficulties for variations in comprehension tests’ designs. Further implications of these findings are discussed. Correspondence: *William Watson, Department of Clinical & Health Psychology, University of Florida, College of Public Health and Health Professions, P.O. Box 100165, Gainesville, FL 32610. E-mail: wwatson@phhp.ufl.edu*

Symposium 7**11:00 a.m.–12:30 p.m.****Approaches to Defining when Dementia Begins****Chair: Diane Howieson****D.B. HOWIESON. Approaches to Defining When Dementia Begins.**

Symposium Description: Alzheimer’s disease begins before symptoms appear, perhaps by many years. When disease altering drugs become available it will be critical to identify the disease at the earliest possible stage. Mild cognitive impairment (MCI) is regarded as an early preclinical stage between normal functioning and dementia. Attempts to identify persons with MCI have included both cross-sectional and longitudinal studies of cognitive performance of individuals at risk for AD by virtue of age or genetic factors. Traditional approaches for identifying persons with MCI have drawbacks, including an inability to systematically detect when a subject destined to develop MCI starts to diverge from a clinically normal trajectory. This symposium presents novel means of identifying changes in cognition and behavior in people who are destined to develop MCI. Scott Hofer will present a review of methodological issues related to analyzing longitudinal data and statistical methods for detecting abnormal cognitive decline. Diane Howieson will present

ent data from the WMS Logical Memory test showing performance changes in subjects prior to diagnosis of MCI and how it differs from the normal aging process. Nichole Carlson will present volumetric MRI data showing accelerated brain loss prior to diagnosis of MCI. Jeffrey Kaye will describe a project studying continuous in-home monitoring of activity of elders that may be useful for detecting the onset of MCI. These approaches may help identifying when dementia begins.

Correspondence: *Diane B. Howieson, Ph.D., Neurology CR131, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu*

S.M. HOFER. Identifying Processes of Within-Person Change: Design and Analysis Issues.

Objective: Recent longitudinal evidence has shown that cognitive loss is strongly linked to disease onset and progression in the case of preclinical Alzheimer’s disease and that cognitive function is relatively stable prior to that time. These studies demonstrate that accelerated cognitive loss occurs several years prior to formal diagnosis of dementia, producing an artifact of greater age-related decline in studies of normative aging processes. At the level of the individual, dementia and other disease processes are important determinants of cognitive loss, although the population prevalence and age-specific incidence rates are low.

Participants and Methods: Longitudinal data are essential for identifying the onset (i.e., change point), pattern, and rate of within-person change relative to each individual’s stable baseline. A key feature of longitudinal studies is the opportunity for analysis of the causal heterogeneity of change retrospective to common classifications or events. For example, representing cognitive loss as a function of disease progression (indexed by time to diagnosis) provides a better account of individual variation in cognitive change than chronological age.

Results: The alignment of individual change relative to time of clinical diagnosis dramatically reduces the heterogeneity in rates of change and permits the evaluation of the inflection point associated with disease progression prior to clinical diagnosis.

Conclusions: Design and measurement issues for the estimation of individual change and time of onset include the resolution of temporal sampling, ratio of within-person variation to monotonic change, and repeated testing effects. Findings from a measurement intensive study will be presented that exemplify several of these issues.

Correspondence: *Diane B. Howieson, Ph.D., Neurology CR131, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu*

D.B. HOWIESON, N. CARLSON, M.M. MOORE, A. DAME & J.A. KAYE. Defining When Memory Problems Begin in MCI Patients.

Objective: Identifying when the dementia process begins for Alzheimer’s disease (AD) has important treatment implications. Mild cognitive impairment (MCI) is regarded as an early preclinical stage between normal functioning and dementia. The purpose was to identify the onset of memory impairment associated with MCI in participants in a longitudinal aging project.

Participants and Methods: Annual cognitive examinations were obtained from 156 participants aged 75 years and older who were followed for an average of over seven years. During this period 68 subjects developed (MCI) based on a Clinical Dementia Rating (CDR) = .5. A longitudinal mixed effects model with a change point was used to assess WMS Logical Memory II Story A performance prior to MCI diagnosis and, in a second phase, relative to the time of diagnosis.

Results: Prior to MCI diagnosis, subjects who developed MCI had a significantly different annual change in LM II compared to cognitively intact subjects ($p=.0084$). MCI subjects exhibited a change point 3.1 years prior to MCI diagnosis when the annual rate of memory loss increased.

Conclusions: We conclude that the clinical symptoms of MCI develop gradually and show an accelerated rate of memory loss at a point several years prior to MCI diagnosis. The findings are consistent with MRI data showing a rapid rate of brain volume loss in the years prior to the emergence of MCI symptoms. The findings suggest that the development of clinical symptoms of MCI is not a steady progression of memory loss but rather has a biphasic course.

Correspondence: *Diane B. Howieson, Ph.D., Neurology CR131, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu*

N. CARLSON, M.M. MOORE, A. DAME, D.B. HOWIESON, L.E. SILBERT, J.F. QUINN & K.A. JEFFREY. Trajectories of Brain Atrophy Associated with Onset of Mild Cognitive Impairment.

Objective: In Alzheimer disease the volume of brain loss seen with MRI has been correlated with both the rate of cognitive decline during life as well as the accumulation of associated lesions observed at autopsy. These data suggest that volumetric MRI may be a sensitive biomarker for assessing transitions to dementia. When the volume loss begins and the rates and trajectory of change associated with the clinical transition to dementia has not been established.

Participants and Methods: We will review the relevant longitudinal volumetric literature and present data from a longitudinal aging study of healthy elderly followed for up to 15 consecutive years with standardized clinical examinations and volumetric brain MRI assessments of ventricular volume.

Results: During the study period 47% of subjects developed mild cognitive impairment (MCI). A mixed effects model with a change point was used to model the pattern of brain volume loss in healthy aging compared to subjects diagnosed with MCI. The brain loss trajectory of subjects developing MCI differed from healthy aging in two ways. First, the annual age-dependent change in ventricular volume was greater in those who developed cognitive impairment compared to those who remain cognitively healthy. Second, subjects destined to develop MCI had an additional acceleration of brain loss approximately 2.3 years prior to clinical diagnosis of MCI.

Conclusions: This suggests that there is early slow brain loss developing years prior to clinical symptoms, while a more fulminant, rapid loss of brain associated with "onset" of clinical dementia occurs 24 months prior to the emergence clinical symptoms.

Correspondence: *Diane B. Howieson, Ph.D., Neurology CR131, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu*

J.A. KAYE & T. HAYES. Continuous In-home Monitoring of Elders for Mild Cognitive Impairment.

Objective: Multiple methodologies confirm that signs of dementia onset appear years before the formal clinical diagnosis is made. Further, the observed trajectories of change are not necessarily linear. Current methods of assessing these changes have relied on widely (e.g., annually) spaced assessment time intervals over many years with the data from these assessments being variable and consequently resulting in difficulty in pinpointing when salient change begins, as well as what the trajectory of that change may be. Recent developments in assessment technologies may provide a new way of assessing change that would more precisely inform the timing and patterns of change associated with dementia. This symposium presentation will present data from cognitive and functional domains of assessment acquired longitudinally via unobtrusive, continuous in-home monitoring of healthy seniors and those with mild cognitive impairment.

Participants and Methods: Individuals were assessed with a suite of home sited motion and contact sensors, an automated medication monitor, and home computer interaction to determine the feasibility of such a system to differentiate subtle change by frequent (daily) assessment over for up to 12 months.

Results: Total time-based activity, walking speed, and medication adherence may be measures sensitive to identifying more precisely the onset and defining the longitudinal course of cognitive decline leading to dementia. **Conclusions:** Particularly important may be the ability to capture day-to-day variability which by itself may be an important measure defining cognitive decline.

Correspondence: *Diane B. Howieson, Ph.D., Neurology CR131, Oregon Health & Science University, 3181 SW Sam Jackson Park Rd, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu*

Symposium 8

11:00 a.m.–12:30 p.m.

Not All That Matters is Gray: The Importance of White Matter in Neuropsychology

Chair: Adam Brickman

Discussant: Erin Bigler

A.M. BRICKMAN. Not all that matters is gray: The importance of white matter in neuropsychology.

Symposium Description: Cerebral white matter comprises commissural, association, and projection fibers that provide the brain with an infrastructure for inter-regional communication. Recent advances in structural magnetic resonance imaging (MRI) enable high resolution visualization of white matter in vivo- and afford an enhanced understanding of how disruption in the brain's circuitry disrupts functioning. The goal of this symposium is to highlight the role of cerebral white matter in selective functioning using three MR-derived approaches: volumetrics (bulk tissue), diffusion tensor imaging (DTI; the coherence and orientation of fiber tracts), and tissue quality assessment (white matter hyperintensities). Dr. Brickman will address age-associated differences in white matter volume and their neuropsychological correlates. Dr. Wilde will present data demonstrating cognitive correlates of white matter macrostructural and microstructural abnormalities in children with traumatic brain injury. Dr. Tate will present visualization and quantification approaches for DTI imaging toward an understanding of the pathophysiology and cognitive symptomatology of HIV infection. Dr. Jefferson will present findings demonstrating the impact of reduced cardiac function on executive abilities and the relevance of white matter hyperintensities. Dr. Butters will focus on neural mechanisms underlying the cognitive symptoms of late life depression illuminated by relations between white matter hyperintensities and the PET amyloid-imaging method (Pittsburgh Complex B). Dr. Sullivan will summarize her work using DTI to depict white matter abnormalities and their cognitive and motor correlates in normal aging, HIV infection, and alcoholism. As symposium discussant, Dr. Erin Bigler will provide conceptual insights on the role of white matter from imaging to function.

Correspondence: *Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu*

A.M. BRICKMAN, M.E. ZIMMERMAN, R.H. PAUL, M.S. BUCHSBAUM & Y. STERN. Regional white matter changes across the healthy adult lifespan and their neuropsychological consequences.

Objective: MRI studies that examine age-associated changes in brain structure traditionally focus on regional gray matter or undifferentiated tissue. However, some investigators hypothesize that age-related cognitive decline is the result of selective white matter (WM) degeneration. We conducted a series of studies to characterize the distribution of WM changes in normal aging and their cognitive correlates. Relative WM values were derived in frontal, temporal, parietal and occipital lobes in 199 healthy participants across the adult lifespan. Age was associated with a relative decrease in frontal and temporal WM. Reduced frontal and temporal WM predicted poorer performance on tests of executive function and memory. Mediation analysis suggested that frontal WM partially mediates the relationship between age and cognitive function. To further characterize age-related changes in frontal lobe, four subregions (orbital, medial/cingulate, dorsolateral, lateral) were examined in an independent sample of 70 healthy adults. Across prefrontal subregions, WM gradually declined with age until the mid-60s, where it evidenced a more severe decrease. Finally, we employed a novel multivariate approach to identify covariance patterns of WM that distinguished younger from older adults among 113 participants. The covariance pattern involved cingulate, corpus callosum, deep frontal WM, and insula. The degree to which each individual expressed this pattern was related to performance on tests of executive function and memory. Taken together, the results of this series of studies suggest a relative age-associated decline in WM in anterior brain regions that partially underlie the cognitive changes that are characteristic of normal aging. Support: AG024708, AG261858, NIRC-05-14586
Correspondence: Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu

E.A. WILDE, J.V. HUNTER, Z. CHU, E.D. BIGLER, M. RAMOS, R. YALLAMPALLI & H.S. LEVIN. White Matter Changes in Pediatric Traumatic Brain Injury.

Objective: Neuroimaging studies consistently indicate the vulnerability of white matter to long-term, brain trauma-induced injury and degeneration, which may contribute to cognitive deficits commonly occurring following traumatic brain injury (TBI). However, the impact of brain injury on the developing brain is still incompletely understood, particularly with regard to white matter tracts which are still undergoing myelination through childhood and adolescence. In this study, we examine deleterious changes to white matter using volumetric analysis and measurement of fractional anisotropy (FA) using diffusion tensor imaging (DTI) in a cohort of children aged 8-16 with moderate to severe TBI and a comparison group of children with orthopedic injury, imaged 3 months post-injury. We will present data showing decreased white matter volume in regions of interest including the frontal and temporal lobes, and decreased FA in frontal and temporal areas, the corpus callosum, and the cingulate gyri. The relation of FA in these regions to performance on cognitive tasks involving processing speed and executive functioning will also be presented. Finally, we will introduce data on the relationship between white matter volume and FA in the frontal and temporal lobes and the corpus callosum. Given the insensitivity of conventional magnetic resonance imaging (MRI) to traumatic axonal injury, the primary candidate mechanism for white matter deterioration, DTI may become a tool which elucidates the effects of TBI on the brain's microstructure and it may have future applications as a biomarker for injury severity and a prognostic tool particularly with respect to diffuse axonal injury. Support: NS-21889

Correspondence: Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu

D.F. TATE, R.H. PAUL, T. FLANIGAN, S. ZHANG & D. LAIDLAW. Unique visualization and quantification methods for analyzing white matter integrity/connectivity and cognition among HIV infected patients.

Objective: Diffusion tensor imaging (DTI) is a method for visualizing highly organized white matter pathways within the central nervous system (CNS). Recent studies have demonstrated the utility of DTI metrics when examining the effects of human immunodeficiency virus (HIV) on the brain and alterations in these metrics are thought to provide unique information about the microstructural integrity of white matter tissue organization and integrity not captured in more routine imaging sequences. However, traditional scalar metrics ignore one of the most exciting contributions of diffusion imaging; namely its ability to visualize in vivo the gross organization of white matter connectivity through tractography methods.

In this study, we examined the utility of quantification methods applied to DTI tractography to examine the impact of HIV. Specifically, we discuss the development and utilization of several unique quantitative diffusion tractography metrics. We also examined the relationship between these metrics and commonly administered neuropsychological measures of executive function, attention, speed of processing, language, and memory.

Utilizing these new metrics, we demonstrated significant group differences between HIV infected patients and demographically matched controls for several measures. All tractography measures for the HIV infected patients were shown to be reduced. Significantly, several of these metrics were found to be related to cognitive functions known to be mediated by white matter abnormalities including measures of executive function and speed of processing.

Combined, these findings suggest that unique quantitative tractography metrics capture relevant clinical information and provide meaningful information about the underlying integrity of white matter tracts among HIV infected patients. Support: K23MH073416, K23MH065857, CFAR Development Funds.

Correspondence: Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu

A.L. JEFFERSON. Cardiovascular risk factors for white matter disease.

Objective: Several vascular risk factors have been implicated in the presence and progression of white matter hyperintensities (WMHs) among older adults. Identifying the risk that subclinical perturbations in cardiovascular function pose for morphological brain changes is important because these factors are amenable to intervention, which may prevent age-related changes or dementia. Though some vascular risk factors for WMH, like blood pressure, have received considerable attention in the literature, other variables, like cardiac structure and function, have received less emphasis. The purpose of this presentation is to review findings from a series of studies within our laboratory that suggest reduced cardiac function is related to executive dysfunction and increased WMHs. In particular, cognitive data from a referral-based sample of 72 cardiac outpatients free of clinical dementia revealed reduced cardiac output (i.e., volume of blood exiting the heart) is associated with cognitive sequelae suggestive of disruptions in frontal-subcortical circuitry (i.e., sequencing and planning difficulties). Subsequent structural neuroimaging data (n=36) suggests reduced cardiac output is related to increased WMHs contiguous to subcortical nuclei but not to other WMH regions. Potential mechanisms accounting for these findings will be discussed, including data that address differences in cerebral perfusion patterns in subcortical brain regions. Finally, a model accounting for these findings will be presented, which proposes that subclinical perturbations in cardiac structure alter cardiac function. These alterations act as an intermediate mechanism contributing to a second pathway of brain injury in addition to that created by traditional

vascular risk factors. Support: AG022773, HD043444, AG13846, AG017975

Correspondence: *Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu*

M.A. BUTTERS, C.C. MELTZER, H.J. AIZENSTEIN, J.C. PRICE, C.A. MATHIS, W.E. KLUNK, S.T. DEKOSKY & C.F. REYNOLDS. White matter hyperintensities, amyloid, and cognition in late-life depression.

Objective: Late-life depression (LLD) is associated with substantial white matter hyperintensity (WMH) burden and is a risk factor for persistent MCI and future dementia (most often AD). Variable data, however, emanate from different laboratories and the disparate results have been difficult to reconcile. This study investigated the relationships among LLD and MCI that persisted after antidepressant therapy, with two imaging approaches: a novel amyloid-binding PET ligand (Pittsburgh Compound-B; PIB) and volumetric MRI of WMH. We hypothesized that LLD would be associated with numerous brain abnormalities, including WMH and amyloid deposits, which lower brain reserve capacity, and in turn, increase risk of cognitive impairment.

Participants and Methods: We studied 11 recently remitted LLD subjects (4M:7F, mean age 72.2 ± 5.2). Nine presented and were treated in a depression clinic; 7 qualified for a diagnosis of MCI. The remaining 2 presented with MCI and a history of mid-life-onset depression. Data from 8 healthy elders (mean age 71.5 ± 3.0) were used for comparison. PET was acquired with arterial sampling and PIB retention was quantified in MRI-guided cortical regions using graphical analysis. MR data included FLAIR images processed with a validated, automated method for quantifying and localizing WMHs.

Results: PIB retention measures for three AD-relevant regions (frontal, parietal, posterior cingulate), was variable across LLD subjects and similar to our studies of never-depressed MCI subjects. WMH volume was also variable but was significantly greater in the LLD subjects versus controls. The WMHs clustered in prefrontal and subcortical white matter tracts as suggested in the literature.

Conclusions: The use of PIB to index amyloid burden in conjunction with WMH volume affords a truly unique opportunity to examine the underlying neurobiological mechanisms and types of dementia for which LLD patients are at risk. P30 MH71944, R37 MH43832, R01 MH072947, AG-05133

Correspondence: *Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu*

E.V. SULLIVAN & A. PFEFFERBAUM. DTI studies of white matter microstructural degradation and associated functions in aging, alcoholism, HIV infection and their interaction.

Objective: Our DTI studies indicate significant deterioration [lower fractional anisotropy (FA) and higher mean diffusivity (MD)] in tissue quality of the corpus callosum with an anterior-posterior gradient in healthy men and women as they age. Those with alcohol dependency exhibit even greater white matter degradation than expected for their age; the extent of abnormality correlates with and may account for performance deficits in working memory, visuospatial ability, interhemispheric information transfer, and gait and balance. Alcoholism is also a relevant factor in HIV-infection, in that the rate of heavy drinking among infected individuals is almost twice that of the general population. Because each condition can disrupt brain structural integrity, including white matter, quantitative fiber tracking has proved valuable for the detection of the separate and combined effects of alcoholism and HIV infection on callosal microstructure. We found that, compared with controls, alcoholic, HIV-infected, and comorbidly-affected subjects (without clinically-detectable dementia) had lower FA and higher MD in callosal re-

gions and fiber bundles connecting the cerebral hemispheres that correlated with motor performance; DTI effects on white matter were significant only in the groups with alcoholism. When the HIV-infected groups were divided by disease severity, defined as an AIDS-defining event or CD4+ counts <200 , the HIV-infected subgroup with AIDS and alcoholism exhibited nearly 2 S.D. abnormality. Brain structure-function associations and double dissociations demonstrate anisotropy and diffusivity as functionally relevant metrics that are continuous and observable in normal aging, alcoholism, HIV infection, and their interaction. Support: AA12999.

Correspondence: *Adam M. Brickman, Ph.D., Taub Institute for Research on Alzheimer, Columbia University, 630 West 168th Street, P & S Box 16, New York, NY 10032. E-mail: amb2139@columbia.edu*

Symposium 9

11:00 a.m.–12:30 p.m.

Learning and Memory Function in HIV-1 Disease: Frontostriatal and Medial Temporal Systems

Chair: Eileen Martin

E. MARTIN, D.J. MOORE, R. GONZALEZ, E. MORGAN, P. MAKI & B.T. JAMES. Learning and Memory Systems in HIV Disease: Frontostriatal and Medial Temporal Systems.

Symposium Description: Studies of learning and memory impairment associated with neuroAIDS have focused primarily on defects associated with dysfunction in frontostriatal systems, while disruptions in medial temporal lobe systems have been largely overlooked. The overall goal of this symposium is to provide neuroimaging, neuropathological, and behavioral evidence suggesting that a shift from an exclusive focus on nondeclarative memory and frontostriatal systems to a perspective that includes episodic memory and underlying medial temporal systems will advance our understanding of memory deficits in HIV. Symposiasts will present recent data on neuropathology of basal ganglia and hippocampal systems as predictors of cognitive impairment (Dr Moore); influence of substance dependence and HIV serostatus on integrity of non-declarative learning (Dr Gonzalez); evidence for dissociation between item and source memory (Erin Morgan); and verbal memory performance and hippocampal blood flow in HIV+ women (Dr Maki). Discussion (Dr Becker) will address the theoretical and translational significance of these studies for development of models of neuroAIDS as well as implications for rehabilitation.

Correspondence: *Eileen Martin, PhD, University of Illinois, 1601 W. Taylor St, M/C 912, Chicago, IL 60612. E-mail: emartin@psych.uic.edu*

D.J. MOORE, E. MASLIAH, R. HEATON & I. GRANT. Regional Neurodegeneration in Relation to Learning and Memory Difficulties Among HIV-infected Individuals.

Objective: Although the exact neurobiological underpinnings of neuropsychological (NP) impairment among HIV-infected individuals are unknown, recent evidence suggests that both frontostriatal systems and medial temporal lobe damage may contribute to cognitive difficulties in these persons.

Participants and Methods: We examined 27 HIV-infected individuals with a comprehensive antemortem NP battery and, following death, assessed level of neurodegeneration in three brain regions of interest: midfrontal, putamen, and hippocampus. Immunocytochemical techniques and laser confocal microscopy were used to evaluate the extent of neurodegeneration. We calculated a regional neurodegeneration score that combined both dendritic and synaptic data for each of the three brain regions

Results: In a regression model assessing the relative impact of synaptodendritic injury in each of the three brain regions on global NP ability, regional neurodegeneration scores from the hippocampus and putamen were both significant predictors, and the overall model was significant ($F_{3,23}=6.17$; $P<0.01$; $R^2=0.45$). A similar model of learning ability also was significant ($F_{3,23}=8.72$; $P<0.01$; $R^2=0.53$); however, only the putamen was a significant predictor. Although the overall model predicting memory (delayed recall) ability was also significant ($F_{3,23}=5.11$; $P<0.01$; $R^2=0.41$), none of the regions were significant predictors in the regression model (both the hippocampus and putamen approached significance $P < 0.10$).

Conclusions: These neuropathological data indicate that HIV-related NP difficulties cannot be solely attributed to frontostriatal systems injury. Damage to regions in the medial temporal lobe (i.e., hippocampus) and subcortical structures appear to be importantly linked to global NP deficits, and subcortical damage especially may be linked to learning problems

Correspondence: *Eileen Martin, PhD, University of Illinois, 1601 W. Taylor St, M/C 912, Chicago, IL 60612. E-mail: emartin@psych.uic.edu*

R. GONZALEZ, J. JACOBUS, J. RODRIGUEZ, E. FAKHOURY & E. MARTIN. Nondeclarative Memory among HIV+ and HIV- Individuals with Substance Dependence.

Objective: HIV and drugs of abuse affect common neural systems underlying nondeclarative or “procedural” memory. We examined how HIV serostatus and severity of past substance use affected performance on 3 measures of procedural learning (PL).

Participants and Methods: Participants were 46 HIV+ and 33 HIV-currently abstinent individuals with a history of cocaine and/or heroin dependence. Groups were well matched on various demographic and psychiatric factors, as well as most substance use parameters. All subjects completed 3 measures of PL: rotary pursuit (RP), mirror star tracing (MST), and weather prediction (WP).

Results: We found that the HIV+ group was significantly slower on the MST ($p < .01$) and showed a trend toward poorer overall performance on the WP ($p = .09$) compared with HIV- controls. Follow-up analyses of statistically significant 3-way interactions showed that a history of more severe cocaine and heroin use among HIV- (but not HIV+) participants was associated with better PL performance, as indexed by improvement across trial blocks of the RP and the MST.

Conclusions: Overall, HIV+ individuals evidenced poorer performance across PL tasks. Interestingly, we found that severity of previous cocaine and heroin use was associated with better PL, but only among the HIV-group. van Gorp et al. (1999) reported similar findings, and speculated they may be explained by increased sensitivity of dopamine receptors after abstinence from cocaine. HIV-associated damage to dopaminergic systems might potentially suppress such an effect.

Correspondence: *Eileen Martin, PhD, University of Illinois, 1601 W. Taylor St, M/C 912, Chicago, IL 60612. E-mail: emartin@psych.uic.edu*

E. MORGAN, S. WOODS, M. DAWSON, R. HEATON & I. GRANT. Evidence for Dissociable Item and Source Memory in HIV Infection.

Objective: Deficits in strategic encoding and retrieval aspects of episodic memory have been observed in HIV-1-seropositive individuals, but source

memory has not been evaluated in this population. Source memory, which refers to recall of information regarding the context in which a memory was formed, relies upon prefrontostriatal systems and strategic processes and is dissociable from the content of the memory (i.e., item memory), which is more dependent upon medial temporal networks and automatic processes

Participants and Methods: In randomized order, 62 HIV-1-seropositive individuals and 37 demographically similar seronegative participants were administered alternate color versions of a visual self-ordered pointing test involving two trials in which designs were presented with either red or black borders. Participants next completed a forced choice trial in which they were asked to identify the designs that had previously been presented (item) and whether the original border was red or black (source).

Results: Results were consistent with the profile of episodic memory impairment observed in the context of HIV-1. The HIV-1-seropositive group evidenced poorer source but not item memory functioning than the seronegative group. Source memory deficits were significantly correlated with measures of episodic memory and measures of constructs that draw upon prefrontostriatal systems and strategic processes.

Conclusions: Findings provide preliminary evidence that item and source memory may be dissociable in HIV.

Correspondence: *Eileen Martin, PhD, University of Illinois, 1601 W. Taylor St, M/C 912, Chicago, IL 60612. E-mail: emartin@psych.uic.edu*

P. MAKI, M. COHEN, K. WEBER, P. PERSCHLER, F. GOULD & E. MARTIN. Deficits in Verbal Memory and Hippocampal Function in Midlife HIV+ Women.

Objective: Neurocognitive complications of HIV/AIDS in women have been understudied, despite indications that women are more vulnerable to the development of neuroAIDS and that dementia is an AIDS-defining condition more frequently for women compared with men. The aim of this study was to investigate cognitive deficits and predictors of cognitive deficits in the Chicago site of the Women’s Interagency HIV Study (WIHS).

Participants and Methods: Participants included 57 HIV+ women and 12 matched HIV- controls (mean age = 43 y). Each woman completed a 1.5- hour battery comprised of tests of mental speed, motor speed, executive function, and memory. A subset of 11 women (7 HIV+) underwent functional magnetic resonance imaging (fMRI) during performance of verbal memory tasks and contributed analyzable data.

Results: A series of multivariate regressions examined serostatus, age, and depression as predictors of cognitive performance. Serostatus had a significant and detrimental effect on verbal memory performance as measured by the Hopkins Verbal Learning Test ($p < .001$) with a smaller effect on the Rey Osterreith Complex Figure Task ($p < .05$). These effects remained significant even when controlling for CD4 count, depressive symptoms and age. Age was negatively related to immediate and delayed memory on the Rey Osterreith task. Depressive symptoms were negatively related to verbal memory performance, as well as to executive function. Neuroimaging findings revealed alterations in left hippocampal function during verbal encoding and right hippocampal function during verbal retrieval.

Conclusions: These results suggest that memory deficits are prominent in midlife HIV+ women and may be due to hippocampal dysfunction.

Correspondence: *Eileen Martin, PhD, University of Illinois, 1601 W. Taylor St, M/C 912, Chicago, IL 60612. E-mail: emartin@psych.uic.edu*

FRIDAY AFTERNOON, FEBRUARY 9, 2007

Poster Session 8: Psychopathology/ Cross Cultural Issues/ Forensics

1:15–2:45 p.m.

Cross-Cultural Issues

E. ANDERSON, L.A. WAGNER & P.J. DONOVICK. Demographic Factors Influencing Performance on Neuropsychological Evaluations with Incarcerated Inmates.

Objective: Demographically corrected norms in neuropsychological assessment have been a subject of recent debate. Incarcerated populations have unique characteristics that potentially decrease the validity of test interpretation based on standard norms. However, demographic differences (i.e., education, IQ, & ethnicity) are rarely examined within this subpopulation. This study evaluated the extent to which ethnicity, IQ, and education influence performance on three neuropsychological measures. It was hypothesized that IQ and education would contribute to performance differences between the ethnic groups, rather than ethnic identity.

Participants and Methods: Data were reviewed from 195 Caucasian (n=72), Hispanic (n=35), and African American (n=88) patients with a variety of neurological and psychiatric diagnoses within a maximum-security prison. This was a referred sample and may not necessarily be representative of the general inmate population. An evaluation was administered based on presenting complaints including a WAIS-III or K-BIT intelligence test, FAS, TMT A & B, and Purdue Pegboard were chosen for this study from a set of measures based on their frequency of administration across the sample.

Results: A MANCOVA failed to reveal significant differences between the ethnic groups on any measure. IQ was a significant covariate ($p < .001$), while years of education was not significant. Post-hoc analyses revealed Caucasians had a significantly higher IQ than their African American ($p < .02$) and Hispanic ($p < .01$) counterparts. Caucasian ($p < .05$) and African-American ($p < .01$) patients had more years of education than the Hispanic patients.

Conclusions: Findings suggest a relationship between IQ and performance on the Purdue Pegboard, TMT, and FAS. Years of education and ethnicity did not appear to influence performance.

Correspondence: *Emily J. Anderson, Ph.D., Psychiatry, Beth Israel Deaconess Medical Center, Massachusetts Mental Health Center, Harvard Medical School, 401 Broadway, Providence, RI 02909. E-mail: emilyjoanderson@yahoo.com*

J. BENNETT, S.P. VERNEY & I. ORTIZ. First Language Learned Influences Verbal Learning Performance in Older Hispanic Veterans.

Objective: Neuropsychological tests that tap into verbal learning deficits, such as the Hopkins Verbal Learning Test - Revised (HVLT-R), are widely used in the cognitive assessment of older Americans. However, many such tests are normed using English-speaking Caucasians. The rapid growth of both Hispanic and elderly populations creates an increased need to accurately assess cognitive functioning for proper diagnosis and treatment. The purpose of this study is to investigate the validity of the HVLT-R among older Hispanics whose first language is not English.

Participants and Methods: Hispanic male veterans aged 55 and older (n=36) were recruited into a larger study: 12 who had English as their first language (H-EFL) and 22 who had learned English as their second language (H-ESL). Neuropsychological assessment included the HVLT-R, the MMSE, TMT, and Digit Span and Digit Symbol tests from the WAIS-III.

Results: The groups had no significant differences in years of education, acculturation level, SES, or English fluency as measured by WRAT-3 Reading subtest. A significant difference was found between the groups on the HVLT-R summary score ($p = 0.03$): the H-EFL group recalled a higher number of words over three trials than did the H-ESL group. No differences were found for the other neuropsychological tests.

Conclusions: This finding suggests that primary language may play a role when using the HVLT-R to assess cognitive ability in older adults even when examinees appear fluent in English. Primary language information may be important to consider for a valid assessment of Hispanic individuals. This study was supported by 5 U01-AA014926-03. Correspondence: *Jennifer Bennett, Psychology, University of New Mexico, 625 Vista Abajo Drive NE, Albuquerque, NM 87123. E-mail: jenben@unm.edu*

J. BURCIAGA, M.R. MADORE, J.T. WONG & J. RAZANI. The Effects of High vs. Low Acculturation on Verbal Memory Tasks.

Objective: Neuropsychological assessment is a constantly expanding field that has been proven useful for detecting brain damage. However, the lack of research and normative information available for ethnic, bilingual groups may limit the utility of neuropsychological assessment and presents a great potential for misdiagnosis. The purpose of the present study was to assess verbal memory skills in ethnically diverse individuals at varying levels of acculturation.

Participants and Methods: The Rey Auditory Verbal Learning Test (RAVLT) and an acculturation measure (i.e., an adapted version of the Acculturation Rating Scale for Mexican Americans; Cuellar, Harris & Jasso, 1980) were administered to 79 ethnically diverse, fluent English-speaking individuals. These participants were healthy adults from Latino, Middle-Eastern, and Asian backgrounds. Highest and lowest quartile scores on the acculturation measure were used to determine low and high acculturation levels (respectively) in these individuals. As a result 40 (19 high acculturated and 21 low acculturated) ethnic minority participants' RAVLT scores were compared to 39 Caucasian, monolingual speaking participants. The RAVLT is a test of rote verbal memory in which each individual is given five learning trials to learn a list of 15 unrelated words. They are also asked to recall the list after a short delay of a few minutes and a long delay of 20 minutes.

Results: One way ANOVA revealed that, in general, acculturation affected learning on the first three trials, but after that all groups were nearly equivalent in performance.

Conclusions: While further studies are needed, the current results indicate that this test may be appropriate for fluid English-speaking, relatively well educated ethnic minorities

Correspondence: *Joaquin Burciaga, MA, University of Cincinnati, Dyer Hall, Mail Location 0376, Cincinnati, OH 45221-0376. E-mail: joaquinburciaga@msn.com*

P.A. SUAREZ, C. POSADA, M. CHERNER, L. ARTIOLA I FORTUNY, I. GRANT & R. HEATON. Equivalency of Spanish Language Versions of the Trail Making Test Part B Including or Excluding "Ch"

Objective: Spanish speakers commonly use a version of the alphabet that includes the sound "Ch" between C and D and another that goes directly to D, as in English. Versions of the Trail Making Test Part B (TMT-B) have been created accordingly to accommodate this preference. However, the equivalency of these alternate forms has not been reported.

Participants and Methods: We compared the performance of 35 healthy Spanish speakers who completed the "Ch" form (CH group) to that of 96 individuals who received the standard form (D group), based on their oral recitation of the alphabet. All were participants in a neuropsychological (NP) test norming study with Spanish speakers from the U.S.-Mexico border region. Both groups ranged in age from 20 to 55 years (CH mean=37.5, SD=9.3; D mean=36.6, SD=9.6, $p=0.63$) and had comparable education (CH mean=10.1, SD=4.4, range=3-20; D mean=10.5, SD=4.0, range=3-19; $p=0.61$). The CH group had proportionately more women (68% vs. 49%; $X^2=4.06$, $p<0.05$). Both groups had similar WAIS-R Vocabulary T-scores (CH mean=44.5, SD=10.2; D mean=47.1, SD=10.4, $p=0.22$) and overall NP performance, indexed by a demographically corrected mean T-score for the complete battery of 16 NP tests (CH mean=51.9, SD=4.0; D mean=51.1, SD=4.4, $p=0.39$).

Results: Mean raw TMT-B time to completion was comparable between the CH (Mean= 91.8", SD=52.8") and D (M=90.8", SD=55.6") groups ($p=0.54$). The relatively high mean scores are consistent with representation of very low levels of education in both groups.

Conclusions: The findings suggest that both versions are equivalent and can be administered to Spanish speakers based on their preference without sacrificing comparability.

Correspondence: Paola A. Suarez, M.A., Psychiatry, UCSD, 150 W. Washington St 2nd Floor, 0603H, San Diego, CA 92103. E-mail: mcherner@ucsd.edu

R.J. EHEMENDIA & J.A. HOLDNACK. The Use of Reliable Digit Span with Ethnic Minorities.

Objective: There has been increased interest in the evaluation of neuropsychological test data using measures of effort or motivation. While some measures have been developed specifically to assess these factors, others have proposed the use of embedded measures or indices that are obtained from standard neuropsychological tests. Reliable Digit Span (RDS) is calculated using scores from the Digit Span subtest of the Wechsler Scales. Several studies have demonstrated that the use of a RDS score of 7 or less can differentiate between well motivated participants and those who may be malingering or providing poor effort. We were interested in determining whether racial grouping differentially affects the proportion of individuals identified using this cut score.

Participants and Methods: The standardization sample of the WAIS-III/WMS-III (N=2385) was used and a RDS was calculated for all participants for whom race was available. RDS scores were examined by race and education.

Results: Using an RDS of 7 or less, 16.1% of the White participants were identified. In contrast, 25.8% of the African Americans and 27.1% of the Hispanic/Latinos were identified. When the data were examined by years of education, 42.6 % of those with 8 years or less, 28% of those with 12 years or less, 15.8% of high school graduates, 12.6 with 13-15 years, and 7.2% of those with more than 15 years of education were identified. African Americans and Latinos tended to have a greater proportion of individuals in the lower educational groups.

Conclusions: The use of RDS and other embedded measures of motivation is increasingly popular. These data indicate that scores on RDS vary as a function of ethnicity and years of education in a large standardization sample. Consequently, caution should be exercised when interpreting test scores using general population cutoff scores.

Correspondence: Ruben J. Echemendia, PANBA, Inc., 119 South Burrows St., Ste 707, State College, PA 16801. E-mail: rechemendia@adelphia.net

S. KAZANDJIAN & J.C. BOROD. Cross-Cultural Differences on Non-verbal Neuropsychological Tests.

Objective: With the widening international use of neuropsychological tests, this study investigated differences in test performance among three cultural groups. A cross-cultural comparison on nonverbal test performance was made among an "original" ethnic group (i.e., Armenian); an Armenian "immigrant" group in the USA educated in both Armenian and English (Armenian-American); and a group of Non-Armenian, White Americans with only an English-language education (Non-Armenian).

Participants and Methods: Twenty-four university-educated women (22-40 years old) participated, with 8 individuals in each group (Armenian, Armenian-American, and Non-Armenian). Two commonly-used, nonverbal neuropsychological tests, reported to be culture-fair, were given: the Rey-Osterreith Complex Figure Test (RCFT) and the Color Trails Test (CTT). Multivariate Analyses of Covariance were used to analyze the data.

Results: Findings indicated that Armenians performed worse on the CTT Part 1 than both Armenian-Americans ($p=.005$) and Non-Armenians ($p=.056$). On the CTT Part 2, Armenian participants performed more slowly than Armenian-Americans ($p=.006$), but similar to Non-Armenians. On the RCFT, groups did not differ significantly on the copy portion. Lower scores on the memory trial were seen for Non-Armenians compared to Armenians ($p=.034$).

Conclusions: Results suggest cross-cultural differences in nonverbal neuropsychological test performance, particularly when timed. The Armenians performed at a slower rate on the timed task compared to the Americans. This effect may be related to the education and culture of Armenia which stresses careful completion rather than speed. This effect may also be related to the better performance of the Armenians on the RCFT memory trial by taking time to ensure that their reproduction was as accurate as possible.

Correspondence: Seta Kazandjian, Ph.D., Neuropsychology, Fondation Ophthalmologique Rothschild, 2 Rue D'Alencon, Paris 75015, France. E-mail: setakaz@gmail.com

T. MONTIEL & E. MATUTE. The Literacy and Schooling Influences in Phonological Awareness, Memory and Executive Function Tasks.

Objective: The main objective of this study was to know the effects of literacy and schooling on phonological awareness, memory and executive function tasks performance.

Participants and Methods: Three groups were used: Illiterate Group (IG): 8 women and 2 men (age mean = 38.20 years old), Literate Group (LG): 8 women and 2 men (age mean = 37.20 years old, non-schooled) and Schooled Group (SG): 8 women and 1 man (age mean = 35.22, 6 years schooling).

The evaluation materials used were: Phonological awareness evaluation (syllabic, intra-syllabic and phonemic levels), Wechsler memory scale 3 ed., Wisconsin card sorting test and Verbal fluency tasks (phonological criterion: syllabic and phonemic, and semantic criterion: animals and fruits).

Results: A non-parametric variance test found a group effect on the phonological awareness, memory and verbal fluency tasks. Post hoc analysis shows that the literate group had higher scores than the illiterate group in two phonological awareness tasks (identification and suppression of the phoneme initial), four memory tasks (logical memory and family pictures in immediate and delayed recall) and syllabic fluency. The schooling participants shown higher scores than illiterate and literate groups in phonemic awareness, working memory and phonological and semantic fluency.

Conclusions: The results suggest that literacy and schooling have influence in the phonological awareness, memory and executive function abilities but each one affects these abilities in a different way.

Correspondence: *Teresita Montiel, PhD, Instituto de Neurociencias, Universidad de Guadalajara, Francisco de Quevedo 150, Col. Arcos Vallarta, Guadalajara 44130, Mexico. E-mail: tere_montiel@yahoo.es*

L. RENTERIA, C. GARCIA, M.E. PUEYRREDON & N.H. PLISKIN. Neuropsychological Assessment with Monolingual Hispanics: Utilizing Normative Data Developed for English Speakers Underestimates Cognitive Abilities.

Objective: A recent survey by Echemendia and Harris (2004) revealed that most neuropsychologists utilize direct verbatim translations of tests rather than culturally adapted versions with representative normative samples. The aim of this study was to examine whether English and Spanish normative data result in equivalent test scores.

Participants and Methods: Participants were 49 monolingual Spanish speaking adults seen for a neuropsychological evaluation for conditions that included stroke, dementia, and traumatic brain injury. Participants were administered the Wisconsin Card Sorting Test (WCST), Color Trails, Spatial Span, and the Stroop Color Word Test (SCWT). These measures were scored with normative data created specifically for monolingual Spanish speakers (Ponton et al. 1996; Fortuny et al. 1998) as well as normative data created for use with native English speakers (Heaton et al. 1993; D'Elia et al. 1996; Wechsler, 1996; Golden & Freshwater, 2002). Except for Spatial Span, the normative data used corrected for age and education.

Results: Paired sample t-tests revealed that patients received a statistically significant higher score on the WCST, Spatial Span, and SCWT (color condition) when using Spanish language norms. The data further indicated that more individuals were classified as being severely impaired on the WCST and color condition of the SCWT when utilizing English language norms.

Conclusions: Cultural factors are relevant and do influence test scores when English language norms are used with monolingual Spanish speakers. This study provided evidence for using tests with representative normative data whenever possible, otherwise one runs the risk of underestimating cognitive abilities.

Correspondence: *Laura Renteria, Ph.D., Psychiatry (MC 913), University of Illinois at Chicago, 912 S. Wood Street, Chicago, IL 60612-7327. E-mail: lrenteria@psych.uic.edu*

L. RENTERIA & N.H. PLISKIN. The Utility of Relying on Nonverbal Tests in the Evaluation of Monolingual Spanish Speakers.

Objective: When working with ethnic minorities, clinicians who don't have access to minority-specific norms often consider non-verbal tests as being more culturally fair than verbal tests. The present study challenged this notion by examining the neuropsychological performance of Spanish speakers with limited acculturation.

Participants and Methods: Participants were 44 healthy, Mexican, monolingual Spanish speaking adults who were administered the COWAT, Rey Complex Figure Copy (RCFC) and Vocabulary and Matrix Reasoning subtests from the Spanish WAIS-III. All participants were deemed to be poorly acculturated to the United States via the Short Hispanic Acculturation Scale. The sample was divided into high (0-6 years, n=21) and low education groups (7-11 years, n=23).

Results: Participants in the low education group performed significantly worse than the high education group on both nonverbal tests administered (Matrix Reasoning & RCFC). There was no difference between the two groups on the verbal tests administered. Paired sample t-tests indicated that scoring the nonverbal tests with normative data created for native English speakers (Meyers & Meyers, 1995) versus for monolingual Spanish speakers (Ponton et al. 1996) resulted in lower scores. The data further indicated that more individuals were classified as severely impaired on the RCFC when utilizing English language norms.

Conclusions: The results suggest that nonverbal skills are not universal and further are not culture free. This is likely the result of different skills and problem solving styles being emphasized within the Mexican culture. Caution is advised when using nonverbal measures with minority individuals as one runs the risk of seriously underestimating cognitive abilities.

Correspondence: *Laura Renteria, Ph.D., Psychiatry (MC 913), University of Illinois at Chicago, 912 S. Wood Street, Chicago, IL 60612-7327. E-mail: lrenteria@psych.uic.edu*

P. TOURADJI & D. JOHNSON-GREENE. Comparison of Reading Level and Race in Predicting Neuropsychological Test Performance among Acute Stroke Rehabilitation Patients.

Objective: We examined whether reading ability, a possible proxy for quality of education (Manly et al., 2002), attenuates neuropsychological test performance in African American patients with acute stroke compared to Caucasians.

Participants and Methods: We used a mixed ethnic convenience sample of 240 rehabilitation inpatients with acute stroke. Participants received a comprehensive neuropsychological test battery that included the Wide Range Achievement Test - 3 (WRAT-3) Reading subtest, HVLT-R, COWAT, animal naming, BNT, BTA, cancellation test, and Finger Tapping Test (FTT) unaffected limb. Regression analyses were conducted to determine whether WRAT-3 reading accounted for significant variance on neuropsychological tests after controlling for demographic variables.

Results: Controlling for the effects race, age, gender, and years of education, reading ability (WRAT-3) was a significant predictor of neuropsychological test performance in the domains of verbal learning, recall, discrimination, letter fluency, semantic fluency, confrontation naming, and visual attention/cancellation. Race was a non-significant predictor after controlling for reading ability.

Conclusions: Significant group differences in neuropsychological test performance exist between African American and Caucasian elders even after controlling for demographic variables, such as years of education. In this study, race did not significantly account for neuropsychological test performance after controlling for the effects of reading level. The implication is that race is a sociopolitical construct that does not account for test performance differences after controlling for the effects of quality of education. Results of this study continue to support that quality of education may be a more salient predictor than race in interpreting neuropsychological test performance.

Correspondence: *Pegah Touradji, Ph.D., PM&R, Johns Hopkins University, 5601 Loch Raven Blvd., POB Suite 406, Baltimore, MD 21239. E-mail: ptourad1@jhmi.edu*

S.P. VERNEY, J. BENNETT & M. LOVGREN. Ethnic Experiences Influence Performance on a Brief Cognitive Ability Test.

Objective: Cognitive ability tests are widely used in a variety of settings including education, vocation, psychiatric, and rehabilitation settings, but may be vulnerable to cultural influences. As our society becomes more ethnically diverse, it becomes increasingly important to obtain valid cognitive assessment results for diverse populations. We investigated the influence of ethnic experiences on a brief cognitive ability measure, the Shipley Institute of Living Scale (SILS).

Participants and Methods: Students (n=626) of diverse ethnic backgrounds (42% White, 37% Hispanic, 10% American Indian, 7% Asian American, 3% African American, 1% Arab American, and 2% Other) completed the Scale of Ethnic Experience (SEE), and the SILS. The SEE provides four factors of cultural attitudes: Ethnic Identity, Perceived Discrimination, Mainstream Comfort, and Social Affiliation. Cultural behaviors were also included (i.e., activities done in one's own vs. other language).

Results: Consistent with the literature, the White students obtained higher IQ estimate scores than did the ethnic students. In a regression

with SILS IQ estimate as the outcome, SES accounted significantly for both the White ($R^2=2.3$) and ethnic students' ($R^2=3.2$) IQ scores. The addition of cultural variables into the regression resulted in a non-significant increase for the White students, but added a significant 8.2% of the variance in IQ scores above and beyond SES for the ethnic students.

Conclusions: These findings suggest that ethnic experiences play a significant role in the brief cognitive ability scores for ethnic minority students. A better understanding of the role that culture plays in cognitive assessment will increase the validity of such tests for diverse populations. Correspondence: *Steven P. Verney, Ph.D., Psychology, University of New Mexico, MSC03-2220, Albuquerque, NM 87131-0001. E-mail: sverney@unm.edu*

J.T. WONG & J. RAZANI. The Effects of Acculturation and its Relationship to Information Processing Tests.

Objective: The focus of the present study is to examine specific aspects of acculturation and its relationship to information processing tests.

Participants and Methods: We examined the performance of 84 fluent English-speaking, bilingual individuals from ethnically diverse backgrounds (Hispanic/Latino, Middle Eastern, and Asian descent) to that of 43 monolingual English-speaking Anglo-Americans on tests of information processing. The Acculturation Rating Scale for Mexican Americans (ARMSA) was adapted so that it could be used with each ethnic group. The ARMSA assesses four aspects of acculturation: Preferences, Ethnic Identity, Exposure, and Ethnic Interaction. Trails A and B, Color Trails, and Stroop A, B, and C were administered to all participants as part of a larger battery of neuropsychological tests. Participants were between 18-74 years of age.

Results: The results revealed that, relative to the mono-lingual Caucasians, the ethnically diverse group performed worse on the majority of the information processing tasks. Additionally, of the four acculturation factors, Ethnic Identity correlated with the fewest information processing tests, followed by the Preference factor (i.e., with only Stroop B and Trails A). However, Exposure and Ethnic Interaction were significantly related to most of the tests of information processing speed (as exposure and interaction with the dominant culture increases, time on these speeded tasks decreases).

Conclusions: These findings suggest that when assessing the impact of acculturation on neuropsychological test performance, it is particularly important to examine those aspects that provide information regarding the degree of exposure and interaction one has with the dominant culture. Correspondence: *Jennifer T. Wong, MA, Psychology, University of Detroit Mercy, 24519 Rensselaer Street, Oak Park, MI 48237. E-mail: jenniferwong1@cs.com*

Cross-Cultural Test Development

S.C. LANTING, M. CROSSLEY & D. MORGAN. The Grasshoppers and Geese Test: A Modified Neuropsychological Measure for Assessing Semantic Memory in a Rural and Remote Memory Clinic.

Objective: In an interdisciplinary Rural and Remote Memory Clinic, a culturally and geographically appropriate neuropsychological assessment protocol was developed for ethnically diverse adults, including Aboriginal seniors. This research describes the development of and preliminary normative and clinical data for the Grasshoppers and Geese Test (GGT), a measure of semantic memory adapted from the Pyramids and Palm Trees Test (PPTT; Howard & Patterson, 1992). Participants are required to examine a series of conceptually related drawings presented in triads and to decide which of two drawings has the closest association to the target picture.

Participants and Methods: Adaptation was facilitated through a partnership with Aboriginal seniors who contributed to the development of picture triads that incorporated colour, humour, and familiar images. Preliminary normative results yielded a comparable average percentage

correct score to the PPTT (95.7% vs. 98-99%). From the original developmental sample of healthy younger and older adults ($n=68$), 53 triads were identified to form the final measure and administered to a sample of clinical ($n=34$) and normal ($n=11$) participants similar in age and level of education. A Mann-Whitney U test was performed to examine differences in total percent correct scores for normal and clinical participants.

Results: The small clinical sample did not allow for comparisons across diagnostic subgroups; however, consistent with previous research that indicates relative stability of semantic memory in the early stages of Alzheimer's disease (AD), in the sub-sample of patients with probable AD, there was no significant difference in performance between mild ($n=14$) and moderately severe ($n=14$) groups, despite significant differences in episodic memory performance.

Conclusions: Preliminary evaluation demonstrates the clinical utility of the GGT in assessing semantic memory in rural and remote seniors.

Correspondence: *Shawnda C. Lanting, Psychology, University of Saskatchewan, 9 Campus Drive, Saskatoon, SK S7N 5A5, Canada. E-mail: shawnda.lanting@usask.ca*

Emotion

D.N. ALLEN & B. PARK. Using the Wechsler Adult Intelligence Scale to Assess Social Cognition.

Objective: The Wechsler Adult Intelligence Scale is the most widely used adult test of intellectual abilities, and a number of its subtests assess various aspects of social cognition. The current investigation examined whether a social cognition factor could be identified on the Wechsler Adult Intelligence Scale - III (WAIS-III).

Participants and Methods: The WAIS-III standardization sample was subjected to confirmatory factor analyses that tested a number of a priori nested models, some of which posited a social cognition factor. Models were tested using LISREL. Goodness-of-fit statistics and incremental fit indexes were used to determine the model that provided the best fit for the standardization sample data.

Results: Results indicated that a five-factor model provided the best fit of the data. Factors included Verbal Comprehension, Perceptual Organization, Working Memory, Processing Speed, and Social Cognition. The Social Cognition factor was composed of the Picture Arrangement and Picture Completion subtests.

Conclusions: The current results provide preliminary support for the construct validity of a social cognition factor measured by the WAIS-III. Additional research is necessary to more clearly delineate the specific subcomponent of social cognition assessed by this WAIS-III factor, as well as to determine its criterion validity in populations characterized by deficits in social functioning.

Correspondence: *Daniel N. Allen, Ph.D., Psychology, University of Nevada Las Vegas, 4505 Maryland Parkway, Box 455030, Las Vegas, NV 89154-5030. E-mail: daniel.allen@unlv.edu*

D.N. ALLEN, G.P. STRAUSS, Z. ZLATAR, B. DONOHUE & D.P. VAN KAMMEN. Using the Wechsler Intelligence Scales to Assess Social Cognition in Schizophrenia.

Objective: Social cognition has received increasing attention in schizophrenia due to marked deficits in social functioning exhibited by those with the disorder. A number of subtests from the Wechsler Adult Intelligence Scales contain social content, and may be useful in evaluating social cognition in schizophrenia. The current study sought to determine whether a social cognition factor could be identified on the Wechsler scales.

Participants and Methods: The Wechsler Adult Intelligence Scale-Revised (WAIS-R) was administered to 169 males with schizophrenia, and test results were subjected to confirmatory factor analysis (CFA). CFA was used to evaluate various models that hypothesized a social cognition factor, and for comparison purposes the same models were evaluated in the WAIS-R standardization sample.

Results: Results confirmed the presence of a four-factor model that included a Social Cognition (SC) factor, as well as the more commonly reported Verbal Comprehension, Perceptual Organization, and Working Memory factors. The SC factor consisted of the Picture Arrangement and Picture Completion subtests, and was significantly correlated with symptoms of disorganization and negative symptoms, as well as with an index of social functioning.

Conclusions: These results provide support for the validity of the SC factor as a measure of social cognition in schizophrenia, and demonstrate that at least some aspects of social cognition represent separable cognitive domains in schizophrenia.

Correspondence: Daniel N. Allen, Ph.D., Psychology, University of Nevada Las Vegas, 4505 Maryland Parkway, Box 455030, Las Vegas, NV 89154-5030. E-mail: daniel.allen@unlv.edu

S. ASSURAS, J. BARRY, T.D. HALBIG, J.C. BOROD, A. VOUSTIANIOUK, H. KAUFMANN, J. GRACIES, W. TSE & C.W. OLANOW. The Impact of Dopaminergic Medication and Emotional Stimuli on Motor Response in Parkinson's Disease.

Objective: In addition to impaired motor functioning, preliminary research has suggested that patients with Parkinson's disease (PD) may experience emotion processing deficits. The current study examined how viewing emotional pictures, including pleasant, unpleasant, or arousing content, affected motor responses of patients with PD and determined whether the effect of emotion interacted with the presence or absence of dopaminergic medication.

Participants and Methods: Fifteen PD and 15 healthy control (HC) participants viewed 54 emotional and non-emotional pictures presented as slides via computer. After a 20-minute delay, participants were shown the original 54 pictures and 54 distracters, and they were asked to identify the pictures originally presented. Reaction times measured from picture onset to keyboard button press were recorded.

Results: PD participants had slower reaction times than HC participants to all stimuli. Both PD and HC participants had slower reaction times to high than low arousal pictures. Both groups demonstrated the slowest reaction time when viewing unpleasant pictures, followed by pleasant and then neutral pictures. Although patients' motor functions measured by clinical exam were significantly better when on medication, reaction times were significantly faster when patients were off medication.

Conclusions: The fact that the effect of stimulus type on reaction time was not significantly different between PD and HC groups suggests that PD, at least in the early-to-moderate stage, may not be impacting emotional processing, per se. Medication also had a negative impact on memory as revealed by fewer accurate responses on than off medication. These findings have implications for the optimization of pharmacological therapy in PD patients.

Correspondence: Stephanie Assuras, Psychology, The Graduate Center at the City University of New York, 225 E 74th St apt 1E, New York, NY 10021. E-mail: stephassuras@hotmail.com

J. BARRY, S. ASSURAS, T.D. HALBIG, J.C. BOROD, N.S. FOLDI, A. VOUSTIANIOUK, H. KAUFMANN, J. GRACIES, W. TSE, K. FUNG, D. WEISZ & C. OLANOW. Age Effects on Memory and Response Time for Emotional Pictures.

Objective: Research suggests that older, relative to younger, adults may have enhanced memory for positive information in contrast to negative information, though results are inconclusive. This is termed the positivity bias. Valence may also affect response time to stimuli. Little

research has examined age effects on response time to emotional material. We examined the role of aging on memory and response time as a function of valence. Young and older adults were hypothesized to demonstrate emotional enhancement, though only older adults were predicted to show a positivity bias. From previous work, we predicted that all participants would have the slowest response times for negative stimuli. No prediction regarding age effects on response time as a function of valence was made.

Participants and Methods: Participants included younger (N=16; M=27.1 years) and older (N=15; M=57.7 years) adults. Groups were matched for gender and education. Participants viewed emotional and nonemotional pictures from the International Affective Picture System (Lang, Bradley, & Cuthbert, 2001) followed by a recognition test. Decision time (DT), movement time (MT), and overall response time (RT) were measured.

Results: Both young and older adults had better recognition for positive than negative and neutral pictures. There was no positivity bias for the older adults. Older adults had slower RTs and DTs, but not MTs, compared to young adults. Both groups had the longest response times for negative pictures.

Conclusions: Findings are discussed in terms of neuroanatomical systems involved in emotional memory and aging effects on these systems. Also discussed are age-related changes in cognitive processing and motor speed.

Correspondence: Judy Barry, CUNY Graduate Center and Queens College, 2170 Crescent St, Apt C2, Astoria, NY 11105. E-mail: judybarry01@gmail.com

J.M. BARTON, N.T. SANTORELLI & D.L. ROBINS. Sex Differences in Emotion Perception Utilizing Dynamic Stimuli.

Objective: This study investigated sex differences in emotion perception, including the potential visual bias in perception of mismatching audio-visual movies, and accuracy of perception by emotion and sex of actor for matching stimuli. It was predicted that women would perform with higher accuracy than men.

Participants and Methods: Undergraduate psychology students, 18-34 years old (M=20.94; females N=27, males N=23), labeled emotion (using forced-choice, 15 emotion options) for audio-visual stimuli depicting a male and a female actor portraying facial and prosodic emotion; 80 stimuli matched on visual and auditory affect (angry, fearful, happy, neutral), and 240 portrayed incongruent face and voice (e.g., happy face, fearful voice).

Results: In mismatching conditions, a significant bias was shown for facial affect, $\chi^2(1, N=55)=19.8, p<.001$. Sex differences indicated a trend toward females using visual information more than males: $t(55)=-1.990, p<.053$. In matching conditions, female participants were more accurate than males, $t(55)=-2.256, p<.05$. Both within- and between-group analyses indicate significant differences in accuracy based on sex of participant, emotion displayed, and sex of actor. For example, males correctly perceived anger in the male actor ($p<.001$), but not in the female actor ($p>.70$); females more accurately perceived fear in the male actor, $t(55)=-2.683, p<.01$, but not in the female actor, $t(55)=-1.394, p>.16$.

Conclusions: The bias found for facial emotion might indicate biological specialization for visual stimuli. The overall superior accuracy of female participants could be the result of socialization or an indicator that female brains process emotion information more accurately than male brains.

Correspondence: Jocelyn M. Barton, Georgia State University, 172 Haynes Street SW #214, Atlanta, GA 30313. E-mail: jociebunny@gmail.com

J.C. BOROD, M. HALFACRE, K. ROGERS, J. SPIELMAN, D. KRCH, A.M. BRICKMAN, C. GRUBER, D. MCCABE & L.O. RAMIG. Aspects of Facial Emotion Expression in Parkinson's Disease (PD) and Healthy Control (HC) Participants: Gender, Valence, and Methodological Innovations.

Objective: This study examined facial emotional expression in PD patients and demographically-matched healthy adults, focusing on gender and valence. A new rating procedure was developed for a more comprehensive evaluation of emotional expressivity.

Participants and Methods: Participants were 13 non-demented, early-stage PD individuals (54% men) and 11 HCs (55% men). Participants produced emotional (happiness, sadness, anger) and neutral monologues from the New York Emotion Battery, from which facial expressions were evaluated. Monologues were divided into 15-second segments and evaluated by three raters for facial mobility (FM), social engagement (SE), and aspects of emotional expressivity — frequency (EF), variability (EV), and intensity (EI).

Results: Interrater reliability was high, yielding these median values: FM=.89; SE=.89; EF=.91; EV=.86; and EI=.90. Three-way ANOVAs were conducted on Group, Gender, and Expression for each variable. There were significant effects or trends for the 3-way interaction for EV ($p=.021$), FM ($p=.012$), and SE ($p=.059$). For emotional monologues, women were more expressive than men, and PDs were generally less expressive than HCs. For the Neutral monologue, female HCs were rated lower than male HCs. There were Expression main effects: happiness and anger showed the most facial activity, followed by neutral and then sadness.

Conclusions: Women were more expressive than men, and PDs were generally less expressive than HCs for expression components related to facial mobility, expressivity, and engagement. Expression findings may result from gender differences for emotional regulation and cultural factors. A new rating procedure delineating aspects of emotional expressivity was developed and found reliable. Future research will utilize these procedures in later-stage PD.

Correspondence: *Joan C. Borod, Ph.D., Psychology; Queens College and The Graduate Center of the City University of New York, 65-30 Kissena Blvd, NSB-E318, Flushing, NY 11367. E-mail: joan.borod@mssm.edu*

B.D. BRIGIDI, L. FORNNARINO, H.S. FRIEDMAN & R.H. RAYNOR. Neurocognitive Predictors of Depression in Frontal Lobe Tumor Patients.

Objective: Depressed individuals can suffer from widespread neurocognitive deficits including reduced attention, verbal memory, psychomotor speed, verbal fluency and executive functioning skills as compared to non-depressed individuals. In CNS tumor patients, frontal lobe tumor location, female gender, marital status, and tumor grade are known clinical predictors of depression. What is not known, and was the objective of this study, are which neurocognitive measures most reliably differentiate depressed and non-depressed frontal lobe tumor patients.

Participants and Methods: Clinical and neurocognitive data for 228 patients with primary malignant frontal lobe tumors (frontal, frontotemporal, frontoparietal) were reviewed. All patients completed comprehensive neuropsychological assessment at The Preston Robert Tisch Brain Tumor Center at Duke between the years 1999 and 2006. Univariate analyses were used to create a parsimonious model. A sequential binary logistic regression was performed to assess prediction in non-depressed (BDI-II score 13 or less) and depressed (BDI-II score > 13) group membership, first on the basis of four demographic/clinical variables (tumor grade, gender, time since diagnosis, previous radiation therapy) and then after addition of 10 neurocognitive variables.

Results: Time since diagnosis was the only significant demographic/clinical predictor until entry and backwards elimination of the neurocognitive variables, which showed that outcome was predictable from verbal attention speed of processing (Verbal Series Attention Test; $\beta = .702$, 95 % CI = .534 - .923, $p = .01$)

Conclusions: The current study demonstrates that a measure of verbal attention speed of processing reliably enhanced prediction of depression in frontal lobe tumor patients, which suggests that it should be tested as an index of change after successful pharmacologic or psychotherapy treatment of depression in frontal lobe tumor patients.

Correspondence: *Bart D. Brigidi, PhD, Surgery; Duke University Medical Center, The Preston Robert Tisch Brain Tumor Center at Duke, DUMC Box 3624, Durham, NC 27710. E-mail: brigi002@mc.duke.edu*

C. CIMINO, L. OELKE, L. BUTTERFIELD, I. FISHMAN, H. CARR & S. BENBADIS. Facilitory and Inhibitory Effects of Emotion on Memory Following Temporal Lobectomy.

Objective: The purpose of this study was to investigate whether emotional stimuli would facilitate as well as inhibit memory processes following temporal lobectomy.

Participants and Methods: Eight right anterior temporal lobectomy (RTL) patients, six left anterior temporal lobectomy (LTL) patients and age/education matched control subjects (NC) were presented a nine object list learning task. All subjects were presented three list types: neutral, negative and positive. In negative and positive lists, subjects viewed an emotional slide from the IAPS presented in the middle of the list. Recall for this fifth critical item (CI) was compared across list type. Recall of surrounding items was also examined to investigate possible disruptive effects of this CI on memory for surrounding items.

Results: Data were analyzed using a repeated measures ANOVA with between Group (LTL, RTL, NC) and Valence (Positive, Negative, Neutral) factors. Analysis of the CI (fifth item) revealed significantly better recall for positive and negative stimuli compared to neutral stimuli across all subjects. In contrast, analysis of items just preceding the CI revealed a main effect of Valence with significantly greater disruptive effects on recall of preceding items in positive lists compared to neutral or negative lists. A Valence x Group interaction approaching significance was also observed in which RTL patients showed consistent rates of recall across all three lists while LTL and NC subjects showed similar patterns of greater disruptive effects of recall of preceding items in positive list trials.

Conclusions: Taken together, these findings suggest that explicit recall of emotional stimuli is facilitated compared to neutral stimuli in patients with RTL, LTL and NCs. However, the disruptive and potentially inhibitory effects of emotional stimuli on recall of surrounding material may be differentially affected in patients with RTL compared to LTL and NCs. Differences in arousal may be one possible mechanism underlying these differences.

Correspondence: *Cynthia Cimino, Ph.D., Psychology, University of South Florida, 4202 E. Fowler Ave PCD4118, Tampa, FL 33620. E-mail: cimino@mail.cas.usf.edu*

U. CLARK & A. CRONIN-GOLOMB. Impaired Recognition of Emotional Facial Expressions in Parkinson's Disease.

Objective: The ability to recognize emotional facial expressions (EFE) may be disrupted in non-demented individuals with Parkinson's disease (PD), with studies yielding equivocal findings. A possible reason for this variability may lie in the confounding of emotion recognition with cognitive task requirements, because of the lack of a control condition using non-emotional stimuli. The present study examined EFE recognition in PD relative to performance on a non-emotional categorization test with comparable task requirements.

Participants and Methods: We tested 15 non-demented PD and 15 control participants matched for age, education, and male:female ratio. Seventy Ekman and Friesen photographs (10 each: Anger, Disgust, Fear, Happiness, Sadness, Surprise, and Neutral) were individually displayed in one of four orders. Participants identified the expressed emotion from a list of the seven emotions. In an analogous Landscape Categorization task, 70 images were individually displayed (10 each: Canyon, City, Forest, Mountain, Shore, Town, and Tropical). Landscape images, like faces, were mono-oriented and were comparable to emotional images for recognizability, as judged by 28 independent observers. ANOVAs were conducted to examine group performances.

Results: Individuals with PD exhibited significant impairments on the recognition of Anger and Surprise. Impairments were not related to anxiety or depression. No group differences were observed on the Landscapes task.

Conclusions: Patients with PD displayed impaired EFE recognition, specifically for angry and surprised faces, but did not show dysfunction on a comparable non-emotional categorization task. This result suggests that PD, with its alterations in the nigrostriatal system, is associated with selective EFE recognition difficulties apart from possible difficulties in categorization in general and overall mood status.

Correspondence: *Uraina Clark, MA, Psychology; Boston University, 648 Beacon St, 2nd floor, Boston, MA 02215. E-mail: urainac@yahoo.com*

D.E. EVERHART, S.E. EDWARDS & H.A. DEMAREE. Low Beta (13 to 21 Hz) Sex-Related Differences Observed During Affective Auditory Verbal Learning.

Objective: Sex-related difference in regional brain activity during completion of emotional tasks has previously been observed. Some studies indicate that women evidence increased brain activity within certain regions during emotional tasks. This purpose of this study was to examine sex-related regional electroencephalographic differences during completion of the Auditory Affective Verbal Learning Test (AAVL).

Participants and Methods: Right-handed men and women participants (N=32) completed the positive and negative word lists of the AAVL in a counter-balanced manner, and were asked to recall the affective words over five learning trials. EEG data were recorded from 19 scalp sites before and following learning trials.

Results: Seven EEG bandwidths were analyzed, but only the low beta (13 to 21Hz) bandwidth produced effects involving sex. For low beta activity, main effects for learning trial [$F(3, 90) = 3.901; p = .032$] and scalp site [$F(5, 150) = 44.82; p = .000$] were observed, as was a significant sex x word list interaction [$F(1, 30) = 5.714; p = .023$]. Post hoc analyses of the sex x word list interaction revealed that women evidenced greater low beta power in comparison to men for both word lists ($p < .05$). In examining within group differences for the positive versus negative lists, women evidenced greater low beta power during the presentation of the negative versus positive word list ($p < .05$), while men evidenced a trend toward the opposite pattern ($p = .06$).

Conclusions: These differences indicate that men and women process emotional stimuli differently. Implications for sex-related differences in cortical function are discussed.

Correspondence: *D. E. Everhart, PhD, Psychology; East Carolina University, Dept of Psychology, Rawl Building, Greenville, NC 27858. E-mail: everhartd@ecu.edu*

A.J. SHIPLEY, D.E. EVERHART, M. WALKER, H.A. DEMAREE & A. GERDING. A Within Subjects Analysis of Menstrual Cycle Phase-Related ERP Differences During the Processing of Emotional Prosodic Stimuli.

Objective: Phase-related menstrual cycle fluctuations in electrophysiological processes (i.e., P300) associated with emotion perception have previously been described. This relationship was further explored by examining event-related potential (ERP) phase-related changes that occur during perception of emotional prosody.

Participants and Methods: Ten women were tested two times on an emotional prosody oddball task. Fear and happy emotional stimuli were presented. Half of the participants were initially tested during the high estrogen phase; the other half were tested during the low estrogen phase. ERPs to stimuli were recorded from ten scalp sites (F3, F4, T3, T4, T5, T6, C3, C4, P3, P4); the amplitude and latencies of the P2, N2, P3(P300), and N3 components analyzed.

Results: Regarding menstrual-phase related ERP amplitude differences, a significant phase x hemisphere x scalp site interaction was observed for P2 amplitude ($F(4,36) = 4.95, p = .001$), and a phase x hemisphere interaction was observed for P3 amplitude ($F(1,9) = 9.32, p = .01$). Post hoc analyses of these two interactions indicate greater amplitude over

the right hemisphere during the high estrogen phase, with the opposite pattern observed during the low estrogen phase; this varies as a function of scalp site. Analyses of latency differences for the same components yielded only one effect involving phase; the N3 component occurred sooner during the low estrogen phase ($F(1,9) = 6.03, p = .03$).

Conclusions: These observed ERP differences indicate that changes in emotion perception occur within auditory channels during the phases of the menstrual cycle. These differences may be partially attributable to the changes in sex hormones.

Correspondence: *D. E. Everhart, PhD, Psychology; East Carolina University, Dept of Psychology, Rawl Building, Greenville, NC 27858. E-mail: everhartd@ecu.edu*

J.G. FINE, M. SEMRUD-CLIKEMAN & B. BUTCHER. Static vs. Dynamic Emotion Perception in Children with Social Deficits.

Objective: Children with social deficits such as autism have been found to be poor interpreters of facial affect in some studies (e.g. Baron-Cohen, 1993, Howard, et. al., 2000), or as able as normally developing children (e.g. Castelli, 2005) using static photos. This study examines the difference between static stimuli and dynamic video simulations, posing that active stimuli may better differentiate deficits in social perception for diagnosing children with SCD.

Participants and Methods: Participants: 92 children (ages 73 and 179 months (mean=124.06); 32 females / 68 males; VIQ > 85. Twenty normal controls; 38 with social deficits (SD; NVLD-10, AS-16, PDD-7, HFA-5); Clinical controls group of 34 with ADHD (14 Combined, 20 Inattentive). Where comorbid SCD/ADHD diagnoses occurred, participants were assigned SCD. The DANVA2 Child Faces subtest was used as the static stimulus. The active stimulus was the CASP Emotions Scale. All children completed both tests.

Results: Group differences for CASP performances were significant for distinctive performances between all three groups, with controls having best scores, SCD poorest, and ADHD in between ($F=19.96, p < .001, \eta^2 = 0.31$; all LSD contrasts $p < .05$). Group differences for the DANVA2 were non-significant among all groups ($F=1.768, p = .18$; all LSD contrasts $p > .08$).

Conclusions: Use of active stimuli better identified children with social deficit disorders. Simple face emotion recognition may be easily learned by children with SDC, making them more difficult to identify on standard static assessments. Moreover, poor emotion training outcomes may be related to children learning facial expressions in static format with poor generalization to real life dynamic social interaction. Using dynamic assessment and remediation procedures may improve identification and treatment. Follow-up studies are suggested, including fMRI research to delineate static/dynamic neural pathways in children with SCD.

Correspondence: *Jodene G. Fine, Ph.D., Psychology; Michigan State University, 262 Psychology Building, East Lansing, MI 48824-1118. E-mail: jodene@jfineglass.com*

S. SCHAFFER, W. BARR & O. DEVINSKY. Ecological Validity of the Comprehensive Affect Testing System-Abbreviated (CATS-A) in a Clinical Sample.

Objective: The Comprehensive Affect Testing System-Abbreviated (CATS-A) is a new computerized assessment battery that examines emotion recognition abilities across three communication channels. Until now, the ecological validity of this measure has not been established. It was hypothesized that CATS-A performance would be positively correlated with self-reported emotional intelligence.

Participants and Methods: Participants included 24 inpatients with known or suspected epilepsy who completed the CATS-A and the Bar-On Emotional Quotient Inventory: Short (EQ-i:S), a measure of social/emotional intelligence. Correlations between performance on the quotient scales of the CATS-A and the five scales of the EQ-i:S were examined to determine the association between emotion perception abilities and self-reported emotional intelligence.

Results: Patients' self-reported interpersonal skills were positively correlated with affect recognition abilities ($r=.487$; $p<.05$) and overall emotion perception abilities ($r=.482$; $p<.05$). Performance on prosody recognition tasks was associated with self-reported mood ($r=.428$; $p<.05$), as well as overall emotional intelligence ($r=.424$; $p<.05$). Self-reported intrapersonal skills, adaptability, and stress management were not associated with emotion recognition abilities. Seizure status was not a significant factor in these results.

Conclusions: Emotion recognition has been cited as a key requisite of emotional/social intelligence. The current results provide the first evidence that the CATS-A is an ecologically valid measure when used in an epilepsy population, and use of this test can help guide treatment interventions with these patients. As emotional intelligence has been found to be a better predictor of overall success than traditional measures of intelligence, the CATS-A has potential for use in a wide variety of clinical and research settings.

Correspondence: Sarah Schaffer, Ph.D., Comprehensive Epilepsy Center, NYU Medical Center, 403 East 34th Street, 4th Floor, New York, NY 10016. E-mail: sarah.schaffer@med.nyu.edu

M. HARCIAREK, K.M. HEILMAN & U.S. SPRINGER. The contribution of anterior and posterior regions of the right hemisphere to the recognition of emotions in faces and prosody.

Objective: Although previous studies have revealed that the right hemisphere (RH) is crucial for the recognition of emotions expressed by faces and prosody, the differential role of anterior and posterior parts of RH in these processes remains unclear.

Participants and Methods: To investigate the contribution of posterior and anterior parts of the RH to emotional recognition we studied 11 subjects with anterior strokes of the right hemisphere (ASRH) and 16 matched patients with posterior strokes of the right hemisphere (PSRH). Recognition of emotions in auditory and visual modalities were assessed with the Emotional Prosody Test (Bryan, 1995) and Ekman and Friesen's (1976) Pictures of Facial Affect.

Results: Analyses revealed that, regardless of valence, patients with PSRH identified visually presented emotions better than subjects with ASRH ($p<.05$). Positive facial emotions were recognized more accurately than those with negative valence, independently of stroke location ($p<.001$). However, in the auditory modality the opposite pattern was observed ($p<.05$). Additionally, post-hoc comparisons showed patients with ASRH were particularly impaired at recognizing emotions with negative prosody.

Conclusions: Our results suggest that anterior parts of the RH seem to play an important role in the identification of emotional faces. Liberman and Mattingly (1985) suggested that the process of perception must be linked with the process of production. Thus, our ASRH subjects' impaired emotional facial perceptions might be due to a deficit in gaining access to facial emotive programs. Further research is needed, however, to test and anatomically refine this hypothesis.

Correspondence: Utaka S. Springer, M.S., Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: uspringe@phhp.ufl.edu

U.S. SPRINGER, E. CONWELL, J. NORTON, A. ROSAS & D. BOWERS. Investigating facial movement asymmetries in the spontaneous expression of positive and negative emotion.

Objective: Numerous studies have shown that the left hemiface is more expressive than the right, but these largely have relied upon subjective ratings of emotional intensity with static picture stimuli (mirror reversals, hemicomposites). We have demonstrated previously that this asym-

metry holds during real-time facial movement in voluntary/posed expressions, and, using transcranial magnetic stimulation, is due at least in part to lateralized asymmetry of corticobulbar projections to facial muscles of expression. In this study, we investigated this phenomenon in spontaneous expressions of positive and negative emotion.

Participants and Methods: We recorded spontaneous facial expressions of 49 males and females watching videos with positive (humorous) or negative (disgusting/fearful) emotional content. Independent, blinded raters categorized all generated expressions as positive or negative in valence and as low or high in emotional expressiveness. For each expression generated, our software yielded the percent rate change in facial movement across the left and right hemifaces. Upper and lower regions were also examined separately due to differences in the cortical innervation of facial muscles (upper-bilateral, lower-contralateral).

Results: We found greater left-sided movement for negative expressions in the lower face, but only in the high-intensity condition (trend for low-intensity condition). Greater right-sided movement was found in the upper face during positive, high-intensity expressions. No other significant asymmetries were found in either region with either valence.

Conclusions: The finding that greater lower-left facial movement occurs during negative expressions is consistent with the previous literature. Lower-left facial expression asymmetries, then, appear to occur during spontaneous as well as posed facial expressions and is reflected in movement dynamics in addition to peak expressivity. The basis for greater right-sided upper face movement for positive expressions is unclear but will be addressed.

Correspondence: Utaka S. Springer, M.S., Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: uspringe@phhp.ufl.edu

I. STROESCU, J.D. GFELLER & M.J. ROSS. Cognitive Intelligence, Emotional Intelligence and Personality: An Exploratory Study.

Objective: There is increased scientific interest in emotional and social intelligence, its proposed neurological substrates (Bar-On, Tranel, Denburg, & Bechara, 2003; Adolphs, 2003), and debate over its psychometric operationalization and its correlates. The present study further explored the relationships between cognitive ability (IQ), emotional intelligence (EI), personality, and academic achievement.

Participants and Methods: Participants were 166 undergraduates (mean age = 19.6) enrolled at a Mid-Western university. The sample comprised 107 females (64.5%) and 59 males (35.5%). Cognitive ability was measured with the Shipley Institute of Living Scale (Zachary, 2000), EI with the 51-item short form of the Emotional Quotient Inventory (EQ-i:Short; Bar-On, 2002), and personality with the NEO-FFI (Costa & McCrae, 1992). All participants provided GPA and ACT/SAT scores.

Results: Participants had a mean estimated FSIQ of 110 and mean EQ-i:S standard scores in the Average range (males = 103, females = 99). Results showed no significant correlations between cognitive ability (IQ) and EI (EQ-i:S). Additionally, EI was not significantly correlated with academic achievement. Two personality factors (Neuroticism and Openness) showed small but statistically significant correlations with cognitive ability. No significant correlations emerged between the scales of the EQ-i:S and the Shipley Verbal (crystallized) and Abstraction Scale (fluid), respectively.

Conclusions: These findings provide further evidence for the divergence of cognitive intelligence and emotional/social intelligence. In addition to providing psychometric divergent validity, the results also indirectly support prior findings pointing to distinct (possibly independent) neural networks underlying cognitive intelligence and social cognition (Bar-On et al., 2003; Damasio, 1994). The findings also have implications regarding normal or high intelligence and ineffective social functioning and decision making (e.g., Asperger's syndrome, Nonverbal Learning Disorder).

Correspondence: *Ioan Stroescu, B.S., Psychology, Saint Louis University, Shannon Hall 119, 221 North Grand Boulevard, Saint Louis, MO 63103-2097. E-mail: ioan91@hotmail.com*

Forensic Neuropsychology

C.C. BREWER, S. HALL, J. DENBOER & T. KIMPTON. A Comparison of Sensitivity Among Three Symptom Validity Measures: TOMM, CARB & WMT.

Objective: This study examined the sensitivity of three popular symptom validity tests (SVT's): TOMM, CARB and WMT in the detection of suboptimal performance among brain injury simulators (BIS).

Participants and Methods: Participants were undergraduate students ($n=194$). Brain injury simulators ($n=138$) were asked to feign cognitive deficits while healthy controls ($n=94$) were instructed to perform to the best of their ability. All symptom validity measures were incorporated into a neuropsychological battery for all participants.

Results: Eighty-one percent of the cases were detected by all three SVT's. In 8% of the cases, two of the SVT's indicated suboptimal performance and the third did not. In terms of specific combinations, in 8% of the cases, the CARB indicated feigned performance when the TOMM and WMT indicated legitimate effort. In 3% of the cases, the TOMM indicated suboptimal performance when the CARB and WMT indicated good effort. The WMT indicated suboptimal performance in <1% of the cases when the TOMM and CARB did not. As expected, all controls performed above cutoff for all SVT's.

Conclusions: These results suggest a high level of agreement when using three measures of effort. When considered in pairs, inconsistent findings were seen in only a small percent of cases. No particular pairing of SVTs appeared to be superior. These results support the use of two measures of effort as well as additional indicators for the diagnosis of suboptimal effort.

Correspondence: *Cameron C. Brewer, M.A., Psychology, University of Montana, Skaggs Building 143, Missoula, MT 59812-1584. E-mail: cameron.brewer@umontana.edu*

J.A. CLARK, Y. ALWES & D. BERRY. Evaluation of Brief Malingering Screening Instruments in a Civil Forensic Sample.

Objective: Although the detection of feigning is a significant concern in forensic psychological assessments, the best validated tests currently available are time-consuming for both evaluatees and mental health professionals. Therefore, the validation of efficient screening measures for feigning would be useful. The Structured Inventory of Malingered Symptomatology (SIMS; Widows & Smith, 2005) and the Miller Forensic Assessment of Symptoms Test (M-FAST; Miller, 2001) have both demonstrated potential in this role; the present study cross-validated the SIMS and the M-FAST for the detection of psychiatric and neurocognitive symptom feigning.

Participants and Methods: These screening measures were compared to independent criterion measures (including the SIRS for psychiatric feigning, and a combination of the TOMM, LMT, and VSVT for neurocognitive feigning) as part of a known-groups design. The sample included 308 individuals who underwent testing as part of a civil forensic evaluation.

Results: Cut scores suggested by previous studies (SIMS: >16; M-FAST: ≥ 6) yielded high Sensitivity and Negative Predictive Power when the SIMS or M-FAST was used to rule-out psychiatric symptom feigning. However, both tests exhibited a decline in Sensitivity and Negative Predictive Power when used to rule-out false cognitive deficits.

Conclusions: These results lend support to the use of both the SIMS and the M-FAST as screens for psychiatric symptom feigning in a civil forensic setting, but are somewhat less positive regarding their applicability to screening out feigned neurocognitive impairment.

Correspondence: *Jessica A. Clark, M.S., Clinical Psychology, University of Kentucky, 2020 Armstrong Mill Rd, Apartment 333, Lexington, KY 40515. E-mail: jaclar6@uky.edu*

C. D'AMATO & R.L. DENNEY. The Diagnostic Utility of the WMS-III Rarely Missed Index (RMI) in Detecting Response Bias in an Adult Male Incarcerated Setting.

Objective: This study used a known-group research design to evaluate the diagnostic efficiency of the RMI in a criminal forensic sample.

Participants and Methods: Archival data from 60 adult male inmates referred for neuropsychological testing were reviewed at the U.S. Medical Center for Federal Prisoners, Springfield, Missouri. Evaluatees were assigned to a probable malingered neurocognitive dysfunction (PMND; $n = 30$) and a valid group ($n = 30$) based on the Slick et al. (1999) criteria. The PMND evaluatees were classified as such if they had scored below the cut-off scores on two or more of the following: CARB, WMT, or TOMM. The valid group were classified based on adequate performance on each of these SVTs. A factorial ANOVA was performed to evaluate significant differences in mean scores between the PMND and the valid group across all WMS-III indices to test the hypothesis that the PMND group would perform more poorly overall than the valid group due to poor effort. Next, the Killgore and DellaPietra (2000) RMI was calculated for each evaluatee. Descriptive classification accuracy statistics and a receiver operating characteristics (ROC) curve were calculated to determine whether the RMI ≤ 136 performed statistically better than chance in correctly classifying evaluatees.

Results: The PMND group demonstrated poorer performance across WMS-III index scores. Results of diagnostic classification accuracy statistics revealed extremely low sensitivity at 33%. Its specificity was 83%. The positive predictive power (PPP) with the base rate of 22.78 was 38%; with a negative predictive power (NPP) of 81%. The PPP with a base rate of 70.48 was 82%. The NPP with a base rate of 70.48% was 34%. The results of the ROC curve revealed performance only slightly above the chance level.

Conclusions: Results suggested poor diagnostic efficiency of the RMI in this setting despite significant differences in WMS-III performance between groups. Results may indicate different negative response patterns in criminal forensic settings.

Correspondence: *Christopher D'Amato, Psy.D., Forest Institute for Professional Psychology, 1330 Atlas Street apt 107, Rapid City, SD 57701. E-mail: cdamato@forest.edu*

C. DEARTH & D. BERRY. Cross-Validation of Malingering Tests for Use with Adolescents.

Objective: The accuracy of symptom self-report during adolescent forensic evaluations is a prominent concern, but malingering tests have not been extensively evaluated in the empirical literature for use with this population. The present study attempted to cross-validate malingering measures for use with adolescents through a simulation design.

Participants and Methods: Eighty-six adolescents aged 14 to 18 (all enrolled in high school) participated in the study. Thirty-seven community volunteer analog malingerers (CVM), 31 adolescents with clinical diagnoses (CLH: ADHD, Bipolar Disorder, or depressive disorders), and 18 honest-responding community volunteers (CVH) completed the SIRS, SIMS, PIY, TOMM, and LMT. Malingerers were provided a forensic scenario, malingering instructions, coaching, and financial incentive for malingered performances.

Results: As expected, the CVM group performed more poorly than the CVH participants on malingering measures. However, differences between CVM and CLH performances were not as large as typically found in the adult literature. The CVM and CLH groups did not differ in performances on the PIY Fb scale or neurocognitive malingering measures, but the CVM group did generate significantly higher total scores for the SIRS and SIMS. Additionally, more CLH participants were found to “fail” malingering measures than expected, contributing to poorer operating characteristics and hit rate for these measures with an adolescent sample.

Conclusions: Results suggest the need for new adolescent cutting scores for malingering measures, more extensive cross-validation of cutting scores, and caution when applying malingering measures to clinical decision making with adolescents.

Correspondence: *Chantel Dearth, Ph.D., Woodlands Center, Inc., 3086 St Rte 160, Gallipolis, OH 45714. E-mail: chanteldearth@cs.com*

J. DENBOER, S. HALL, J. WAX, K. LORDEMANN, T. BADER, C. BREWER & C. MILLER. Memory for Complex Pictures: Initial Development and Validation of a Digital Test of Memory Malingering.

Objective: This study highlights the psychometric characteristics of a new symptom validity test (SVT), entitled Memory for Complex Pictures (MCP). The MCP is a computerized measure employing 50 high-resolution color photographs of complex visual scenes presented over two trials.

Participants and Methods: Undergraduate students without a history of neurological, psychological, or alcohol/drug problems were randomly assigned to one of three groups: coached brain injury simulators (CBIS) ($n=32$), uncoached brain injury simulators (UBIS) ($n=35$), or controls ($n=33$). CBIS received detailed instructions to fake cognitive impairment while UBIS received briefer directions; controls were asked to give full effort on all tests. The MCP was administered as part of a battery of standard neuropsychological measures.

Results: As hypothesized, controls performed at ceiling levels on the MCP, scoring an average of 49.18 out of 50 on Trial 1 ($SD = 1.13$) and 49.67 out of 50 on Trial 2 ($SD = .60$). CBIS scored significantly lower than controls on Trial 1 (mean = 33.78, $SD = 8.0$) and Trial 2 (mean = 35.78, $SD = 10.10$). UBIS scored lower than CBIS on both trials, although not significantly so (Trial 1 mean = 29.74; $SD = 10.63$; Trial 2 mean = 31.20, $SD = 11.18$). Although response latency for correct and incorrect responses did not differ significantly between groups, controls were significantly faster and more consistent in their responding than CBIS and UBIS.

Conclusions: This study details the performance of brain injury simulators on a new SVT. Results suggest that the MCP has potential as a test of memory malingering.

Correspondence: *John DenBoer, M.A., GRECC, Boston VA Health Care System, 53A Fairview St., Roslindale, MA 02131. E-mail: judenboer@yahoo.com*

J. DENBOER & S. HALL. Preliminary Validation of the Memory for Complex Pictures test in a Mixed Brain-Injured Population.

Objective: The purpose of this study was to validate the use of the Memory for Complex Pictures test (MCP), a new measure of memory malingering, using patients with various forms and severity levels of brain injury. Performance of litigating and non-litigating patients on the MCP was compared.

Participants and Methods: Participants were 29 brain-injured patients presenting for neuropsychological assessment (17 males; 12 females). Participants ranged in age from 5 to 82, with a mean age of 29.45. Four patients (13.8%) were currently pursuing litigation. All patients displayed at least mild deficits on a standard memory test (e.g., CVLT-II).

Results: Adult patients not involved in litigation ($n = 17$, mean age = 36.94) achieved an average of 45.18 correct responses out of 50 on MCP

Trial 1 ($SD = 6.15$) and 46.59 out of 50 on Trial 2 ($SD = 5.97$); litigating adult patients had lower scores on both Trial 1 (mean correct = 40.00, $SD = 11.34$) and Trial 2 (mean = 43.75, $SD = 7.41$). Child and adolescent patients ($n = 8$, mean age = 10 years) exhibited higher performance than litigating adults, with an average Trial 1 score of 43.63 ($SD = 6.14$) and Trial 2 score of 45.50 ($SD = 6.95$). On average, patients completed the MCP in approximately 12 minutes.

Conclusions: All adult non-litigating patients exhibited near-ceiling performance on the MCP; litigating patients scored lower than non-litigating patients. These results lend support for the MCP's potential efficacy as an accurate and relatively brief assessment of client effort during neuropsychological assessment.

Correspondence: *John DenBoer, M.A., GRECC, Boston VA Health Care System, 53A Fairview St., Roslindale, MA 02131. E-mail: judenboer@yahoo.com*

P.A. DUNBAR-MAYER & D. WHITESIDE. An Investigation of the Sensitivity, Specificity, Negative-Predictive and Positive-Predictive Values of the TOMM Trial 1 on Trial 2 and the Retention Trial Performance.

Objective: The focus of this archival study is to help establish an early discontinuation rule for the TOMM after Trial 1 for those scoring \geq to 45 on Trial 1. The primary goal of this research is a partial replication of a study conducted by Gavett, O'Bryant, Fisher, and McCaffrey (2005), which calculated the hit rates for Trial 2 and the Retention Trial on the TOMM based on the cutoff score of 45 for Trial 1.

Participants and Methods: The archival study involved 305 participants who underwent a similar neuropsychological battery of tests, including the TOMM.

Results: Consistent with Gavett et al. (2005), the current study showed a high hit rate for scores \geq to 45 on Trial 1 in relation to performance on Trial 2 (100% hit rate) and the Retention Trial (99%). The capacity for Trial 1 of the TOMM in predicting a positive score (between 1 and 44) on Trial 2 showed perfect sensitivity (100%) and on the Retention Trial (94%). The NPV for Trial 1 scores (\geq to 45) in predicting Trial 2 (100%) and the Retention Trial (99%) scores were also excellent.

Conclusions: These findings lend additional support to an early discontinuation rule for the TOMM after Trial 1 for examinees that score \geq to 45 on Trial 1. However, due to the high false-positive rate (22%) for those scoring between 1 and 44 on Trial 1, it is highly recommended that all three trials of the TOMM be administered in these cases.

Correspondence: *Philip A. Dunbar-Mayer, MA, Clinical, Argosy University/Seattle, P.O. Box 5253, Lynnwood, WA 98046. E-mail: philip.mayer@comcast.net*

D.S. GOLDSTEIN & L.A. SWOROWSKI. Sensitivity and Specificity of the Rey-15, TOMM, VSVT, WMT and CVLT-II FC Among Criminal Defendants.

Objective: The present study was designed to compare the failure rates and sensitivity and specificity of five commonly used effort tests (Rey 15-Item Test, TOMM, VSVT, WMT and CVLT-II FC) among criminal defendants.

Participants and Methods: A large sample ($n = 125$) of felony defendants undergoing adjudication-related evaluation was compared to a large sample ($n = 125$) of post conditional job offer public safety candidates undergoing psychological evaluation. Participants were judged to have provided good, questionable or poor effort based on extensive clinical interviews and in the forensic sample comprehensive neuropsychological evaluation and record review. Failure rates on individual and combinations of effort measures were calculated for both samples, and sensitivity and specificity determined. Correlations between effort measures and an overall test battery mean were additionally calculated for the forensic sample based on Rohling's Interpretive Method (Rohling & Miller, 1998; Miller & Rohling, 2001) in order to determine which individual or combination of effort measures best predicted performance.

Results: Among criminal defendants, failure rates were highest on the WMT, followed by the TOMM, Rey-15, VSVT and CVLT-II FC. A significant minority of controls failed the WMT, but no other measure. The positive predictive value for certain effort tests was increased when combined with another measure, though is dependent on specific combinations.

Conclusions: Failure rates on various effort measures differ significantly and using multiple effort measures increases their positive predictive power. Factors associated with the surprisingly high number of failures on the WMT in controls as well as forensic participants judged to have provided good effort are discussed.

Correspondence: *Diana S. Goldstein, Ph.D., Isaac Ray Forensic Group, 200 S. Michigan Avenue, Suite 710, Chicago, IL 60604. E-mail: dgoldstein@irfg.org*

L.A. SWOROWSKI & D.S. GOLDSTEIN. Increasing the Positive Predictive Power of the TOMM, VSVT, WMT and CVLT-II FC in Criminal Defendants through the Use of Altered Cutoff Scores.

Objective: The present study was designed to compare the effect on sensitivity and specificity of altered cutoff scores in four commonly used effort tests (TOMM, VSVT, WMT, CVLT-II Forced Choice) among criminal defendants.

Participants and Methods: A large sample ($n = 125$) of felony defendants undergoing adjudication-related evaluation was compared to a large sample ($n = 125$) of post conditional job offer public safety candidates undergoing psychological evaluation. Participants were judged to have provided good, questionable or poor effort based on extensive clinical interviews and in the forensic sample comprehensive neuropsychological evaluation and record review. Using traditional and altered cutoff scores, failure rates on individual and combinations of effort measures were calculated for both samples and changes in relative sensitivity and specificity determined.

Results: Increases in sensitivity and specificity were obtained by using a clinically-derived cutoff score based on a sample of nonlitigating moderate to severe closed head injury patients (Berry, 1996) versus traditional chance-range determined cutoff scores on the VSVT. Similar changes were obtained with use of the former WMT cutoff scores.

Conclusions: The use of altered/more stringent cutoff scores improves the positive predictive power of certain effort tests in criminal defendants. Correspondence: *Diana S. Goldstein, Ph.D., Isaac Ray Forensic Group, 200 S. Michigan Avenue, Suite 710, Chicago, IL 60604. E-mail: dgoldstein@irfg.org*

L. GRAUE, D. BERRY, J. CLARK, M. SOLLMAN, M. CARDI, J. HOPKINS & D. WERLINE. Detection of Malingered Mental Retardation.

Objective: The 2002 Supreme Court decision (*Atkins vs. Virginia*, 536 U. S. 304), prohibiting the execution of mentally retarded persons, may potentially increase malingering of mental retardation (MR). There is limited research addressing the detection of feigned MR. The present study compared results from tests of intelligence, adaptive functioning, legal knowledge, and psychiatric and neurocognitive feigning to determine how effectively these instruments discriminate between MR participants and community volunteers asked to feign MR.

Participants and Methods: Participants included 26 individuals with mild MR who were their own legal guardians and 35 community volunteers (CV) completing no more than 11 years of school. CVs were randomly assigned to either the malingering (CVM) or honest (CVH) group. All groups completed the same demographics questionnaire and test battery.

Results: The CVMs suppressed their IQ scores sufficiently to appear mildly MR. On tests of adaptive functioning and courtroom knowledge, CVMs overestimated the deficits of individuals with genuine MR. Psychiatric feigning instruments did not differentiate between MR and CVM

groups. Neurocognitive feigning instruments discriminated between groups, however specificity and Positive Predictive Power were unacceptably low. Revising cutting scores to hold specificity at .95 improved PPP significantly, suggesting the potential utility of these instruments to detect feigned mental retardation.

Conclusions: Results from this study suggest that applying published decision rules to MR populations on tests commonly used in forensic evaluations will likely result in high false positive errors. Given the high stakes associated with classification inaccuracy in capital cases involving MR defendants, alternative cutting scores appropriate for this population should be determined.

Correspondence: *Lili Graue, M.S., Clinical Psychology, University of Kentucky, 2109 Ladera Lane, Lexington, KY 40514. E-mail: lili.graue@uky.edu*

K.W. GREVE, K.L. CURTIS, K.J. BIANCHINI & J. ORD. A Comparison of Malingering Indicators Derived from the Original and Second Edition of the California Verbal Learning Test.

Objective: The California Verbal Learning Test (CVLT-1) can accurately detect cognitive malingering in TBI. It is unknown whether CVLT-1 findings will generalize to the CVLT-2. This study directly compared the classification accuracy of the CVLT-1 and CVLT-2 in the detection of cognitive malingering in chronic pain.

Participants and Methods: CVLT data were examined in a matched-group comparison study ($n = 82$ per group) and in a known-groups malingering study (CVLT-1: not MND = 99, MND = 53; CVLT-2: not MND = 38, MND = 41). The primary variables were Recognition Hits and the Millis and Volinsky Linear Shrinkage Model.

Results: Significant test effects were seen in the matched group study. At a given cutoff, up to 3 times as many CVLT-2s were positive compared to CVLT-1s. In the known groups study, the CVLT-1 false positive (FP) error rate in pain was comparable to that in TBI. The CVLT-2 FP rate was higher relative to the CVLT-1 at the same cutoff. However, at cutoffs associated with the same FP rate, the CVLT-2 had equal or greater sensitivity.

Conclusions: In pain, cutoffs for CVLT-1 indicators are likely to produce unacceptable FP rates when applied to the CVLT-2. However, when cutoffs appropriate to the CVLT-2 are used, the CVLT-2 is just as accurate in detecting cognitive malingering. Accuracy data for both CVLTs in chronic pain are provided.

Correspondence: *Kevin W. Greve, Ph.D., Psychology, University of New Orleans, UNO-Lakefront, New Orleans, LA 70148. E-mail: kgreve@uno.edu*

R. KOTASEK, R.A. HANKS & S.R. MILLIS. Analysis of TOMM scores using the established cut score in a heterogeneous group.

Objective: To analyze the interrelationships of the three Test of Memory Malingering (TOMM) trials in relation to the established TOMM cut score.

Participants and Methods: A diagnostically heterogeneous group of seventy-eight participants from an outpatient hospital and private practice setting were given the TOMM as part of a standard neuropsychological test battery. Crosstabulations and correlations were conducted using the TOMM raw scores.

Results: All three trials of the TOMM were found to be highly intercorrelated across the entire sample. All participants scoring greater than 44 on Trial 1 also scored greater than 44 on Trial 2. Of those scoring less than 45 on Trial 1, approximately 47% scored less than 45 on Trial 2. In addition, of those scoring greater than 44 on Trial 2, approximately 78% scored greater than 44 on the Retention Trial. Of those scoring less than 45 on Trial 2, approximately 93% scored less than 45 on Retention.

Conclusions: This suggests that if an individual scores above the cut score on Trial 1, administration of Trial 2 is not necessary to establish “good” test effort. Further, if an individual does not score above the cut score on Trial 2, administration of the optional Retention Trial is not necessary to establish “suboptimal” effort.

Correspondence: *Robin A. Hanks, Ph.D., Physical Medicine and Rehabilitation, Wayne State University School of Medicine, 261 Mack Blvd., Detroit, MI 48201. E-mail: rhanks@dmc.org*

L.L. HOSKINS, M. DANIEL, L. CHRISTIANSEN, K. BRODEUR & D. FECHTINGER. Severity of Criminal History and Neuropsychological Status in a Community Corrections Population.

Objective: This study examined the neuropsychological functioning of 70 male and 30 female inmates in a community corrections facility (aged 19-61 years). A comprehensive review of criminal records was completed and subjects were administered neuropsychological tests.

Participants and Methods: The relationship between number of convictions and neuropsychological performance was examined. Subjects were divided into three groups according to number of convictions (1-5; 6-10; >10). Additionally, the relationship of education to neuropsychological performance was analyzed. Subjects were divided into three groups according to their educational level (<10 years; 10-12 years; >12 years).

Results: The inmates had the following distribution of Wechsler Abbreviated Scale of Intelligence (WASI) Full Scale IQ (FSIQ) scores: 9% < 69; 24% = 70-89; 55% = 90-109; 12% > 110.

There was a statistically significant difference in WASI Block Design t-scores for the three conviction groups. Group comparisons on all other neuropsychological tests were non-significant for number of convictions. There were significant differences among education groups on WASI Vocabulary and FSIQ; Wechsler Individual Achievement Test (WIAT) Spelling and Word Reading; IVA Continuous Performance Test; and Delis-Kaplan Executive Function System Sorting, Color-Word Switching and Tower.

Conclusions: As a group, these criminals in community corrections had slightly lower cognitive functioning compared to the normal population; however, beyond this, there was no consistent relationship between severity of criminal history and neuropsychological status. Education was the strongest influence on neuropsychological status among these inmates. Correspondence: *Laura Hoskins, M.S., SPP, Pacific University, 1249 Park Avenue, Apt 17A, New York, NY 10029. E-mail: hosk5601@pacificu.edu*

L. HOSKINS, L. BINDER, D. DRANE, N. CHAYTOR, D. WILLIAMSON & E. STROUP. Comparison of the Oral and Computerized Versions of the Word Memory Test.

Objective: This study examined the equivalency of the oral and computerized versions of the Word Memory Test, a measure of symptom validity, in two populations.

Participants and Methods: Subjects were obtained from two samples: 1) inpatients undergoing video-EEG monitoring (n = 67) and 2) outpatients in a private practice (forensic and clinical; n = 58). Participants received one version of the WMT, with comparisons made for the primary effort indices [immediate recognition (IR), delayed recognition (DR), and consistency (CNS)].

Results: A failure was defined as any of the three scores falling below the suggested cutoff. Failure rates, analyzed by Chi-square, showed no significant differences between versions in either sample. Failure rates appeared high, but are consistent with previous reports in similar patient samples. For example, combining both versions, 28% of the inpatient sample failed. Mann-Whitney analyses of mean scores showed no significant differences between versions in the outpatient sample, while in the inpatient

sample the computerized administration yielded significantly higher scores only for IR. The effect size, however, was negligible. Inpatient failure rates fell short of significance but suggested epilepsy patients fail the computer version at a greater frequency than the oral version (29% vs. 14%) and PNES patients more frequently fail the oral version (44% vs. 28.6%).

Conclusions: The data support equivalency of the oral and computerized versions in a mixed sample of outpatients. However, failure rates for the two versions should be explored by subgroup, as performance patterns may differ at this level.

Correspondence: *Laura Hoskins, M.S., SPP, Pacific University, 1249 Park Avenue, Apt 17A, New York, NY 10029. E-mail: hosk5601@pacificu.edu*

M. KEISKI, V. MISKOVIC, D. SHORE & J. HAMILTON. Sensitivity of Response Bias Indicators on the Personality Assessment Inventory (PAI) to the Feigning of Traumatic Brain Injury (TBI): An Analogue Study.

Objective: The purpose of this study was to evaluate the sensitivity of PAI negative response bias indicators to the simulation of somatic and cognitive sequelae of TBI in an analogue design.

Participants and Methods: Naive undergraduates, warned to evade detection, were instructed to feign common somatic and cognitive sequelae (but not psychiatric sequelae) of TBI (sSIM = 43). Their scores on Negative Impression Management (NIM) and the Rogers Discriminant Function (RDF) were then compared to those of naive undergraduates feigning a broad range of psychiatric, somatic, and cognitive sequelae of TBI (pSIM = 42) and to those of mild TBI patients whose performance on tests of neurocognitive effort appeared adequate (mTBI = 65).

Results: The sSIM group obtained lower scores on NIM and RDF than did the pSIM group. Nonetheless, both groups of simulators produced higher elevations on NIM and RDF than the mTBI group. ROC analyses suggested that NIM and RDF were less sensitive to simulation of strictly somatic / cognitive sequelae than to simulation that incorporated psychiatric elements. Approximately 90% of simulators in the sSIM group produced elevations of at least 70T on NIM, whereas 63% of simulators in the pSIM group produced similar elevations.

Conclusions: Response bias indicators on the PAI demonstrated some degree of sensitivity to the simulation of psychiatric, cognitive, and somatic symptoms commonly reported following TBI. However, NIM and RDF appeared less sensitive to the feigning of strictly somatic / cognitive symptoms than to the feigning of a broad range of symptoms that included psychiatric symptoms.

Correspondence: *Michelle Keiski, M.A., Dept. of Psychology, University of Windsor, 401 Sunset Ave., Windsor, ON N9B 3P4, Canada. E-mail: keiski@uwindsor.ca*

S.R. MILLIS, P. WOLFE, G. LARRABEE, R. HANKS, J. SWEET & N. FICHTENBERG. The California Verbal Learning Test-II in the Detection of Incomplete Effort.

Objective: To derive a multivariable logistic regression model based on the California Verbal Learning Test – II (CVLT-II) to detect incomplete effort.

Participants and Methods: A case-control design was used: 124 persons with moderate to severe traumatic brain injuries (TBI) and 77 persons with mild head injuries (MHI) who were in litigation and failed at least 1 effort measure (e.g., TOMM, Word Memory Test, CARB). Bayesian model averaging (BMA) for logistic regression was used with 18 CVLT-II variables. The leaps and bounds algorithm was used to search over the model space to determine which variables and models were optimal in discriminating the TBI and MHI groups.

Results: The model having greatest support from the data included long-delay free recall, total recognition discriminability (d'), and total recall discriminability. Area under the ROC curve was 0.82, which indicated excellent group discrimination.

Conclusions: Some of the newly derived CVLT-II variables appear to have considerable promise in detecting incomplete effort. The litigating MHI group tended to have suppressed recall and recognition discriminability relative to long-delay free recall.

Correspondence: *Scott R. Millis, PhD, Physical Medicine & Rehabilitation, Wayne State University; RIM - Rm 552, 261 Mack Blvd, Detroit, MI 48201. E-mail: aa3379@wayne.edu*

S. MINTZ & R. LEARK. Executive Functioning of Domestic Violence Offenders.

Objective: The theory behind this research is that domestic violence offenders commonly experience deficits in impulse control and that these impulse control deficits are part of a global impairment in frontal, or executive functioning in these offenders. Moreover, if a deficit in executive functioning does exist among these offenders, rehabilitation programs should be designed in a way that will account for these deficits. The hypothesis of this research is that domestic violence offenders will demonstrate impaired performance on measures of executive functioning compared to controls.

Participants and Methods: Participants were $n=40$ first time domestic violence offenders who were recruited from a 52-week domestic violence offender rehabilitation program. A battery of four neuropsychological testing instruments designed to measure executive functioning was administered to each participant. These tests were the Stroop Color and Word Test, the Reynolds Comprehensive Trail-Making Test, the Tower of London Drexel Version, and the Wisconsin Card Sorting Test, administered respectively. These tests were then scored.

Results: After each test was scored, a series of single-sample t-tests were run to compare each T-score from the experimental group, to the average T-score ($T=50$) of the norming sample from each test. Results indicated that the experimental group demonstrated impaired performance on several scores. Cohen's d was then used to determine the size of each significant difference.

Conclusions: Results indicate that several measures of executive functioning were impaired in the experimental group, supporting the hypothesis. The most significantly impaired scores were in measures sensitive to impulse control. The conclusion of this research therefore, is that domestic violence offenders suffer from impaired executive functioning, especially in impulse control. Therefore, domestic violence rehabilitation programs should focus on developing curricula that are sensitive to impaired impulse control.

Correspondence: *Sean Mintz, M.A., Alliant International University, 45333 Mays Ct., Lancaster, CA 93535. E-mail: daseaner@aol.com*

N.W. NELSON, J.J. SWEET, C.M. SMART, F.B. BRYANT, D.T. BERRY, R.P. GRANACHER & R.L. HEILBRONNER. Identification of Cognitive Effort Using the MMPI-2: An Optimal Classification Tree Analysis.

Objective: Neuropsychologists routinely rely on response validity measures, both psychological and cognitive, to evaluate the authenticity of test performances. Yet, research has suggested that the relationship between measures of cognitive and psychological response validity is complex and not clearly understood. The present study examined whether psychological test results can be expected to enhance clinical decision-making with regard to cognitive effort.

Participants and Methods: The present analysis applied classification tree methodology (Optimal Discriminant Analysis: ODA; Yarnold & Soltysik, 2005) in a sample of 307 individuals who had completed the MMPI-2 and a variety of cognitive effort measures. One-hundred-ninety-eight participants were evaluated in the context of secondary gain, and 109 had no identifiable secondary gain. Through recurrent dichotomous discriminations, ODA resulted in optimized linear decision trees to classify either good or insufficient cognitive effort according to various MMPI-2 scale cutoffs.

Results: ODA results are presented as classification trees, with optimal MMPI-2 cut-scores classifying insufficient versus sufficient cognitive effort. After 'pruning' of an initial, complex classification tree, the Response Bias Scale (RBS; Gervais, 2005) took precedence in classifying cognitive effort. When removing RBS from the model, Hy took precedent in classifying cognitive effort, with relatively strong resultant classification accuracies.

Conclusions: Findings illustrate the complex relationship that MMPI-2 validity and clinical scales have with cognitive effort measures. Present classification trees provide the clinician with a decision-making heuristic regarding which MMPI-2 scores can be expected to identify good and insufficient cognitive effort in clinical and civil forensic individuals.

Correspondence: *Nathaniel W. Nelson, Ph.D., Neuropsychology Laboratory, University of Minnesota, University of Minnesota, Neuropsychology Laboratory, Mayo Mail Code 390, Minneapolis, MN 55455. E-mail: nels5363@umn.edu*

J.J. NEUDECKER & R.L. SKEEL. A Novel Malingering Detection Method Involving Multiple Detection Strategies.

Objective: The malingering of cognitive deficits due to alleged or actual head injury is problematic for the multiple parties it affects. A number of approaches have been used to assess effort. These include response time, floor effect, symptom validity testing, and performance curve analysis. The current project involves a novel computer administered measure of malingering detection that utilizes multiple detection strategies. It was hypothesized that multiple strategies would provide improved balance of sensitivity and specificity compared to individual detection strategies.

Participants and Methods: One hundred fourteen individuals participated, with ninety-four subjects without a history of TBI being evenly split between a control group and an educated malingering group. The educated group was provided with information regarding head injury sequelae. Twenty subjects with a history of moderate to severe TBI served as a clinical control group.

Results: Using cut scores, the overall measure yielded a sensitivity of .81 and a specificity of .89 for malingering, with 2/20 clinical group members being falsely implicated, and 9/47 malingers being wrongly classified. Individual components of the measure varied widely in classification accuracies. The measure was also sensitive to impairment, with total completion time and learning curves having the best classification accuracy (sensitivity = .95; specificity = .95).

Conclusions: Results suggest there is utility to combining detection techniques, including indicators of genuine impairment, particularly with regard to learning profiles and completion times.

Correspondence: *John J. Neudecker, M.A., University of Florida, 13200 W. Newberry Rd, #S103, Newberry, FL 32669. E-mail: jneudecker@yahoo.com*

J. ORD, K.W. GREVE, K.J. BIANCHINI & K.L. CURTIS. Prevalence of Malingering in Chronic Pain: A Comparison of Two Diagnostic Systems.

Objective: This study compared the prevalence of malingering in chronic pain patients as defined by two different classification systems: The Slick et al. (1999) criteria for Malingered Neurocognitive Dysfunction (MND) and the Bianchini et al. (2004) MPRD criteria. While the MPRD criteria were inspired by the Slick et al system, they go beyond cognitive malingering to address the potential for malingering of emotional and physical disability.

Participants and Methods: Data were obtained on 508 chronic pain patients referred for psychological pain evaluations. All were seen in a compensation-seeking context. The malingering status of each patient was determined using both of systems, relying on objective psychometric indicators of malingering. A second estimate of MPRD rates also included qualitative inconsistencies on medical examination (MPDR+).

Results: Of the 508 patients, 25.2% met criteria for MND, 32.5% met criteria for MPRD, and 37.4% met criteria for MPRD+. 8.9% scored below chance on a forced-choice symptom validity test. An additional 1.6% met criteria for Definite MPRD with a “compelling inconsistency.”

Conclusions: These findings support recent survey findings of a 31% base rate of malingering in pain patients (Mittenberg et al., 2002). Thus more recent empirical and survey information supports higher prevalence than reported in earlier literature (Fishbain et al., 1999). Given the now clear relationship between incentive and outcome from treatment for pain problems (Harris et al., 2005), the findings of a higher prevalence of malingering has important implications for clinicians working with pain and chronic pain populations and should impact surgical and pain management practice.

Correspondence: *Kevin W. Greve, Ph.D., Psychology, University of New Orleans, UNO-Lakefront, New Orleans, LA 70148. E-mail: kgreve@uno.edu*

A. SALDIVAR. Neuropsychological Testing of a Child and an Adolescent Exposed to Elemental Mercury.

Objective: To present neuropsychological testing of two individuals exposed to mercury subsequent to a mercury spill in their community.

Participants and Methods: Child and adolescent neuropsychological cases will be presented to illustrate the effects of mercury at different points in the developmental continuum.

Results: Case 1: Anita was 1 year and 1 month old when she was exposed to mercury. She was exposed while playing in the street near her home, within her home, and through nursing. Anita developed a rash, problems breathing, head aches, change in personality (irritability), problems sleeping, had blood in her feces, and received chelation therapy. Case 2: At the time of the spill Abby was 10. She was exposed to mercury in her family's store, at home, as well as by playing with it on the street. She developed nausea, fever, myalgias, cephalalgias, abdominal pain, memory loss, irritability, sleep disturbance, sadness, paresthesias, anorexic behavior, tremor in arms, gingivitis, and dermatitis on all body surface and was treated with penicillamine. Both underwent neuropsychological examination 5 years after the exposure.

Conclusions: This presentation will focus on the similarities and differences found on neuropsychological test results of two individuals exposed to mercury at varying developmental stages.

Correspondence: *Aida Saldivar, Ph.D., Rancho Los Amigos National Rehabilitation Center, 7601 E. Imperial Hwy., HB 226, Downey, CA 90242. E-mail: asaldivar@ladhs.org*

L. SCHIPPER, D. BERRY, E. COEN & J. CLARK. Validation of a Manual Form of the Letter Memory Test.

Objective: The past decade has seen increased interest in forensic neuropsychological assessment and concern with the detection of malingered neurocognitive deficit (MNCD). The exact base rate of MNCD during neuropsychological evaluations is not known, although estimates have ranged from 7% to 48% in forensic settings. Several well-validated tests of MNCD are currently available, but concern has been raised about compromise of test security over time, creating a need for new measures. The Letter Memory Test (LMT; Inman et al., 1998) is a newer test for MNCD. The computerized version has established reliability and validity, but the manual form of the test, administered with stimuli on index cards, has not yet been formally validated. The present study provides cross-validation of the manual form of the LMT using a Known-Groups design.

Participants and Methods: Participants were 47 outpatients referred for neuropsychological testing. They were classified as honest (HON: $n = 38$) or probable cognitive feigners (PCF: $n = 9$) based on results from the DMT and TOMM using established cutting scores.

Results: The groups were comparable on most demographic and injury severity characteristics, although PCF participants had significantly

less education and were significantly more likely to be seeking compensation. PCF participants scored significantly lower on many neuropsychological tests (median Cohen's $d = 1.2$), and significantly worse on the manual form of the LMT (PCF: $M = 61.9\%$, $SD = 28.4$; HON: $M = 98.1\%$, $SD = 4.5$; Cohen's $d = 4.2$). At the recommended cutting score, Sensitivity of the LMT was .78. Specificity was .95, and the overall Hit Rate was .91.

Conclusions: Results were comparable to those previously reported using the computerized version of the LMT.

Correspondence: *Lindsey Schipper, University of Kentucky, 156 Black Water Lane, Lexington, KY 40511. E-mail: ljschi2@uky.edu*

L. SCHIPPER & J.E. WILLIAMS. Comparison of MCMI-III, PAI, and MMPI-2 in Detecting Malingered Traumatic Brain Injury.

Objective: The Millon Clinical Multiaxial Inventory-III (MCMI-III), Personality Assessment Inventory (PAI), and Minnesota Multiphasic Personality Inventory-2 (MMPI-2) are measures of personality assessment commonly used as part of a neuropsychological battery. Although the MMPI-2 has the most research supporting its use in detecting malingered traumatic brain injury, the MCMI-III and PAI have initial, but significantly less, empirical research supporting their use in this setting. The purpose of this study was to provide a direct comparison of these measures and their ability to distinguish between simulated malingerers and patients who have sustained real mild traumatic brain injury.

Participants and Methods: A total of 169 participants were utilized in this study. The simulated malingering ($n = 84$) and control ($n = 51$) groups included normal undergraduate students from two universities, while the head injury group ($n = 34$) included undergraduate students who had sustained a previous mild traumatic brain injury. Simulated malingerers were coached on symptoms of traumatic brain injury prior to testing.

Results: Results showed mean differences between malingerers and honest participants on all validity scales examined, but no differences were found between honest head injured and control participants. The MCMI-III Z scale and PAI NIM scale did well at detecting malingering based on the operating characteristics of Sensitivity and Specificity, but the widely used MMPI-2 scales performed the best when detecting malingering. Hierarchical logistical regression showed that either the MCMI-III or PAI may have incremental predictive utility when added to the MMPI-2, but the benefits of using all three measures together are limited.

Conclusions: Implications for neuropsychological assessment and future research are discussed.

Correspondence: *Lindsey Schipper, University of Kentucky, 156 Black Water Lane, Lexington, KY 40511. E-mail: ljschi2@uky.edu*

J.A. SMITH & K. BOONE. Preliminary Examination of the Extended Complex Figure Test's Utility in the Identification of Suspect Effort.

Objective: The Extended Complex Figure Test's (ECFT; Fastenau, 1996, 2003) ability to identify neuropsychological patients giving suspect effort (SE) was examined. The ECFT is the most recent variation of the original Rey-Osterrieth Complex Figure Test (ROCFT; Rey, 1941). Meyers and Meyers (1995) first added a recognition trial to the ROCFT recall trial, which was subsequently validated as a measure of SE (Lu, Boone, Cozolino & Mitchell, 2003). The ECFT recognition trial is more comprehensive and followed by a matching task, thus having the potential to be more sensitive to suboptimal effort than the Meyers and Meyers paradigm.

Participants and Methods: ECFT scores of 24 nonlitigating/nondisability-seeking neuropsychological patients were compared to 15 litigating, neuropsychological patients with SE (i.e., failed ≥ 2 independent effort measures).

Results: Summing incorrect responses of Recognition items 5, 12, 22, 29, 30, and Matching item 9 achieved 53% sensitivity and 96% specificity using a cutoff ≥ 4 to identify SE. Cutoffs for four ECFT scores (Recognition, Recognition Right Detail, Matching Right Detail, and Matching Time) achieved $\geq 40\%$ sensitivity and $\geq 88\%$ specificity. Response style analysis showed that SE participants endorsed more incorrect "E" responses than credible participants on Recognition, $t(29) = 2.85, p = .008$; using a cutoff ≥ 4 achieved 46% sensitivity and 95% specificity.

Conclusions: Preliminary investigation suggests that ECFT data may be useful in the identification of suboptimal effort, and that future research should focus on incorporating time scores, combination scores, "E" errors, and right-sided errors into existing algorithms.

Correspondence: Jason A. Smith, MA, Biola University, 616 Mossoak Dr, Dayton, OH 45429. E-mail: jadsmith@msn.com

M. SOLLMAN, D.R. BERRY, M. HARRIS & L. SCHIPPER. Detection of Inadequate Effort on Neuropsychological Testing: A Meta-Analytic Update and Extension.

Objective: This meta-analytic review of stand-alone neurocognitive feigning measures offers an update and extension to Vickery and colleagues's work (2001). The since-expanded body of literature and detection tools was examined. Inclusion criteria were modified with an increased focus on maximizing external validity of studies, to provide clinicians with the most valid indication of the tools' real-world performance.

Participants and Methods: A thorough literature search through December 2005 revealed 13 measures not included in the previous study, and a modified version of an earlier procedure included by Vickery et al. After combing studies with the more stringent inclusion criteria of this analysis, only the Victoria Symptom Validity Test (VSVT), Test of Memory Malingered (TOMM), and the Letter Memory Test (LMT) provided enough data to be further examined. Overall effect size for feigning indices, between-index differences, and moderators of effect sizes were calculated using the unbiased effect size metric d .

Results: Each of these measures demonstrated a significant ability to separate feigning and honest groups, mean unbiased d -metric = 1.75. Only the VSVT performed better than the others. Each index demonstrated high sensitivity and specificity values, with no between-measure differences. Several moderators of effect size were noted.

Conclusions: Effect size and test parameter improvements are seen over the previous meta-analysis, using this set of feigning indices and more externally valid inclusion criteria. Moderators of effect size were noted and provide direction for further test validations.

Correspondence: Myriam Sollman, MS, Psychology, University of Kentucky, 111-C Kastle Hall, Lexington, KY 40506. E-mail: myriam@uky.edu

J. SUHR, K. DOBBINS-BUCKLAND & D. HAMMERS. Assessment of Malingering in Adults Presenting for ADHD Evaluation.

Objective: Although both clinicians and researchers emphasize use of malingering tests in neuropsychological evaluation, there is a paucity of research on the use of such tests in evaluation of adults referred for Attention Deficit Hyperactivity Disorder (ADHD).

Participants and Methods: In the present study, student referrals for ADHD from a university clinic were given a standard clinical battery, including the Word Memory Test (WMT); 32% failed one or more WMT effort indices. Students were divided into three groups: 1) those who failed the WMT (MAL), 2) those diagnosed with ADHD (ADHD), and 3) those not diagnosed with ADHD (usually diagnosed with another psychiatric condition) but who passed the WMT (OTHER).

Results: ANOVA showed that self-reported childhood symptoms (WURS) and self-reported hyperactive/impulsive symptoms (CAARS) were lowest in OTHER and ADHD, with MAL falling in the middle. However, on CAARS inconsistency index, both MAL and OTHER scored higher than ADHD. Groups were not different on the CPT. Using clinical

cutoffs for impairment, a higher percentage of MAL and ADHD scored in the clinical range on WURS and CAARS hyperactive/impulsive symptoms, while a higher percentage of OTHER and MAL scored in the clinical range on the inconsistency index. Groups were not different in CPT omissions, but a high percentage of MAL and an even higher percentage of ADHD performed in the clinical range on CPT commissions.

Conclusions: Results underscore the importance of screening for poor effort/malingering in ADHD evaluation, in both self-report and cognitive testing. Further, results emphasize the difficulty in using self-reported symptoms in differential diagnosis of ADHD.

Correspondence: Julie Suhr, Ph.D., Psychology, Ohio University, 249 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu

J. TSANADIS, E. MONTOYA, R.A. HANKS, S.R. MILLIS, N.L. FICHTENBERG & B.N. AXELROD. Head Injury Severity, Litigation Status, and Self-Report of Postconcussive Symptoms.

Objective: The purpose of the current study was to examine group differences on individual items of the Postconcussive Syndrome Questionnaire (PCSQ) in a clinical sample consisting of individuals with moderate to severe TBI and a group of mild TBI poor effort litigants.

Participants and Methods: This was an archival with a clinical sample consisting of 133 cases of moderate to severe TBI and 25 mild TBI poor effort litigants (as determined by failure of two objective measures of effort). All participants completed the PCSQ as part of an outpatient neuropsychological evaluation. Each item of the PCSQ was transformed into a dichotomous variable indicating either the presence or absence of a symptom.

Results: Chi-Square analysis of self-report presence or absence of symptoms revealed a significant difference between the groups ($p < .05$) on 30 of the 45 PCSQ questionnaire items and two additional items approached significance ($p < .10$). The poor effort litigant group had a higher proportion of symptom endorsement for all significant items.

Conclusions: Results suggest that mild TBI cases in litigation, where effort is suboptimal, report a significantly higher rate of neurological symptoms compared to moderate to severe TBI cases.

Correspondence: John Tsanadis, Ph.D., Psychology, Rehabilitation Institute of Michigan, 261 Mack Blvd., Suite 555, Detroit, MI 48201. E-mail: jtsanadi@dmc.org

J. TSANADIS, E. MONTOYA, S.R. MILLIS, R.A. HANKS, N.L. FICHTENBERG & B.N. AXELROD. A Negative Impression Management Scale for the Postconcussive Syndrome Questionnaire.

Objective: The purpose of the current study was to develop a negative impression management scale using items from the Postconcussive Syndrome Questionnaire (PCSQ).

Participants and Methods: This was an archival study with a clinical sample consisting of 133 cases of moderate to severe TBI and 25 mild TBI poor effort litigants (as determined by failure of two objective measures of effort). All participants completed the PCSQ as part of an outpatient neuropsychological evaluation. Each item of the PCSQ was transformed into a dichotomous variable indicating either the presence or absence of a symptom.

Results: Chi-Square analysis of self-report presence or absence of symptoms was used to identify items that best discriminated between the two groups. Items that differed at a level of significance greater than or equal to .01 were used resulting in a 19-item scale. A ROC curve analysis found an area under the curve of .79 ($p < .001$) with a confidence interval ranging from .67 to .91. Further analysis indicated that using a cutoff of >13 resulted in sensitivity of 67% with specificity at 85%, and a cutoff of >14 resulted in sensitivity at 54% and specificity at 89%. Increasing the cutoff to >16 resulted in modestly better specificity (94%) with sensitivity at 46%.

Conclusions: Results support the utility of a negative impression management scale derived from the PCSQ, but further research is required to validate the scale and improve sensitivity and specificity.

Correspondence: *John Tsanadis, Ph.D., Psychology, Rehabilitation Institute of Michigan, 261 Mack Blvd., Suite 555, Detroit, MI 48201. E-mail: jtsanadi@dmc.org*

L.A. WAGNER, J.S. PORTOCARRERO, M.N. HALLQUIST & P.J. DONOVICK. Construct Validity of the Expressive Vocabulary Test in a Prison Population.

Objective: The present study sought to better understand the relationship between the PPVT-III and EVT by examining the performance of incarcerated adults on these two tests. In addition, the relationships among the Digit Span, Vocabulary, Information, and Similarities subtests of the WAIS-III and the EVT were examined in order to determine the degree to which the EVT measures expressive language abilities.

Participants and Methods: Data were collected on a sample of incarcerated adults from two state prison mental health units ($N = 151$). Participants were referred for neuropsychological evaluation and were given the PPVT-III, EVT, and WAIS-III as part of a larger neuropsychological test battery. The prison group had an average of 10 years of education and an average IQ of 75.

Results: Average scores on all tests were one to two standard deviations below the mean of the general population. There were strong positive correlations between PPVT-III and EVT scores and between scores on EVT and WAIS-III Full Scale IQ. Results from simultaneous multiple regression analyses revealed that WAIS-III Vocabulary and Similarities moderately predicted EVT score while Digit Span and Information failed to significantly predict EVT score. When PPVT-III score was entered into the regression equation, it became the strongest predictor of EVT score.

Conclusions: Strong correlations were found between the EVT and the WAIS-III subtests. Additionally, a substantial portion of the variance ($R^2 = .7$) in EVT scores was explained by PPVT-III and Similarities. Thus the EVT is not a pure test of expressive vocabulary in this population. Correspondence: *Lori A. Wagner, B.S., Clinical Psychology, Binghamton University (SUNY), PO Box 6000, Binghamton, NY 13902. E-mail: bj92174@binghamton.edu*

Psychopathology/Neuropsychiatry/Other

V.G. BOUDREAU, I.J. TORRES, C.M. DEFREITAS, W.G. HONER & L.N. YATHAM. Stability of Cognitive Deficits in First Episode Bipolar Disorder.

Objective: Recent studies suggest that cognitive deficits are present in euthymic first-episode bipolar patients. However, the underlying cause(s) of these impairments (e.g., trait genetic/developmental abnormalities, disease-related changes present at onset, residual effects from the first episode) remain unclear. This study evaluates these possibilities by examining longitudinal cognitive deficits in euthymic bipolar patients in the 6 months following their first manic or hypomanic episode.

Participants and Methods: Preliminary data are presented on bipolar patients initially tested in the euthymic state following their first manic/hypomanic episode ($n = 13$), and again after 6-months. Data were also compared longitudinally to that of age- and premorbid IQ-matched healthy controls ($n = 9$). Neuropsychological measures assessed premorbid and current IQ, attention, memory, visual-spatial ability, and executive functioning.

Results: Measures were subjected to a repeated measure ANOVA with group (patient vs. control) as a between-subject factor and time (baseline vs. 6 months) as a within-subject variable to evaluate the group by

time interaction. Patients exhibited significantly lower cognitive functioning at baseline than controls, particularly in sustained attention, executive functioning, and memory. However, these deficits remained relatively stable over time, with similar magnitude of performance differences between groups at baseline and 6-months.

Conclusions: Results suggest that deficits exhibited by bipolar patients are relatively stable throughout the early months of illness, and may indicate trait deficits reflecting genetic/neurodevelopmental vulnerability rather than residual from the first episode. Longitudinal studies extending into the first years of illness may further clarify the stability and etiology of these deficits with illness progression.

Correspondence: *Vanessa G. Boudreau, MA, Psychology, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada. E-mail: vgb@sfu.ca*

A. CIOVICA, M.E. COTTINGHAM, K.B. BOONE, T.L. VICTOR & M.A. ZELLER. The MMPI-2 and Neurocognitive Ability: Profile Comparability in Credible Patients vs. Patients Judged to Be Exerting Poor Cognitive Effort.

Objective: The MMPI-2 is a widely used instrument in the medico-legal arena, both in the assessment of psychopathology and evaluation of possible symptom exaggeration. There is a small literature relating MMPI data to neuropsychological test scores; however, there is no research investigating whether credible and noncredible patients show the same relationships between MMPI-2 scales and cognitive and effort test scores.

Participants and Methods: Eighty-eight credible patients and 28 patients judged to be exerting poor effort underwent a comprehensive test battery that included measures of neurocognitive ability, cognitive effort, and psychopathology (MMPI-2). Malingered neurocognitive deficit was identified by failure on two or more independent effort tests in the presence of documented motive to feign.

Results: Correlations assessing the relationships among performance on neurocognitive measures and the MMPI-2 validity scales revealed a significant negative relationship between IQ and F, Fp, VRIN, and Gough Dissimulation in the credible patient group, indicating that patients with a low IQ appeared more symptomatic on the MMPI-2. However, in the noncredible group, these MMPI-2 validity measures were related to cognitive effort tests, but not IQ. Additionally, in the credible patient sample, the neuropsychological pattern previously found in depressed patients was confirmed (i.e., reduced speed and memory ability), but this relationship was not present in the noncredible group. Finally, the FBS and MMPI-2 scales 1 and 3 were not significantly related to any cognitive or effort test scores in the credible group, but were related to cognitive effort performance in the noncredible group.

Conclusions: Clinical and research implications of these data will be discussed.

Correspondence: *Maria E. Cottingham, M.A., Fuller Graduate School of Psychology, 1310 S. Catalina Ave., Apt. 112, Redondo Beach, CA 90277. E-mail: mecottingham@gmail.com*

M.E. COTTINGHAM, A. CIOVICA, K.B. BOONE, T.L. VICTOR, M.A. ZELLER & H.E. GOLDBERG. The MMPI-2 Restructured Clinical Scales and Their Correlates Among Various Neuropsychological Domains.

Objective: Studies have explored the relationships between various neurocognitive abilities and psychopathology, and certain psychiatric diagnoses have been found to be associated with particular neuropsychological profiles. The Minnesota Multiphasic Personality Inventory, Second Edition (MMPI-2) was designed to capture these psychiatric diagnoses by assessing personality characteristics and clusters of symptoms. Recently, new restructured clinical scales were developed to aid

interpretation of the MMPI-2. These scales attempt to elucidate profiles that were previously difficult to interpret due to large numbers of scale elevations and scale overlap. No published research has examined the relationships between these scales and neuropsychological test scores.

Participants and Methods: A total of 88 credible patients and 28 patients judged to be exerting poor effort (identified by failure on two or more independent effort tests in the presence of documented motive to feign) underwent a comprehensive test battery, including the MMPI-2. **Results:** The results of correlations revealed that, in the credible group, restructured clinical scales showed a different pattern of relationships with neuropsychological scores than that observed for standard MMPI-2 clinical scales. For example, elevations on RC2 (low positive emotions) were associated with higher executive functioning, while elevations on clinical scale 2 (depression) were associated with lower visual/spatial and memory scores. In contrast, no differences were found in the relationships between cognitive scores and MMPI-2 restructured and original clinical scales in the poor effort group.

Conclusions: These results are discussed in light of their clinical utility and in guiding future research.

Correspondence: *Maria E. Cottingham, M.A., Fuller Graduate School of Psychology, 1310 S. Catalina Ave., Apt. 112, Redondo Beach, CA 90277. E-mail: mecottingham@gmail.com*

J.S. KIXMILLER, M. JOHNSON & W. RIEMAN. Long Term Behavioral Management of an Adult with Dandy-Walker Syndrome.

Objective: Dandy Walker Syndrome (DWS) is a neurological disorder characterized by congenital malformation of the cerebellum and fourth ventricles, and frequently, hydrocephalus. Significant cognitive deficits and/or mental retardation (MR) are often associated sequela; psychosis has been discussed in some DWS case studies, suggesting the possibility of a subtype of DWS. The literature has been sparse in describing adults with DWS, especially in regard to the management of these adults' neurological, neuropsychological, and psychiatric problems. The present poster discusses an adult with DWS and the challenges of providing long term behavioral management for her.

Participants and Methods: This case presents a 47 year old, African American female with DWS since infancy, including hydrocephalus and shunt placement. Medical history is detailed, including developmental, psychosocial, neurologic and neuroimaging, and history of functional deficits due to MR, psychosis. Our treatment efforts at managing her extraordinary behavioral dyscontrol are presented.

Results: Review of her past and current psychopharmacologic treatment regimes are detailed. We contrast recent successful management of this case with decades of prior insufficient behavioral control of her aggression and social deficits. The behavioral management program, including intensive stimulus-control, milieu-contingency management, structured activity scheduling, and psychosocial skills training are reviewed as related to her current manageable status.

Conclusions: In relation to her adolescent and early/middle adult years, in our inpatient treatment facility, this patient has been managed through an intensive behavioral and psychopharmacologic treatment regime. Her combined DWS-variant MR and chronic psychosis present unique challenges and theoretical interest to health care providers for individuals with DWS chronic/persistent mental illness. We discuss the viability of proposing a subtype of DWS with psychosis.

Correspondence: *Jeffrey S. Kixmiller, Ph.D., VANCHCS, 150 Muir Road, Martinez, CA 94550. E-mail: jeff.kixmiller@va.gov*

S. MACKIN, T. HUH, H. BORNFELD, N. DUFFY, E. GILLUNG, F. LEILANI & P. AREAN. Incidence and Documentation of Cognitive Impairment in a Community Mental Health Center.

Objective: Cognitive impairments among older adults are commonly linked to poor medical and psychiatric outcomes but are often poorly

documented in medical records. Older adults utilizing services at community mental health centers have numerous risk factors for cognitive impairment but few studies have explored the incidence and documentation of cognitive impairment in this vulnerable patient population.

Participants and Methods: Data was collected from 38 ethnically diverse older adults attending day programming at a large community mental health clinic. Cognitive status was evaluated with the Mattis Dementia Rating scale (DRS). Measures of depression severity and substance abuse history were also obtained. An age and education corrected DRS total score falling below the 5th percentile was used as the criteria for cognitive impairment. A medical chart review was conducted to determine the rate of documentation for cognitive impairment and to obtain psychiatric diagnoses.

Results: Cognitive impairment was demonstrated by 50% of the sample and was significantly related to psychiatric status $F(1,33) = 6.60$, $p = .015$; individuals with psychotic disorders demonstrated poorer cognitive performance than those with mood disorders. Cognitive impairments were documented in medical charts for 17% of patients; yielding a sensitivity coefficient of .32 and a specificity coefficient of 1.0.

Conclusions: Preliminary data from an ongoing study suggests cognitive impairments are common among community mental health patients but these impairments are not well recognized or documented. Neuropsychological screening evaluations in community mental health centers would improve our understanding of the role of cognitive functioning on medical and psychiatric treatment outcomes.

Correspondence: *Scott Mackin, PhD, Psychiatry, University of California San Francisco, 401 Parnassus Avenue, Box OVS 0954, San Francisco, CA 94143. E-mail: scottm@lppi.ucsf.edu*

L.M. RITTER, M. GOLDBERG & K. BELL. A case of reduplicative paramnesia following right temporal lobectomy.

Objective: Reduplicative paramnesia is a rare disorder involving the delusional belief that a place or location has been duplicated or moved to another site. We present a case of reduplicative paramnesia that emerged following a right anterior temporal lobectomy for a brain abscess. Neuropsychological findings are correlated with the course of the delusion.

Participants and Methods: The patient is a 58-year-old, right handed female with a Master's degree in education and a history of breast cancer and resection of a right parietal metastasis. A brain abscess developed 2 weeks post tumor resection and necessitated a right anterior temporal lobectomy, including removal of the parahippocampal gyrus, uncus, and hippocampus. Neuropsychological screening examinations were performed at 12 and 38 days following the lobectomy.

Results: Post lobectomy, orientation returned for person and time, but not for place, as she expressed a new onset, intractable delusional belief that her hospital room and surroundings were part of her home, which, in fact, was in another state. This belief persisted throughout her hospital stay despite demonstrated improvement in her overall cognitive functioning and (given the location of the lobectomy) unexpected gains in visual memory across the 2 neuropsychological examinations.

Conclusions: This case study is consistent with previous reports in the literature implicating right hemispheric lesions in the emergence of reduplicative paramnesia, especially when the ventral visual pathway is involved. Of particular note in this case was the persistence of the delusional belief despite evidence of improvement in her visual memory ability and overall cognitive functioning status.

Correspondence: *Myron Goldberg, Ph.D., Rehabilitation Medicine, University of Washington Medical Center, P.O. Box 356490, Seattle, WA 98195. E-mail: goldbm@u.washington.edu*

K.S. SCHMIDT, J.L. GALLO, W. ALEXANDER, M. O'CONNOR, L. HYER, F. FILIPETTO, L. GEKHMAN, M. WIDOWS, A. MAY & A. CHOPRA. Behavior and Psychological Assessment of Dementia (BPAD): Evidence of Construct and Criterion Validity.

Objective: Behavioral and psychological symptoms in dementia have been studied for a number of years. While recent research advances have made gains toward the identification, diagnosis, and treatment of such behaviors, existing instruments have not differentiated the psychopathology associated with chronic psychiatric illness from the new onset of behavioral disturbance related to dementia.

Participants and Methods: The BPAD is a 79-item, proxy-report questionnaire that assesses 7 domains of behavioral and psychological symptoms (e.g., Perceptual, Aggressive, Disinhibited) over two time periods (i.e., 'within the past 4 weeks' and '5 years ago') in order to obtain information about a change in behavior associated with dementia. Three groups participated in the present study: (1) caregivers/family members of patients with dementia, (2) caregivers/family members of patients with psychiatric illness, and (3) family members of individuals without neuropsychiatric disease.

Results: Convergent/divergent correlations between BPAD domain scores and other standardized published measures assessing like domains (i.e., BEHAVE-AD, NPI-Q, BRIEF-A) reveal the instrument's strong construct validity. In terms of criterion validity, BPAD scores accurately classifies most patients according to diagnosis (dementia, psychiatric illness, no diagnosis).

Conclusions: The results of these validity studies are robust, and suggest the BPAD may be a useful assessment tool in both clinical and research settings.

Correspondence: *Kara S. Schmidt, Ph.D., Private Practice, 323 Park Avenue, Swarthmore, PA 19081. E-mail: kara.schmidt@gmail.com*

Psychopathology: Anxiety/Stress

J.E. CARMONA, A.K. HOLLAND, D.W. HARRISON, H.J. STRATTON & T.F. DESOUKY. Sympathetic arousal and state anxiety differences in men following vestibular rotary stress.

Objective: Dysregulation of the vestibular system yields dizziness, nausea, and sweating. These symptoms are frequently associated with trait anxiety and Panic Disorder, which are commonly associated with exaggerated sympathetic activation. The current experiment utilizes skin conductance as an index of sympathetic arousal in individuals reporting high and low anxiety following a vestibular stressor.

Participants and Methods: Thirty right-handed, healthy males, between ages 19-22 years, were recruited from university undergraduate psychology courses. Each participant received a total of 20 passive rotations about the vertical neuroaxis in the clockwise direction at a rate of approximately 120 degrees/s as paced by a digital timer circuit. Following rotation 7 high and 7 low anxious men were identified through scores on the State-Anxiety Scale of the State-Trait Anxiety Inventory. Skin conductance level was assessed at baseline and immediately following rotation for both high and low anxious groups.

Results: A two-way analysis of variance was conducted with the factors of Group (HI, LO) and Condition (Baseline, Post-rotation). A significant main effect was found for Condition, whereby overall skin conductance was higher following rotation. A Group x Condition interaction indicated that individuals reporting high state anxiety had significantly higher skin conductance levels following rotation.

Conclusions: The data provides evidence that verbal reports of anxiety accurately reflect significant differences in sympathetic arousal to a vestibular stressor. The results may have significant implications for populations experiencing significant vestibular dysfunction such as the elderly. It is proposed that this population may be at special risk for development of anxiety disorders stemming directly from vestibular dysfunction.

Correspondence: *Joseph E. Carmona, M.S., Virginia Tech, 109 Williams Hall, Blacksburg, VA 24061. E-mail: jcarmona@vt.edu*

J.E. CARMONA, A.K. HOLLAND, D.W. HARRISON, C. MANUEL & H.J. STRATTON. Lateralization of sympathetic arousal to verbal processing in state-anxious men.

Objective: This experiment investigates hand lateralization of sympathetic tone in high and low anxious men to a dichotic listening task. Research has associated the right hemisphere with sympathetic arousal, and the left for parasympathetic control. Nevertheless there is a debate on the contribution of left and right hemispheric activation in anxiety. Left and right hand skin conductance was calculated in order to test lateralized sympathetic activation.

Participants and Methods: Data from 12 high- and 7 low- state anxiety males, between ages 19-22 years, was analyzed after completion of a dichotic listening task. Participants were identified through scores on the State-Anxiety Scale of the State-Trait Anxiety Inventory. Skin conductance levels (SCL) were recorded before and immediately following administration of a dichotic listening task. The auditory stimuli consisted of 30 pairs of consonant-vowel phonemes presented simultaneously in each channel. Log(SCL) was calculated for each hand.

Results: Data was analyzed using general linear model procedures for an analysis of variance to compare log(SCL) for the fixed factor of Group anxiety (Hi, Lo anxious), Hand (Left, Right), and Condition (Baseline, post-task). Results indicate overall higher SCL following the verbal task. Furthermore, a Group x Hand interaction indicates that the high anxious men have significantly higher right relative to left hand SCL, whereas low anxious men did not demonstrate significant laterality in arousal.

Conclusions: Though low anxious men had overall higher SCL, high anxious men showed significantly greater disparity at the right hand relative to the left hand. Findings support discussion of a model of decreased left and/or increased right hemispheric activity for anxiety.

Correspondence: *Joseph E. Carmona, M.S., Virginia Tech, 109 Williams Hall, Blacksburg, VA 24061. E-mail: jcarmona@vt.edu*

D. CAUDLE, A. SENIOR, J. WETHERELL, H. RHOADES, J. BECK, M. KUNIK, A. SNOW, N. WILSON & M. STANLEY. Cognitive Errors, Symptom Severity, and Response to CBT in Older Adults with Generalized Anxiety Disorder.

Objective: Wetherell and colleagues (2005) investigated response to group-administered cognitive-behavioral therapy (CBT) for generalized anxiety disorder (GAD) in older adults and established that GAD severity, homework adherence, and psychiatric comorbidity were predictive of outcome. The current study investigated the hypotheses that performance on separate domains of the Mini-Mental Status Examination (MMSE) could predict differences in baseline anxiety/depression and outcome following CBT when already established predictors were controlled.

Participants and Methods: Baseline presentation of anxiety and depression was investigated in 208 older (>54 years) participants diagnosed with GAD. Predictors of treatment response were investigated in the subsample of 65 participants who completed CBT and were previously studied by Wetherell and colleagues (2005). Multivariate Analysis of Covariance (MANCOVA) was used to assess group differences in MMSE domains (error/s vs. no error) on measures of baseline anxiety and depression. Hierarchical regression was used to assess the effect of MMSE domain performance on outcome [Reliable Change Index (RCI)].

Results: Participants who committed an error on the MMSE Working Memory domain exhibited increased severity in anxiety/depressive symptoms at baseline. Participants who committed an error on the MMSE Orientation domain exhibited decreased treatment response at 6-month follow-up while controlling for previously established predictors.

Conclusions: Performance on MMSE Working Memory and Orientation domains predicted baseline anxiety/depression and response to CBT, respectively, in older adults with GAD. The MMSE is widely used as a cognitive screen to exclude participants whose scores suggest dementia; however, our results suggest that cognitive errors in MMSE domains may be useful in the study of symptom presentation and treatment outcome. Correspondence: *Donald Caudle, M.A., Counseling Psychology, University of Houston, 4800 Calhoun Road, Houston, TX 77004. E-mail: dcaudle@houston.rr.com*

R. JURADO, S. FERNÁNDEZ GUINEA, C. MINGOTE, F. DENIA & D. TABOADA. ALTERATIONS IN VERBAL MEMORY AND ATTENTIONAL DEFICITS IN ANXIETY DISORDERS: POSTTRAUMATIC STRESS DISORDER AND PANIC DISORDER.

Objective: Analyze in a Spanish population, the differences of verbal learning process and the attentional performance

between two groups: one with anxiety disorders- Posttraumatic Stress Disorder (PTSD) and Panic Disorder (PD)- and another of healthy subjects.

Participants and Methods: 30 patients with PTSD, 26 with PD and 26 controls. The instruments employed: Stroop Test, Toulouse Pièron Test of Maintained Attention, Trail Making Test, "Test de Aprendizaje Verbal España-Complutense" (TAVEC) and letters and numbers subtest of WAIS-III (LyN).

Results: When compared to the control group, PTSD group show a less amplitude learning curve, less consolidation of information, together with inferior levels of free memory and a low percentage of discrimination. The PTSD patients do not benefit from semantic cues and show retroactive interference. PTSD patients obtained inferior scores in working memory, being this difference statistically significant in comparison with the other groups. In the PD group, all the scores were very similar to those of healthy people. PTSD subjects show slowly speed of information processing, in comparison with the other two groups. They also tend to make commission errors. PTSD patients' performance was significantly below in alternation of sequences when compared to controls. All of these differences reached the statistical significance.

Conclusions: PTSD patients have alterations in the process involved in consolidation and information recall, their performance did not improve by semantic cues or recognition tests. They also showed a minor capacity of selective and alternating attention in comparison with PD patients and healthy subjects. There were no differences between PD patients and control group.

Correspondence: *Sara Fernández Guinea, Ph.D., Psicología Básica II (Procesos Cognitivos), Universidad Complutense de Madrid, Facultad de Psicología, Campus de Somosaguas, Madrid 28223, Spain. E-mail: sguinea@psi.ucm.es*

T.D. PARSONS & A.A. RIZZO. A Meta-Analysis of Virtual Reality Exposure Therapy.

Objective: Virtual reality exposure therapies (VRET) used as treatments for affective dysregulation incorporate extinction procedures. The neurocircuitry of affective regulation during VRET involves processing of affect laden content in a given threatening situation, which facilitates prefrontal control over the amygdala. Qualitative reviews have concluded that diminished anxiety symptoms are common after VRET. Lacking is a quantitative meta-analysis that enhances understanding of the variability and clinical significance of anxiety reduction outcomes after VRET.

Participants and Methods: Searches of MedLine (1990-2006), PsycLIT (1990-2006), and ISI Web of Science electronic databases (1990-2006) yielded 50 VRET studies, and of these, 20 studies (including 275 subjects) met the eligibility criteria for inclusion in the meta-analysis.

Results: Given heterogeneity of variance in study effect sizes (Cohen's d : a measure representing the standardized difference between two

means), the random effects meta-analysis methodology was used, which revealed large declines in anxiety symptoms following VRET (PTSD Cohen's $d=0.87$; Social phobia: Cohen's $d=0.96$; Arachnophobia: Cohen's $d=0.92$; Acrophobia: Cohen's $d=0.93$; Panic disorder: Cohen's $d=1.79$; Aviophobia: Cohen's $d=1.75$).

Conclusions: Results revealed that VRET had statistically large effects on all affective domains, as well as all anxiety/phobia groupings evaluated. Thus, VRET appears effective from a clinical psychology standpoint.

Correspondence: *Thomas D. Parsons, PhD, Centers for Creative Technologies, University of Southern California, 13274 Fiji Way., Office 301, Marina del Rey, CA 90292-4019. E-mail: tparsons@usc.edu*

T.D. PARSONS, M. MACEDONIO & A.A. RIZZO. 360-Degree Panoramic Video Virtual Reality System for Affective Arousal.

Objective: Recent advances in Panoramic Video (PV) camera systems have produced new methods for the creation of virtual reality (VR) environments that can capture and playback pictorially accurate 360-degree video scenes of "real world" environments. When delivered via an immersive head mounted display (HMD), an experience of presence within these captured scenarios can be supported in human users. The aim of this preliminary study was to investigate the capacity of PV methods used in the creation of VR environments to induce affective arousal and assess its impact on physiological correlates of affective arousal (i.e., blood pressure, heart rate, respiration rate, galvanic skin response, and temperature).

Participants and Methods: Eighty-one participants were randomly assigned to audio based guided Imagery and VR groups using a PV HMD. Participants were compared across three exposure conditions: HMD-delivered PV scenarios; Single frame video capture of actors extracted from PV content; and Guided imagery scripts based on the thematic content in each of the PV scenarios. Seven physiological measures were analyzed (systolic [SBP] and diastolic [DBP] blood pressure, mean arterial pressure [MAP], heart rate [HR], respiration rate [RR], galvanic skin response [GSR], and temperature [T]).

Results: Overall, results followed the anticipated pattern of measures rising at each time point both across the sample and between groups, with GSR and T remaining relatively stable; this suggests that VR can be, at the very least, as arousing as Imagery. Further analyses, however, evaluating change across time for the sample revealed significant results in only BP measures and HR, with differences between groups limited to BP measures alone. Furthermore, no group by time interaction was found.

Conclusions: Results suggest that VR is at least as effective as imagery in arousing anger, and blood pressure is moderated by anger and hypnotizability.

Correspondence: *Thomas D. Parsons, PhD, Centers for Creative Technologies, University of Southern California, 13274 Fiji Way., Office 301, Marina del Rey, CA 90292-4019. E-mail: tparsons@usc.edu*

J. REA & A.P. DEPRINCE. Memory, Learning, and Emotional Context: A Study of Children Exposed to Domestic Violence.

Objective: Recent research suggests that children with posttraumatic stress disorder (PTSD) show poorer performance on some cognitive and neuropsychological tasks, including those assessing IQ, attention, abstract reasoning, and executive functioning. The purpose of the current study was to: 1) replicate these findings in children exposed to domestic violence (DV) with a specific focus on verbal learning and memory, and 2) assess the impact of learning context on performance.

Participants and Methods: Fifty-three children exposed to DV and 13 controls (mean age 9 years) completed alternate versions of the Rey Auditory Verbal Learning Test (RAVLT), counterbalanced across neu-

tral and conflict-primed conditions (i.e., after watching a relaxing video, and after watching a video of 2 adults having an argument). They also completed the Vocabulary and Block Design subtests of the WISC-III. Mothers completed questionnaires to assess children's school performance and PTSD symptoms.

Results: Consistent with previous research, children exposed to DV showed poorer school achievement by parent report, as well as lower predicted IQs than control children. In the neutral learning context, there was a moderate-sized (but statistically non-significant) multivariate effect for learning and memory scores, with exposed children performing worse than control children. Further, exposed children who witnessed DV both recently and early in life performed worse on tests of learning and memory in the conflict-primed context, compared to children who experienced early, time-limited exposure.

Conclusions: Implications for traumatized children's educational experience, as well as for the further study of cognitive and neuropsychological functioning in the context of PTSD will be discussed.

Correspondence: *Jacqueline Rea, Ph.D., University of Illinois at Chicago, 912 S. Wood St., Chicago, IL 60612. E-mail: jackierea@gmail.com*

M.L. ROHLING, R. GERVAIS & G. DEMAKIS. PTSD and Cognitive Ability in Patients Passing SVTs.

Objective: This study examined the effect of PTSD on cognitive ability in patients who passed all SVTs. Prior research has found patients diagnosed with PTSD suffer from impairments. However, the samples have typically not been screened for poor effort. We examine the association between PTSD symptoms and cognitive performance after excluding patients who failed any one of several SVTs.

Participants and Methods: Three measures of PTSD were used, including the IES, DTS, & DAPS, to assess patients' severity of symptoms. These scores were linearly combined as an index of severity. The sample was screened for poor effort using the WMT, CARB, MSVT, and TOMM. The initial sample consisted of 305 patients. This was reduced to 203 following SVT-screening. The remaining sample was analyzed using both an extreme groups ANOVA and multiple regression to determine the impact of symptom severity on cognition.

Results: High PTSD symptom patients demonstrated a very mild level of impairment in the range of $-.20$ SDs (Hedges' g). However, when the two samples were statistically adjusted for differences in premorbid functioning using years of education, there was no significant difference on cognitive test scores between patients who had more severe PTSD symptoms and those who had much more mild symptoms and in some cases did not meet the diagnostic criteria for PTSD.

Conclusions: Contrary to clinical lore and several previously published studies on the effect of PTSD on cognition, we did not find much if any effect. The most likely explanation for the differences between the current study and prior research has to do with the screening of the sample to ensure that those who remained at put forth optimal effort during testing. Our findings are similar to those of another study, which used the same design and examined patients with depressive symptoms (Rohling et al., 2002). It appears that neither PTSD symptoms nor depressive symptoms are associated with clinically meaningful cognitive deficits.

Correspondence: *Martin L. Rohling, Ph.D., Psychology, University of South Alabama, 331 Life Sciences Building, Mobile, AL 36693. E-mail: mrohling@usouthal.edu*

C. BRUEGGEMEIER, J.L. SHUCARD & D.W. SHUCARD. An Electrophysiological and Neuropsychological Study of Attention in PTSD.

Objective: Posttraumatic stress disorder (PTSD) is characterized by attentional disturbances, including hyperarousal, hypervigilance, exaggerated startle response, and difficulty concentrating. We examined at-

tention in PTSD under sustained and focused conditions. It was hypothesized that amplitude and latency of the P3 component of the event-related potential would be related to neuropsychological measures of attention and also would differ between PTSD and control groups based on attentional load.

Participants and Methods: An A-X Continuous Performance Task was presented under sustained (without distraction) and focused (with distraction) conditions. P3s to Target detection (go), response inhibition (no-go), and nontargets were examined. Participants were 21 Vietnam veterans with PTSD and 13 controls.

Results: Findings revealed that the focused condition produced lower P3 amplitudes and longer latencies to go and no-go stimuli for both groups. The PTSD group, however, had longer latency than controls for the no-go stimuli and shorter latency than controls for the go stimuli regardless of the attention condition. For nontarget stimuli, P3 amplitude was reduced during the focused condition for the control group but not for the PTSD group. P3 topography differences to nontargets were also present between PTSD and controls, with higher frontal-central amplitude for the PTSD group and higher parietal amplitude for the control group. Performance on neuropsychological attention tasks was related to no-go latency during the focused condition, with poorer performance being related to longer latency.

Conclusions: These findings suggest that the effects of focused attention in PTSD occur primarily in response to processing of irrelevant nontarget stimuli, and support a neurobiological model of attentional dysregulation.

Correspondence: *Janet L. Shucard, Ph.D., Neurology, University at Buffalo, State University of New York, 100 High Street (D-6), Buffalo, NY NY. E-mail: shucard@buffalo.edu*

J. SNOW, T. WALDECK, D. LUCKENBAUGH, O. BONNE, D. CHARNEY & M. VYTHILINGAM. Effects of Hydrocortisone on Neurocognitive Performance in PTSD and Healthy Subjects.

Objective: Prior studies demonstrating increased glucocorticoid sensitivity in post-traumatic stress disorder (PTSD) have mainly focused on peripheral measures. The present study evaluated whether patients with PTSD had greater central sensitivity to glucocorticoids by measuring changes in hippocampal and extra-hippocampal neuropsychological test performance following hydrocortisone administration.

Participants and Methods: A neuropsychological test battery was administered to 15 unmedicated individuals with PTSD and 17 controls 4 hours post intravenous administration of 30 mg of hydrocortisone or saline in a double-blind crossover design. The test battery included measures of attention span, sustained attention, working memory, repetition priming, and declarative recall and recognition.

Results: PTSD was not associated with greater central glucocorticoid sensitivity compared to healthy subjects, that is, diagnosis did not differentially affect performance on either hippocampal or extra-hippocampal tasks following intravenous hydrocortisone administration. Compared to healthy subjects, patients with PTSD performed poorly on naming and priming tasks and had a greater immediate-to-delay decrease in story recall on placebo consistent with reports of impairment of both hippocampal as well as extra-hippocampal function in PTSD. Administration of hydrocortisone increased false alarms on object recognition and RVL recognition in both patients as well as healthy subjects.

Conclusions: PTSD appears to be associated with baseline deficiency in cognitive functioning, possibly related to attentional disturbance. However, the findings from the present study do not support increased central sensitivity to glucocorticoids in PTSD.

Correspondence: *Joseph Snow, nih, 9000 rockville pike, Bethesda, MD 20902. E-mail: joseph.snow@nih.gov*

Psychopathology: Depression

J.D. BAYLESS, P.B. ESPE-PFEIFER, M.C. BRUMM, J.J. LONG, J.L. LEWIS & L.M. MCCORMICK. Cognitive performances pre-and post-ECT in psychotic depression: Improvements in RBANS and attention/speed tasks.

Objective: Electroconvulsive therapy (ECT) is the most rapidly acting and effective antidepressant treatment available, with a 95% response rate in psychotic depression. Despite this, a major factor limiting its use has been concern over potential cognitive side effects.

Participants and Methods: As part of a study investigating ECT-mediated changes in cerebral electrophysiology and metabolism, a brief battery of neuropsychological tests were administered to 15 patients with psychotic depression just prior to ECT, and again approximately 2–3 weeks following the last treatment. The battery included the RBANS, a relatively brief, multi-domain neurocognitive screening battery with alternate forms, as well as additional measures of verbal and nonverbal executive functions (Controlled Oral Word Association, Trail Making Test), working memory (WAIS-III Letter-Number Sequencing), and single word reading (WRAT-3). Self-report measures of depression (BDI-II) and clinician ratings (HAM-D) were also obtained.

Results: Pre- vs. post-ECT mean change scores revealed net increases in virtually all cognitive performances post-ECT, with significant improvements in RBANS total score (particularly delayed memory), psychomotor speed and working memory. Individually considered, seven participants (46%) showed pre-ECT cognitive dysfunction (RBANS total score = 80 or less), with only two (13%) with such impairment post-treatment. Performance fell from adequate to impaired levels in a single, treatment-resistant individual. Although there were significant improvements in depression ratings following ECT, this was not significantly correlated with the increases seen in RBANS score.

Conclusions: Results provided evidence for post-ECT cognitive improvement, and suggested that such improvements were not directly attributable to resolution of depression.

Correspondence: *John D. Bayless, Ph.D., Psychiatry, Univ. of Iowa, 200 Hawkins Drive, Iowa City, IA 52242. E-mail: john-bayless@uiowa.edu*

J. DUNKIN, N. RASGON, M. ZELLER, K. WAGNER-STEHL, S. DAVID, A. LORI & A. RAPKIN. Relationships Between Neuropsychological Deficits and Social Functioning in Depressed and Nondepressed Postmenopausal Women.

Objective: Previous studies have observed both cognitive and social deficits in depression. While studies suggest that cognitive deficits are strongly predictive of functional outcome in schizophrenia, this has not been explored in depression. Based on previous research, we hypothesized that neurocognitive deficits would be significantly related to social functioning in depressed women.

Participants and Methods: Subjects were 26 postmenopausal women meeting DSM-IV criteria for Major Depressive Episode, and 24 control females. Subjects were administered a brief neuropsychological battery and four measures of social and functional behavior. Cognitive test scores were standardized by the control group and averaged to create two internally consistent summary scores: attention and executive functioning. Hierarchical multiple regression was used to test the main hypotheses, with the four social functioning measures as the dependent variables, and demographic variables, depression severity, and neuropsychological test summary scores as the predictors.

Results: Results indicate that in the depressed sample, poor attention was significantly related to deficits in social functioning, after accounting for depression severity and demographic variables. Deficits in executive functioning were significantly related to poor functional performance in the depressed sample. No significant findings were observed in the control group.

Conclusions: Both attentional and executive deficits were associated with poor social functioning and disability in activities of daily living in

depressed women, but not in controls. These relationships were present even after controlling for depression severity, suggesting that neuropsychological functioning is a unique contributor to functional outcome in major depression. The data further suggest that neurocognitive deficits in depression are not benign symptoms of the disorder but have significant negative effects on day-to-day functioning, and should be included as targets of treatment.

Correspondence: *Jennifer Dunkin, Ph.D., Psychiatry, University of California, San Diego, San Diego VA Healthcare System-Psychology SVC 116B, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: jdunkin@ucsd.edu*

G.G. POTTER, H.R. WAGNER, H.B. BOSWORTH & D.C. STEFFENS. Neurocognitive Correlates of Medication Noncompliance in Geriatric Depression.

Objective: Recent studies suggest that neurocognitive measures reflecting frontostriatal dysfunction are associated with poor treatment response, but medication noncompliance has not been thoroughly examined. We studied the neurocognitive correlates of medication noncompliance in a sample of 81 depressed older adults enrolled in an ongoing treatment program.

Participants and Methods: Participants were clinically depressed at entry to the study as rated by the Montgomery-Asberg Depression Rating Scale (MADRS > 15), at which time they also completed a comprehensive neuropsychological battery. An inventory of self-reported treatment compliance was obtained between baseline and 6-month follow-up. Neurocognitive variables were aggregated to reflect indices of timed processing, memory, verbal fluency, and working memory.

Results: Using logistic discriminative procedures to predict noncompliance and controlling for age, gender, education, and baseline MADRS severity, we found that the timed processing index (Trail Making A, Trail Making B, Symbol-Digit Modalities) was significantly associated with medication noncompliance, but that noncompliance was not associated with baseline depression severity. There was also a statistical trend that noncompliance predicted poorer 6-month treatment response.

Conclusions: The current findings are consistent with research indicating that neurocognitive measures associated with frontostriatal dysfunction may be markers for adverse treatment outcomes in geriatric depression, and a discussion is presented on the broader relationships among these factors.

Correspondence: *Guy G. Potter, Ph.D., Psychiatry and Behavioral Sciences, Duke University Medical Center, Box 3925, Duke University Medical Center, Durham, NC 27710-3925. E-mail: guy.potter@duke.edu*

R.E. READY & M.I. WEINBERGER. Depressive Symptoms and Cognitive Biases in Older and Younger Adults.

Objective: Persons with depressive symptoms exhibit negative cognitive biases relative to healthy individuals but these effects have rarely been studied in the context of adult aging. This study examined the independent and interactive effects of depressive symptoms and age on cognitive processing of emotional information.

Participants and Methods: Younger ($n = 53$, M age = 19.5 years) and older adults ($n = 63$, M age = 74.9 years) participated and 31% of the sample endorsed clinically significant depressive symptoms at the time of participation. Several cognitive measures with emotional content were administered: recall of autobiographical events, episodic memory tests for positive and negative stories, and a lexical ambiguity task.

Results: Depressive symptoms were associated with negativity biases for recall of recent negative life events, such that depressed persons recalled more negative life events than healthy participants. Depressive symptoms also were significantly associated with greater negative interpretations of ambiguous stimuli on the lexical ambiguity task, relative to healthy persons. After controlling for depressive symptoms, older adults exhibited a positivity effect on the emotional memory task, show-

ing stronger performance in recall of positive than negative information relative to younger adults. Older adults also exhibited a reduced negativity effect relative to younger adults on the lexical ambiguity task. Interactions between age and depressive symptoms were found for negative life event data but there was no pattern indicating if negativity biases might increase or decrease with age in the context of depression.

Conclusions: Ways in which cognitive vulnerability for depression might change across the adult lifespan are discussed.

Correspondence: *Rebecca E. Ready, Psychology, University of Massachusetts, 135 Hicks Way, Tobin Hall, Amherst, MA 01002. E-mail: ready@psych.umass.edu*

E.M. WEKKING, C. BOCKTING, M. KOETER, H. MIDDELKOOP & A. SCHENE. Prognostic value of mild neuropsychological impairment in high risk euthymic patients with recurrent depression treated with a preventive cognitive-behavioral module.

Objective: The objective of this study was to investigate the prospective value of cognitive functioning in a strictly defined group of high risk euthymic patients.

Participants and Methods: Patients participated in a randomized controlled clinical trial in which regular care, including no care at all, was compared with additional preventive cognitive therapy. All patients had at least two previous episodes in the last five years. Before random assignment to the treatment condition neuropsychological tests of mental speed, memory and executive functioning were assessed in 137 remitted patients and compared with clinically used (published) normative data. Previous episodes and follow-up relapses/recurrences at three, twelve and twenty-four months were measured with the Structured Clinical Interview for DSM-IV (SCID). Baseline levels of depressive symptoms and the severity of depressive residual symptoms was measured with the 17-item Hamilton Rating Scale for Depression (HRSD).

Results: Results indicated that cognitive performance was significantly impaired for remitted patients for all cognitive variables with the exception of delayed recall and executive functioning. With Cox regression no effect of the preventive treatment and/or number of previous episodes on the relation between all neuropsychological variables and time to recurrence were observed. Neuropsychological measures appeared not to be related to time to recurrence (all p 's $> .10$). Pearson correlation of baseline neuropsychological test scores with the HRSD-scores were not significant.

Conclusions: The results give evidence for the presence of a cognitive trait marker in remitted patients with recurrent depression. However, cognitive functioning did not predict future relapses.

Correspondence: *Ellie M. Wekking, Ph.D., Neuropsychology, University of Leiden, Wassenaarseweg 52, Leiden 2333 AK, Netherlands. E-mail: ewekking@fsw.leidenuniv.nl*

Psychopathology: Schizophrenia

S. RÉMILLARD, E. POURCHER & H. COHEN. Off-line proceduralization in schizophrenia.

Objective: The question of skill proceduralization over time and under neuroleptic treatment was addressed in the present study.

Participants and Methods: Twenty six Schizophrenic (SZ) patients under atypical (risperidone; 2-6 mg) or typical (haloperidol; 2-40 mg) neuroleptic medication and matched healthy participants were compared on a non-motor procedural task involving semantically-related inverted word pairs, and at 3, 6 and 12 months later to determine the extent of skill consolidation.

Results: SZ patients were found to acquire new procedural skills necessary to read these inverted word pairs. They were also found to benefit

from the semantic relationship between the words in the pairs. However, relative to controls, all SZ participants showed generalized slowing of reading time performance, suggesting less efficient encoding. Furthermore, performance was poorer in the haloperidol-treated participants over the duration of the experiment.

Conclusions: The findings indicate that there is a differential impact of NLP medication on the acquisition and consolidation of a new skill.

Correspondence: *Henri Cohen, Université du Québec à Montréal, C.P. S888, Succ. Centre-Ville, Montréal, QC H3C 3P8, Canada. E-mail: henri.cohen@uqam.ca*

J.M. FOLEY, C. GOLDEN, E. SIMCO, B. SCHNEIDER & R. MCCUE. Examination of Premorbid Intellectual Estimation in Geriatric Schizophrenia and Frontotemporal Dementia.

Objective: This study addresses whether common measures to assess premorbid intelligence are equally capable in geriatric Schizophrenia/Schizoaffective (SCZ) patients. A Frontotemporal Dementia (FTD) comparison group was employed to glean specificity of cognitive processes in SCZ, given theoretically similar neuropathology of both groups.

Participants and Methods: Participants included geriatric SCZ ($n=37$), FTD ($n=41$), and healthy controls ($n=107$). Mean ages were SCZ=59.9(4.62), FTD=76.59(4.75), and controls=70.97(9.18). Mean education was SCZ=11.70(2.41), FTD=14.61(2.48), and controls=13.76(2.70). Language/verbal measures were employed. Analyses were conducted with zero-order correlations and serial one-way ANOVAs. In cases where Levene's assumption was not met, the Welch statistic was used. Family-wise alpha was set to .017.

Results: Zero-order correlations showed significant positive relationships between WAIS-III Information and Folstein MMSE in SCZ ($r=.549$, $p=.000$) and controls ($r=.346$; $p=.000$). ANOVAs between groups on discrepancy scores examining premorbid devices showed significant differences between the groups on the WAIS-III Information-COWAT discrepancy comparison $F[2,69.461]=20.160$; $p=.000$ and the BNT-WAIS-III Information discrepancy comparison $F[2,179]=9.971$; $p=.000$. Post hoc Tukey HSD showed WAIS-III Information to be a stronger premorbid estimate than COWAT in controls and FTD when compared to SCZ. Results also showed BNT to be a stronger premorbid estimate in SCZ when compared to FTD and controls.

Conclusions: Findings lend support to the specificity of cognitive processes in schizophrenia disorders, even when accounting for processes common to the theoretically similar FTD. The SCZ group showed a unique pattern of spared function (elevated BNT, declined WAIS-III Information) which supports clinical utilization of discrepant measures of premorbid intellectual estimation for schizophrenia populations. Such a pattern was not also evident for FTD.

Correspondence: *Jessica M. Foley, MS, Department of Psychiatry and Human Behavior, Brown Medical School, Clinical Psychology Training Consortium, Brown Medical School, Box G-BH, Providence, RI 02912. E-mail: foley@brown.edu*

J.M. FOLEY, C. GOLDEN, E. SIMCO, B. SCHNEIDER & R. MCCUE. Nature and Pattern of Memory Decline in Geriatric Schizophrenia versus Frontotemporal Dementia.

Objective: The nature of memory capacity and decline is a highly controversial area in the study of Schizophrenia research, and previous work has argued for initial organizational deficits versus memory decay over time. This study addresses whether the apparent memory decline in Schizophrenia can be attributable to failures in organization and encoding during initial learning rather than to memory decay over time. A Frontotemporal Dementia (FTD) comparison group was employed to glean specificity of cognitive processes in Schizophrenia, given theoretically similar neuropathology of both groups.

Participants and Methods: Participants included geriatric Schizophrenia/Schizoaffective(SCZ) patients (n=37), FTD patients (n=41), and healthy controls (n=107). Mean ages were SCZ=59.92(4.62), FTD=76.59(4.75), and controls=70.97(9.18). Mean education was SCZ=11.70(2.41), FTD=14.61(2.48), and controls=13.76(2.70). Discrepancy scores were used and included WMS-III Logical Memory1-Logical Memory-2, Faces1-Faces2, VPA1-VPA2, Family Pictures1-Family Pictures2, Auditory Immediate Index-Auditory Delayed Index, and Visual Immediate Index-Visual Delayed Index.

Results: Six one-factor between-subjects ANOVAs compared groups on WMS-III discrepancy scores. In cases where Levene's assumption was not met, the Welch statistic was employed. A Bonferroni adjusted α level per family (.05/6 = .008) was used. Results failed to suggest differences between groups on immediate-delayed memory discrepancy scores.

Conclusions: Findings are consistent with prior Schizophrenia literature, and suggest a failure to show memory decay over time in light of probable deficits in immediate encoding. Failure to show group differences is expected given the similarities between SCZ and FTD in memory pattern. Comparisons with more dissimilar populations (e.g., AD) are needed to document the qualitatively distinct nature of memory impairment in Schizophrenia. Correspondence: *Jessica M. Foley, MS, Department of Psychiatry and Human Behavior, Brown Medical School, Clinical Psychology Training Consortium, Brown Medical School, Box G-BH, Providence, RI 02912. E-mail: foley@brown.edu*

M. GAROLERA, G. GARRIDO, N. TORTAJADA, M. FABRA, M. PAJARES, U. GONZALEZ, M. SANTACANA & J. ALBERNI. Executive Impairment and Quality of Life in Schizophrenic Patients.

Objective: The impact of specific cognitive deficits in daily lifestyle remains unclear. The purpose of this study was to examine the relationship between several aspects of executive function and the different areas of quality of life for patients with stable chronic schizophrenia.

Participants and Methods: The subjects for this study were 67 outpatients diagnosed with schizophrenia by the DSM-IV. All patients were clinically stable under antipsychotic treatment. Patients were assessed for executive functioning with tests including: verbal fluency (COWA), working memory test from an attention computerized battery (TAP), Hooper Visual Organization Test, Wisconsin Card Sorting Test, Trail Making Test-B, Matrix Reasoning, Tower of London and Stroop Test. All patients completed a questionnaire to assess their quality of life (QLS).

Results: There were correlations of initiation, working memory, organization, sequencing, categorization, reasoning, and inhibitory control with common objects and activities (e.g., driving a car, reading a book); also between initiation, organization, sequencing, reasoning and intrapsychic foundations (e.g., sense of purpose, emotional interaction, empathy, motivation); and correlation of categorization and planning with instrumental role (e.g., role of worker, student, housekeeper/parent).

Conclusions: Deficits in different components of executive abilities become limiting factors in diverse aspects of affective, social and occupational functioning.

Correspondence: *Maite Carolera, PhD, Hospital de Terrassa, ctra Torrebónica s/n, Terrassa 08227, Spain. E-mail: mgarolera@csdt.es*

M. GAROLERA, G. GARRIDO, M. FABRA, U. GONZALEZ, M. PAJARES, N. TORTAJADA, M. SANTACANA & J.M. VENDRELL. Facial affect recognition deficits and visual attention in schizophrenic patients.

Objective: Patients with schizophrenia suffer from emotional impairment. Controversial findings were reported in studies of the association between emotion recognition and cognition. The aim of this study was to identify schizophrenic patients with facial affect recognition deficit and to examine whether emotion processing deficits are associated with attention performance

Participants and Methods: The group studied consisted of 67 schizophrenic outpatients diagnosed by DSM-IV. Patients were clinically sta-

ble without prominent positive symptoms at the time of testing. To assess facial affect recognition deficit we chose a standardized facial expressions of emotion test, which required the forced-choice labeling pictures of each of six facial expression (anger, disgust, fear, sadness, happiness, surprise). The neuropsychological battery consisted of test evaluating different components of visual attention, which included alerting (ability to maintain the alert state), orienting attention (selection of information) and executive control of attention (involves self regulation)

Results: 20 patients met the facial affect recognition deficit criteria, 47 patients did not. The group with facial affect recognition deficit were more cognitively impaired in executive control of attention

Conclusions: Patients with the facial emotional recognition deficit may have a worse response control ability. This cognitive characteristic may contribute to failure to recognize facial affect

Correspondence: *Maite Carolera, PhD, Hospital de Terrassa, ctra Torrebónica s/n, Terrassa 08227, Spain. E-mail: mgarolera@csdt.es*

S.K. HILL, J.L. REILLY, R.W. MARVIN, C. ROSEN, T. KHINE, N. NAVARRO, O.A. DE LEON & J.A. SWEENEY. A Comparison of Neuropsychological Dysfunction in Early Psychosis of Schizophrenia, Bipolar Disorder, and Psychotic Depression.

Objective: Profiles of cognitive dysfunction in untreated early psychosis remain unclear. Moreover, comparisons among diagnostic groups with psychosis as a common feature are limited. This study was designed to evaluate the profile and extent of cognitive dysfunction in patients with bipolar, schizophrenia, and psychotic depression experiencing their first episode of psychosis.

Participants and Methods: Patients were recruited following hospitalization for psychotic symptoms and diagnosis (14 bipolar, 14 psychotic depressed, and 20 schizophrenia) was confirmed over the course of monthly clinical follow-ups. All patients were unmedicated prior to administration of a neuropsychological battery assessing the domains of Processing, Reasoning and Flexibility, Verbal Memory, Face Memory, Working Memory, and Attention. A comparison group of healthy individuals (n=26) completed all cognitive assessments and were matched with patient groups on age, sex, race, education, and SES. While the schizophrenia, bipolar and healthy groups were matched on estimated intellectual abilities, the psychotic depression group scored significantly lower on measures of intelligence.

Results: Compared to schizophrenia, repeated measures MANOVA indicated that psychotic depression was characterized by a remarkably similar, but less severe, pattern of global neuropsychological dysfunction. This replicated, in a new sample, our previous findings of parallel neuropsychological profiles in psychotic depression and schizophrenia (Hill et al., 2004). The bipolar group was characterized by mild deficits in Reasoning & Flexibility, Working Memory, and Attention relative to the healthy comparison group.

Conclusions: Overall, relative to first episode schizophrenia, early psychotic depression was qualitatively similar, but with somewhat reduced severity of deficit in all neuropsychological domains, whereas early psychosis in bipolar disorder was notable for only mild frontal-executive dysfunction.

Correspondence: *S. K. Hill, Ph.D., Psychiatry, University of Illinois at Chicago, Center for Cognitive Medicine (MC 913), 912 South Wood St., Ste 235, Chicago, IL 60612. E-mail: shill@psych.uic.edu*

S.K. HILL, J.A. SWEENEY, R.M. HAMER, R.S. KEEFE, D.O. PERKINS, H. GU, G. KOCH, J.P. MCEVOY & J.A. LIEBERMAN. Efficiency of the BACS and CATIE Neuropsychological Batteries in Assessing Cognition and Antipsychotic Treatment Related Change in Cognition during the CAFÉ Clinical Trial.

Objective: While clinical trials in schizophrenia have become more sophisticated in evaluating cognitive treatment effects, few studies have compared assessment approaches. This study was designed to compare the efficiency with which two neuropsychological batteries estimated cognitive abilities and change in cognition.

Participants and Methods: Participants were first episode psychosis patients who completed baseline (n=367) and 12-week (n=219) assessments with the BACS (Brief Assessment of Cognition in Schizophrenia) and CATIE (Clinical Antipsychotic Trials of Intervention Effectiveness) neuropsychological batteries as part of the Comparison of Atypicals in First Episode schizophrenia (CAFÉ) clinical trial.

Results: Exploratory factor analysis revealed that both batteries were characterized by a single factor of cognitive ability for both baseline performance and change in cognitive performance after treatment. Efficiency analysis showed that both batteries evaluated this generalized deficit adequately, although the BACS battery did so in half the time.

Conclusions: Given that a unitary factor characterized baseline cognitive abilities in schizophrenia spectrum disorders as well as cognitive improvement after antipsychotic treatment, brief assessments of the procognitive effects of antipsychotic treatments may provide efficient neuropsychological measures in clinical trials. Advantages of shorter batteries include reduced costs associated with administration time and scoring, reduced demands for sustained patient cooperation during cognitive testing, and fewer missing data points. However, should adjunctive therapies target specific cognitive deficits such as reasoning, episodic or working memory, a multi-factorial approach to neurocognitive assessment may be more appropriate given that domain specific cognitive outcomes would need to be evaluated.

Correspondence: *S. K. Hill, Ph.D., Psychiatry, University of Illinois at Chicago, Center for Cognitive Medicine (MC 913), 912 South Wood St., Ste 235, Chicago, IL 60612. E-mail: shill@psych.uic.edu*

S. KEEDY, R. MARVIN, C. ROSEN, M. HARRIS, T. KHINE & J.A. SWEENEY. Antipsychotic Treatment Effects on the Saccadic Eye Movement System: a Longitudinal fMRI Study in First Episode Schizophrenia.

Objective: While much is known about receptor-level effects of antipsychotic medications, less is known about how they impact functional brain systems that support cognition. fMRI was used to study antipsychotic treatment on the oculomotor system in initially untreated schizophrenia patients.

Participants and Methods: Data was collected during a saccadic eye movement paradigm on a 3T GE magnet from 10 untreated schizophrenia patients before and after 4-6 weeks of antipsychotic medication. Matched healthy individuals were scanned at a similar interval for comparison.

Results: At baseline, patients had reduced activation relative to healthy individuals in dorsal cortical areas known to support saccadic eye movements. Patients also displayed hyperactivation in parietal motion-processing regions that were not active for healthy individuals. At follow-up, relative to healthy individuals, schizophrenia patients displayed a reduction over time in dorsal cortical areas including the frontal, pre-supplementary, and parietal eye fields. Schizophrenia patients also demonstrated reduction of activation in the caudate nucleus, an area where antipsychotic drugs have a robust effect on D2 receptors and which plays an important role in saccade control. Reductions in activation in schizophrenia patients were also seen in ventral anterior cingulate, the cingulate motor area, and precuneus, relative to healthy individuals.

Conclusions: This study provides new evidence documenting the impact of antipsychotic medication on functional brain systems. Findings illustrate the potential value of functional neuroimaging biomarkers for tracking drug effects on brain systems, and provide insight into the origins of antipsychotic effects that have been reported previously in laboratory studies of oculomotor changes in first episode schizophrenia patients.

Correspondence: *Sarah Keedy, Ph.D., Psychiatry, University of Illinois at Chicago, Center for Cognitive Medicine, 912 S. Wood St. MC 913, Chicago, IL 60612. E-mail: skeedy@psych.uic.edu*

R.K. KESSLER, T. GIOVANNETTI & L.R. MACMULLEN. Improving Everyday Action in Chronic Schizophrenia through Strategic Object Placement.

Objective: Everyday action is impaired in schizophrenia; however, few studies have explored the effect of environmental adaptations on action. We examined the effect of strategic object placement on action performance.

Participants and Methods: Twenty inpatients with schizophrenia were administered the Naturalistic Action Test (NAT), which involves performing three everyday tasks using objects placed on a tabletop. NAT tasks differ with respect to the presence and salience of distractor objects. All tasks were administered under Standard (S-NAT) and User-Centered (U-NAT) conditions. In the U-NAT, objects were arranged in the order that they should be used. In the S-NAT, objects were arranged according to the manual instructions. Overall performance (NAT Score), total errors, and accomplishment were compared across conditions. The three NAT tasks were examined separately to determine if they were differentially affected by the U-NAT intervention.

Results: Significantly more participants fell in the impaired range on the S-NAT than the U-NAT (50% vs. 20%; $\chi^2 = 3.96, p < .05$). NAT Scores were higher (M = 15.85 vs. 14.50) and error rates lower (M = 9.20 vs. 12.32) on the U-NAT, but these comparisons just missed statistical significance ($z = 1.8, p < .08$). The U-NAT had a significant effect on the NAT task that included salient distractor objects (NAT Scores, errors & accomplishment $z = 2.06-2.89, p < .04-.004$).

Conclusions: Strategic object placement may facilitate everyday action in individuals with schizophrenia, particularly in cluttered, highly confusable contexts. Thus, caregivers should be educated on the impact of the environment on everyday action performance.

Correspondence: *Rachel K. Kessler, Psychology, Temple University, 3131 Walnut street, apt #412, Philadelphia, PA 19104. E-mail: rkessler@temple.edu*

M. KIM, Y. KIM & T. YOUN. The relationship between cognitive insight and neuropsychological functions in schizophrenic patients.

Objective: This study investigated the cognitive insight in schizophrenic patients. More specifically this study examined the relationships between cognitive and clinical insights, and between cognitive/clinical insights and the neuropsychological functions in patients with schizophrenia.

Participants and Methods: Twenty schizophrenic patients participated in this study. For the measurement of cognitive and clinical insight, Beck Cognitive Insight Scale (BCIS) and Scale to Assess Unawareness of Mental Disorder (SUMD) were administered, respectively. And Wisconsin Card Sorting Test (WCST), Controlled Oral Word Association Test (COWA), Trail Making Test (TMT) and d2 test were administered for the measurement of neuropsychological functions. The schizophrenic symptoms were measured by the Positive and Negative Syndrome Scale (PANSS) and Wechsler Adult Intelligence Scale (WAIS) was administered to measure IQ.

Results: The results showed a significant correlation between BCIS total score and SUMD total score ($r = -.54, p < .001$). Self-reflectiveness subscale of BCIS was associated with TMT, part B response time ($r = -.46, p < .05$), while self-confidence of BCIS was correlated with COWA (letter) ($r = .44, p < .05$), concentration index of d2 test ($r = .57, p < .05$) and IQ ($r = .49, p < .05$). There was a significant correlation between total score of SUMD and TMT, part A response time ($r = .63, p < .01$). In addition, both BCIS and SUMD were associated with general pathology of PANSS.

Conclusions: All of these results indicate that BCIS is a reliable and valid tool for the measurement of insight in schizophrenic patients. Although cognitive and clinical insight share common factors, the two types of insight seem to be related to the different cognitive functions.

Correspondence: *Myung-Sun Kim, Ph.D., Psychology, Sungshin Women's University, 249-1 Dongsun 3ga Sungbuk, Seoul 136-742, South Korea. E-mail: kimms@sungshin.ac.kr*

S. LUNDY, F.M. HANLON, J.J. SHIH, M. EULER, P.A. LYSNE, A. JONES, R. BANTZ & R.J. THOMA. Impaired Memory Function in Schizophrenia and Temporal Lobe Epilepsy.

Objective: Abnormal structure and function of the hippocampus is characteristic of schizophrenia and has been conceptualized as a core feature of the disorder. As the hippocampus is critical for some aspects of memory, it potentially plays a central role in visual and verbal memory impairments exhibited in schizophrenia. The purpose of this study was to test the extent to which neuropsychological impairment in schizophrenia may be related to hippocampal function.

Participants and Methods: Neuropsychological test data was collected from healthy control subjects ($n = 12$), patients with schizophrenia ($n = 8$), and patients with temporal lobe epilepsy (TLE) who underwent surgical temporal lobe, including hippocampus, resection for seizure control ($n = 5$). Groups were matched on age and education. The neuropsychological test battery included the Wechsler Adult Intelligence Scale-III and Wechsler Memory Scale-III (Logical Memory, Faces, Verbal Paired-Associates, Visual Reproduction).

Results: One-way ANOVAs comparing scores between groups showed that groups were equivalent on FSIQ, VIQ and PIQ. However, the experimental groups scored more poorly than controls on Logical Memory I and Verbal Paired Associates I & II ($p < .05$), and there was a trend for Visual Reproduction I and Logical Memory II ($p < .10$). Post-hoc analysis of inter-group contrasts suggested that the pattern of scores for the schizophrenia group resembled that of TLE patients more than that of healthy controls.

Conclusions: This result is consistent with our hypothesis that memory deficits in schizophrenia are secondary to hippocampal abnormality.

Correspondence: *S. Laura Lundy, Psychology, University of New Mexico, 11600 Academy Rd NE, #3222, Albuquerque, NM 87111. E-mail: lundysl@unm.edu*

M. MATSUI, H. ARAI, M. YONEZAWA, K. TANAKA & M. KURACHI. Influence of instruction on the Verbal Learning Test in patients with schizophrenia.

Objective: Memory impairment in patients with schizophrenia is a hallmark cognitive feature of the illness. One possible explanation for this impairment is that patients with schizophrenia fail to use effective memory strategies and show impaired use of organizational strategies. The purpose of this study was to examine whether patients with schizophrenia benefit from instruction in cue of memory strategy.

Participants and Methods: Twelve patients and 12 normal people participated in this study. Participants were administered two different versions of a list learning test, the Japanese Verbal Learning Test (JVLT). Then, these participants also received instruction in cue of memory strategy, before administration of the second word list. The instruction consisted of demonstrating to participants that giving specific instructions to group words into four kinds of category during each administration of the second word list.

Results: As a result, performance of the second list learning test was better than that of the first list learning test in normal people, while there was no significant difference of performance between 1st and 2nd list learning test in patients with schizophrenia. Namely, patients with schizophrenia did not reveal improvement of memory performance even after the instruction in cue of memory strategy.

Conclusions: Our findings suggest that impairment in use of cue for effective strategy influences memory performance in patients with schizophrenia and that it is an essential feature and it is not easy to change such impairment. Future studies will need to be taken into account of more explicit and concrete instruction for patients with schizophrenia.

Correspondence: *Mie Matsui, Ph.D., Psychology, University of Toyama, 2630 Sugitani, Toyama 930-0194, Japan. E-mail: mmatsui@las.u-toyama.ac.jp*

J. THYSEN, B. FREILICH, A. PADMANABHAPILLAI & A. MEDALIA. The Relationship Between Performance on the Brief Assessment of Cognition in Schizophrenia (BACS) and Insight into Illness.

Objective: Previous research has suggested a causal relationship between cognitive functioning and insight into illness in schizophrenia. This relationship has examined neurocognitive performance through a variety of different assessment measures and normative data. In attempting to better understand the underlying relationship between cognitive status and insight in schizophrenia, we chose to use a screening battery specifically designed for individuals with schizophrenia that has a single normative sample thereby enabling a better comparison of overall and component areas of cognitive functioning and insight.

Participants and Methods: Seventy-five subjects with schizophrenia aged 18-60 were administered the BACS to assess cognitive status and the SUMD to measure insight into illness.

Results: Findings demonstrated non-significant relationships between overall cognitive functioning and insight, attention and insight, and memory and insight. Executive functioning as assessed by a Tower of London task was significantly correlated to general insight in schizophrenia ($r = -0.375$, $p < 0.001$), insight into having a mental disorder ($r = -0.291$, $p < 0.05$), and insight into the effectiveness of medication ($r = -0.313$, $p < 0.01$).

Conclusions: Neither overall cognitive functioning nor attention nor memory are related to insight in schizophrenia. However, executive functioning is significantly associated with general insight in schizophrenia as well as insight into illness and insight into the effectiveness of medication. This supports findings from previous research, and suggests a link between insight and frontally mediated cognitive functions.

Correspondence: *Julie Thyssen, Department of Psychiatry, Neuropsychiatry Section, University of Pennsylvania, 10th Floor Gates Building, 3400 Spruce Street, Philadelphia, PA 19104. E-mail: jthyssen@aol.com*

Symposium 10

1:30–3:00 p.m.

Testing Neuropsychological Models across Patient Populations: the Advantages of Examining Measurement Equivalence.

Chair: Stephen Bowden

E.D. BIGLER, K.M. ADAMS, B. STEPHEN, V.M. PETRAUSKAS & N. GREGG. Testing Neuropsychological Models across Patient Populations: the Advantages of Examining Measurement Equivalence.

Symposium Description: In this symposium, a new method for testing the generality of neuropsychological models will be described. The method is known as evaluation of measurement model equivalence. The principles of measurement equivalence address many fundamental assumptions in neuropsychological theory and assessment but, until re-

cently, have not been amenable to detailed testing within a single comprehensive framework. Examples of the questions that can be evaluated using these methods include the following. Do different patient groups respond to test items in the same way? Do the same psychological constructs underlie a set of test scores in different patient groups? Can clinical dissociations be interpreted as evidence of different cognitive architecture or as evidence of different relationships in the same cognitive architecture? In this symposium three papers will illustrate the broad application of tests of measurement equivalence. In the first presentation, Stephen Bowden will describe the principles of measurement equivalence and show how an extension of familiar confirmatory factor analytic techniques can be used to test these principles across groups. The approach will be illustrated with an examination of the equivalence of a model of depressive symptoms in a sample of patients with traumatic brain injury, compared to community controls and other clinical groups. In the second presentation, Vilija Petrauskas will describe item level analysis of the WMS-III scores and illustrate examination of measurement equivalence across heterogeneous neuroscience samples. In the final presentation, Noel Gregg will examine samples of college students with learning difficulties and attention deficit/hyperactivity disorder and compare these to the US co-norming sample on the WAIS-III and WMS-III.

Correspondence: *Stephen C. Bowden, Ph.D., University of Melbourne, Swanston Street, Parkville, VIC 3010, Australia. E-mail: sbowden@unimelb.edu.au*

S. BOWDEN. Examining the Equivalence of a Measurement Model of Mood Disorder in Patients with Traumatic Brain Injury Versus Community Reference and other Clinical Groups.

Objective: In this presentation the principles of measurement equivalence will be illustrated by examination of a model of depressive symptoms in a sample of patients with traumatic brain injury (TBI). Establishing measurement equivalence across groups involves the empirical demonstration that a set of test scores measure the same set of psychological constructs (or latent variables) across groups and the numerical relationships between the tests scores and the corresponding latent variables are equivalent. In patients with TBI, symptoms of mood disorder are sometimes attributed to the intractable effects of the neurotrauma and may not be treated in the same way as in patients with uncomplicated depression. This type of interpretation may involve implicit rejection of measurement equivalence and requires explicit evaluation.

Participants and Methods: Scores on the Beck Depression Inventory-II (BDI-II) were examined in a volunteer sample of 201 patients with TBI of varying severity. The latent variable model of depression derived from this sample was compared with the normative sample of 528 community volunteers, and other clinical samples. A nonparametric confirmatory factor analysis was used to evaluate measurement equivalence across the groups.

Results: A four factor model of BDI-II scores was found to fit best in each of the groups examined. Measurement equivalence was shown to hold across groups for this model.

Conclusions: The same psychological constructs underlie mood symptoms in all patient groups examined.

Correspondence: *Stephen C. Bowden, Ph.D., University of Melbourne, Swanston Street, Parkville, VIC 3010, Australia. E-mail: sbowden@unimelb.edu.au*

V.M. PETRAUSKAS. Item Level Analysis of WMS-III Scores in a Heterogeneous Neuroscience Sample.

Objective: When scores on a published test are used for clinical interpretation, the scores employed are often sums of a set of items, sometimes referred to as item parcels. For example, the score on Story A from the WMS-III Logical Memory I comprises a parcel of 25 items. The use of parcels as item scores is controversial because the process of

parcelling may involve untested assumptions regarding the trait composition of the items so parcelled. When constructs are multidimensional, parcels drawn from items assessing a construct are themselves likely to be multidimensional. At a practical level, unpacking parcels, and modelling item level data allows testing of clinical hypotheses such as the commonly inferred “dissociation” between forward and backward digit span.

Participants and Methods: The present study explored the dimensionality of the primary subtests in the WMS-III in detail in a total sample of 491 neurosciences patients, the largest subset of whom were patients undergoing evaluation for seizure disorders. Selected subtests were examined for measurement equivalence across subsets of patients.

Results: Results suggested that most of the WMS-III subtests are multidimensional, although the nature of the dimensions varied across subtests. Typically, multidimensionality reflected presentation order or item subtypes. A simple dissociation between forward and backward digit span was not observed, but the measurement model of digit span was found to be equivalent across patient groups.

Conclusions: Item level modelling facilitates clarification of subtest trait composition, including the nature of clinical dissociations.

Correspondence: *Stephen C. Bowden, Ph.D., University of Melbourne, Swanston Street, Parkville, VIC 3010, Australia. E-mail: sbowden@unimelb.edu.au*

N. GREGG. Divergent Factor Means and Correlations in the Context of Measurement Model Equivalence in College Students with Developmental Disabilities when Compared to the WAIS-III/WMS-III Normative Sample.

Objective: Establishing measurement equivalence is necessary for meaningful comparison of test scores across groups. In other words, if the trait composition of a set of test scores varies across groups, then the scientific basis for clinical inferences may be questionable. In seeking to understand the nature of cognitive abilities in people with learning disabilities, there has been much speculation regarding the most appropriate models of intelligence. In this study, we examined the equivalence of the measurement model underlying the WAIS-III and WMS-III in two samples of college students with learning disabilities, and compared these students with an age-matched subset of the WAIS-III/WMS-III co-norming sample.

Participants and Methods: Three samples were examined (i) 186 college student with a diagnosis of learning disabilities, (ii) 170 college students with a diagnosis of attention-deficit/hyperactivity disorder, and (iii) an age-matched subset of 375 people drawn from the WAIS-III/WMS-III co-norming sample. Measurement equivalence was examined by testing all components of the measurement model underlying combined Wechsler Scale scores.

Results: Equivalence of the measurement model was observed when each clinical group was compared with the age-matched WAIS-III/WMS-III co-norming sample. However, striking differences were observed in the college student samples in terms of factor means and factor correlations.

Conclusions: The results of this study suggest that significant group differences may be observed in the structure of cognitive abilities (the mean values of factor scores and correlations between factors) despite equivalence of the underlying measurement model.

Correspondence: *Stephen C. Bowden, Ph.D., University of Melbourne, Swanston Street, Parkville, VIC 3010, Australia. E-mail: sbowden@unimelb.edu.au*

Poster Session 9: Medical and Degenerative Disorders

3:00–4:30 p.m.

Drug/Toxin-Related Disorders (Incl. Alcoholism)

A.N. CERNICH, M. KABAT, K. LONSER, P. GUCER, M.A. MCDI-ARMID & R.L. KANE. Stability of Neurocognitive Test Performance Over Time in Soldiers Exposed to Depleted Uranium.

Objective: Previous studies of the effects of depleted uranium (DU) on neurocognition in exposed soldiers have yielded no significant findings on cross-sectional analysis. Reliable change methodology was used to determine change in neurocognitive performance across the longitudinal study for veterans with elevated urine uranium (UU; uranium concentration mcg per gram creatinine).

Participants and Methods: Fifty-two veterans were included in the analyses (Age, $\mu = 30.73$, $sd = 5.38$; Education, $\mu = 12.8$, $sd = 1.6$). Each clinic visit was treated as an observation as all subjects were not available at each visit (test-retest interval ≈ 2 years). High UU level was defined as 1.0 $\mu\text{g/g}$ CRT in urine, consistent with previous studies. An exploratory analysis using non-parametric statistics was used to determine possible group differences by exposure level (>1.0 high, 0.1–0.9 medium). ANAM scores were transformed into an Index of Cognitive Efficiency (ICE) to increase range and normalize distribution. Reliable change indices were calculated via the Chelune reliable change index (RCI) and linear regression using the low UU sample as the comparison.

Results: There was no suggestion of cognitive decline based on high UU level alone across observations ($U = 10.5$, $p > .05$; $U = 36$, $p > .05$; $U = 20.5$, $p > .05$). No differences were noted between high and medium uranium groups ($H = 2.387$, $p > .05$; $H = .022$, $p > .05$; $H = 1.18$, $p > .05$; $H = .563$, $p > .05$), with similar results across RCI methods. Individuals with significant decline were not consistent across observations and were equally distributed across uranium groups.

Conclusions: Veterans with elevated UU did not demonstrate reliable decline on measures of neurocognition over three observations. Future analyses should include covariates associated with mood and take interval between measurements into account.

Correspondence: *Alison N. Cernich, Ph.D., Psychology, VA Maryland Health Care System, BT/116/MH, 10 North Greene Street, Baltimore, MD 21201. E-mail: alison.cernich@va.gov*

M. CERRIER, J. AMORY, G. HOLMAN, L. SONG, M. JOHNSON, M. ERSEK, L. RISLER & D. SHEN. Characterization of Cognitive and Subjective Side Effects from Immediate Release Oxycodone in Older Adults.

Objective: Persistent pain, sufficient to cause significant impairment in daily functioning, affects up to 50 percent of older adults. Analgesics are the most common therapy used to manage pain, with opioids playing an increasingly important role in the treatment of chronic disabling pain in older adults. The efficacy of opioid therapy needs to be balanced against potential side effects, including the risk of neurocognitive impairment. This study measured the objective and subjective neurocognitive effects of two doses of immediate-release oxycodone in healthy, older (>65 years) adults.

Participants and Methods: Participants were assessed for subjective physical side effects and completed a one hour cognitive testing battery prior to and 60 minutes after medication. Ten participants completed two separate study days and were blind to dose order (5, 10 mg). Blood samples were taken to characterize medication pharmacokinetics.

Results: There were no significant differences on cognitive measures between baseline and 60 minutes for the 5mg dose. However, decre-

ments in simple and choice reaction time as well as verbal memory were evident ($p < .01$, $p < .08$) for the 10mg dose. Participants reported subjective side effects including compromised alertness (e.g., spaced out, confused) rated as mild to moderate after dose at 5mg and 10 mg. Medication blood levels demonstrated a peak level 60–90 minutes post dose with a return to baseline at five hours.

Conclusions: This study suggests that mild changes in reaction time are evident at peak blood levels for older adults. Further, studies will examine how long these neurocognitive changes persist. Support from UW Cancer & Aging Center 10372-03 and AG025503 and M01-RR-00037. Correspondence: *Monique Cherrier, Ph.D., Psychiatry, University of Washington, 1660 S. Columbian Way, VAPSHCS 1S2 GRECC, Seattle, WA 98108. E-mail: cherrier@u.washington.edu*

R.L. DOTY, R. BOWLER & M. ANTUNES. San Francisco/Oakland Bay Bridge Welder Study: Olfactory Function.

Objective: To evaluate the olfactory function of professional welders who worked in poorly ventilated confined spaces for 1–2 years on the San Francisco/Oakland Bay Bridge.

Participants and Methods: 43 professional welders and 43 controls matched on the basis of age, gender, education, and smoking habits were administered the University of Pennsylvania Smell Identification Test (UPSIT) and extensive neurological and neuropsychological test batteries.

Results: The UPSIT scores of the welders were significantly lower than those of the controls; respective means (SEMs) = 29.51 (0.90) and 36.55 (0.88). 88% percent scored below their individually-matched normal control. As in idiopathic Parkinson's disease, the UPSIT scores of the welders were unrelated to a broad spectrum of neurological and neuropsychological measures. Although blood levels of Mn were correlated with the time spent working on the bridge, workers with the highest Mn blood levels exhibited better olfactory function than those with the lowest Mn blood levels. The basis of this paradoxical phenomenon, which has been observed previously in other contexts, is unclear.

Conclusions: Professional welders who do not wear adequate respiratory protection may be at significant risk for loss of smell function. Such loss is unrelated in a systematic way to neuropsychological measures. Although the cause of the olfactory dysfunction is unknown, it presumably reflects damage to the olfactory membrane from exposure to airborne transitional and heavy metals.

Correspondence: *Richard L. Doty, Ph.D., Smell & Taste Center, University of Pennsylvania, HUP - 5 Rardin Building, 3400 Spruce Street, Philadelphia, PA 19104. E-mail: doty@mail.med.upenn.edu*

S. GYSENS & R. BOWLER. Factor Loadings of a Neuropsychological Screening Test Battery for the Evaluation of Manganese Exposure.

Objective: A recent study of a group of welders with acute exposure to manganese (Mn) fumes (Bowler et al., 2006) showed a dose-effect relationship between Mn Blood levels and lower scores on WAIS-III FIQ, VIQ and WMI, Digit Span, Arithmetic, Letter-Number-Sequencing, DKEFS Design Fluency, and WMS-III Verbal Paired Associates and WordList. A similar association was found with an exposure index that took into account type and duration of welding, and Mn Air level measurements. Findings showed lowered scores in the domains of attention, executive functioning, and memory. The present study seeks to confirm domains assessed with a short but sensitive screening test battery.

Participants and Methods: A group of welders with acute exposure to Mn ($n=43$) and two groups with long-term exposure ($n=123$) were evaluated with a screening battery of neuropsychological tests deemed sensitive to impairment found after toxic exposure. Tests included WAIS-III Digit Span, Letter-Number-Sequencing, Arithmetic, Matrix

Reasoning, Symbol Search, Digit Symbol-Coding, WMS-III WordList, Verbal Paired Associates, and Logical Memory, Stroop, Cancellation H, Trail Making, COWAT, Fingertapping, Grooved Pegboard, and Dynamometer. Principal Components Analysis was performed to confirm domains of functioning assessed in these groups.

Results: Five factors with eigenvalues of 1 or higher explained 62% of the variance found in the welders group. These factors were consistent with the following domains: Immediate Verbal Memory, Delayed Verbal Memory, Attention and Executive Functioning, Mental Processing Speed, Motor Skills. All but one test had a factor loading above .5.

Conclusions: The short test battery used for screening welders with different exposure levels did assess the domains intended to be evaluated. Specific factor loadings for different tests will be shown.

Correspondence: *Sabine Gysens, Ph.D., Neuropsychology, California Pacific Medical Center, PO Box 31637, San Francisco, CA 94131. E-mail: sgysens@sfsu.edu*

K.L. HANSON, M. LUCIANA & K. SULLWOLD. Reward-Related Decision-Making Deficits Among MDMA and Other Drug Users.

Objective: MDMA (3,4-methylenedioxymethamphetamine; 'Ecstasy') is a synthetic amphetamine derivative with mild hallucinogenic and stimulant effects. It is a known serotonin neurotoxin that may produce memory and executive dysfunction as well as impulsivity. However, few studies of MDMA users have examined reward-related decision-making, thought to be mediated by the ventromedial prefrontal cortex. Our aim was to examine reward-related decision-making among MDMA users, while considering the influence of other substance use via a poly-drug control group.

Participants and Methods: Abstinent MDMA users ($n = 22$), other drug users ($n = 30$), and healthy non-drug controls ($n = 29$) completed the Iowa Gambling Task (IGT; Bechara et al., 2004), a neuropsychological battery, self-report measures of personality, and a comprehensive drug use interview.

Results: MDMA users and other drug users were similar on measures of cognition and personality; however, both drug use groups demonstrated poorer IGT performance and elevated impulsivity relative to controls. Among MDMA users, individuals who met DSM-IV substance use disorder criteria for MDMA ($n=14$) performed more erratically on the IGT relative to individuals without this diagnosis ($n=8$). Relationships between IGT performance, alcohol and drug use characteristics, and self-report measures of impulsivity were examined using Spearman's correlations.

Conclusions: Both drug use groups were at risk for reward-related decision-making deficits and elevated impulsivity, possibly due to a dysregulated serotonin system and/or ventromedial prefrontal cortex dysfunction. Individuals who abuse or are dependent on MDMA may have a particularly increased risk of executive dysfunction.

Correspondence: *Karen L. Hanson, Ph.D., University of California - San Diego, 3350 La Jolla Village Dr., 151B, San Diego, CA 92161. E-mail: khanson@ucsd.edu*

J. JACOBUS, B.C. SCHWEINSBURG, A.D. SCHWEINSBURG, M.J. TAYLOR & I. GRANT. The Interactive Effects of Age and Alcoholism on Brain Response to Spatial Working Memory.

Objective: Previous studies have suggested age-related structural brain changes in alcoholism that differ from effects in normal aging. However, the functional correlates of this relationship have not been well characterized. In this study, we examined the interaction between age and alcoholism on fMRI response during a spatial working memory task, as this task has been shown to be sensitive to alcoholism-related brain injury across a wide age range.

Participants and Methods: Participants were 27 male recently detoxified alcoholics (RDA, abstinent 2 to 8 weeks, mean age = 46.2 ± 8.8) and 11 male controls (mean age = 45.6 ± 9.6) matched on age. fMRI data were acquired while participants performed a 2-back spatial location working memory task. Regression analyses predicted fMRI response from age, alcoholism status, and their interaction.

Results: Groups had similar accuracy and reaction times on the task. fMRI analyses revealed interactions between age and alcoholism in bilateral medial frontal, bilateral superior frontal, and right middle frontal gyri, medial precuneus/posterior cingulate, and bilateral cuneus (clusters > 943 microliters, $p < .05$). Simple effects regressions showed that RDA had a negative relationship between age and fMRI response, while controls showed a positive relationship between age and fMRI response.

Conclusions: These results demonstrate an age-related decline in fMRI response to spatial working memory among alcoholics, yet an age-related increase among controls. In healthy volunteers, neural effort may be increased in older age in order to maintain task performance. Yet in alcoholics, such compensatory responding is observed at a younger age, but this capacity may be limited in older alcoholics. One implication may be that older recently detoxified alcoholics may process information less efficiently, and thus could potentially have difficulty with complex everyday tasks.

Supported by a Veterans Affairs Merit Review Grant to Dr. Grant.

Correspondence: *Joanna Jacobus, B.A. Psychiatry, University of California, San Diego, 7515 Charmant Dr. #1406, San Diego, CA 92122. E-mail: joannajacobus@gmail.com*

K. SULLIVAN, P. JANULEWICZ, M. KRENGEL, C. COMTOIS & R. WHITE. Qualitative Findings in Complex Figure Drawing In Military Pesticide Applicators from the Gulf War.

Objective: Current hypotheses for the continued cognitive complaints in GW I veterans invoke exposure to multiple neurotoxicants. Many neurotoxicants are known to affect the visuospatial domain. Therefore, the goal of this study was to evaluate the relationship of multiple chemical exposures and visuospatial functioning on the Rey-Osterreith Complex Figure Test (ROCF). By employing the Boston Qualitative Scoring System (BQSS), it was possible to provide an in depth analysis of performance by obtaining 6 summary scores and 17 qualitative scores of the ROCFT.

Participants and Methods: Study participants included a subgroup of 67 GW pesticide control personnel taken from a larger study of GW veterans. Pesticide control personnel were divided into 4 groups based on high and low exposure for pesticides and pyridostigmine bromide (PB). Each study participant completed the ROFCT according to standard administration and standard scoring of the BQSS. It was hypothesized that individuals with multiple chemical exposures (PB, pesticides) would perform significantly worse on the qualitative measures of the BQSS compared with veterans without such exposures.

Results: Multivariate analyses suggested overall group differences on the BQSS configural, cluster, detail, presence, accuracy, placement, and qualitative scores when comparing the four exposure groups of PB and pesticides.

Conclusions: These preliminary findings suggest that multiple chemical exposures in GW pesticide control personnel appear to have resulted in impairments in visuospatial functioning and visual memory as indicated by in depth qualitative scoring of the ROFCT. Further analyses with a larger sample size will help to further elucidate these findings.

Correspondence: *Kimberly Sullivan, Ph.D., Environmental Health, Boston University School of Medicine, 150 S. Huntington Ave. 116B-4, Boston, MA 02130. E-mail: kjsw118997@msn.com*

T. MCQUEENY, K. LISDAHL MEDINA, A.D. SCHWEINSBURG, M. COHEN-ZION, B.J. NAGEL & S.F. TAPERT. Effects of Alcohol and Marijuana Use During Adolescence on Hippocampal Asymmetry and Cognitive Functioning.

Objective: Memory deficits have been reported in adolescents with heavy alcohol and marijuana use, yet the impact of these substances on hippocampal development remains unclear. In addition, relationships between hippocampal asymmetry and memory function have not been explored in substance involved adolescents. This study examined relationships between right > left (R>L) hippocampal asymmetry and cognitive functioning in alcohol and marijuana using adolescents.

Participants and Methods: Participants (15-18 years-old) were 16 alcohol using (Alc) teens, 26 marijuana and alcohol using (MJ-Alc) teens and 21 demographically similar controls. Hippocampal volumes were obtained through manually traced structural magnetic resonance images. All data were collected after at least 2 days of abstinence from all substances.

Results: After controlling for age and intracranial volume, group differences in asymmetry were observed ($p < .02$). Post-hoc analyses revealed that Alc teens had greater R>L asymmetry ($p < .05$) than both controls and MJ-Alc teens, for which more L>R asymmetry was observed.

Among controls only, individuals with more R>L asymmetry performed better on verbal learning ($r = .45$, $p < .05$) whereas superior visual memory performance was related to greater L>R asymmetry ($r = -.54$, $p < .01$).

Conclusions: Alcohol using teens exhibited greater right versus left hippocampal asymmetry than other groups. The functional relationship between verbal and visual memory and hippocampal asymmetry was abnormal among substance using adolescents compared to non-drug using controls. These findings suggest differential effects of alcohol and combined marijuana and alcohol use on the relationship between hippocampal morphometry and learning and memory performance.

Correspondence: *Tim McQueeny, VASDHS, 3350 La Jolla Village Drive (151B), San Diego, CA 92161. E-mail: tmcqueen@ucsd.edu*

K.L. MEDINA, K.L. HANSON, A.D. SCHWEINSBURG, M. COHEN-ZION & S.F. TAPERT. Neuropsychological Functioning in Adolescent Marijuana Users: Subtle Deficits Detectable After 30 Days of Abstinence.

Objective: In adults, studies examining the long-lasting cognitive effects of marijuana use demonstrate subtle deficits in attention, executive function, and memory. However, since neuromaturation continues through adolescence, these results cannot necessarily generalize to adolescent marijuana users. Therefore, the goal of the present study was to examine neuropsychological functioning in abstinent marijuana-using and demographically similar control adolescents.

Participants and Methods: Data were collected from 65 adolescent marijuana users ($n=31$, 26% female) and controls ($n=34$, 27% female) aged 16-18. Extensive exclusionary criteria included independent psychiatric, medical, and neurologic disorders. Substance use information and neuropsychological assessments were collected after 30 days of monitored abstinence. Dependent variables were composite scores for: psychomotor speed, visuospatial skills, complex attention, story memory, verbal list learning, verbal fluency accuracy, planning and sequencing, and problem solving.

Results: After controlling for lifetime alcohol use and gender, adolescent marijuana users demonstrated significantly poorer planning and sequencing ability ($\beta = -.78$, $p < .002$), complex attention ($\beta = -.37$, $p < .05$), and slower psychomotor speed ($\beta = -.49$, $p < .05$) compared to demographically similar controls. No significant gender-by-group interactions were observed.

Conclusions: The general pattern of results suggested that even after 30 days of monitored abstinence, adolescent marijuana users continue to demonstrate subtle deficits in planning and sequencing, complex attention, and psychomotor speed compared to non-marijuana using teens. Thus, marijuana use during adolescence may negatively

impact neuromaturation and cognitive development. Implications include the need for psychoeducation aimed at informing adolescents and parents of the potential long-term cognitive consequences of heavy marijuana use, as well as longitudinal studies to help rule out pre-morbid influences.

Correspondence: *Krista L. Medina, Ph.D., Psychiatry, University of California, San Diego, 3350 La Jolla Village Drive (151B), San Diego, CA 92161. E-mail: klmedina@ucsd.edu*

A.D. SCHWEINSBURG, K.L. MEDINA, T. MCQUEENY, B.C. SCHWEINSBURG & S.F. TAPERT. An fMRI Study of Residual and Persisting Abnormalities in Adolescent Marijuana Users.

Objective: Research suggests recovery from the neurocognitive impact of marijuana use within a month of abstinence among adults. We previously demonstrated altered functional magnetic resonance imaging (fMRI) response to spatial working memory (SWM) in heavy marijuana using (MJ) adolescents after 28 days of abstinence, but the influence of recency of use has not yet been explored in detail. In this study, we compared fMRI response during SWM between MJ teens with brief and sustained durations of abstinence.

Participants and Methods: Participants were 15-18 years old, including 15 MJ teens (33% female) who had used 2-14 (mean=4) days prior to scanning (MJ-recent), and 15 MJ teens (27% female) who had been abstinent for at least 27 (mean=55) days (MJ-abstinent). Groups were similar on demographic and substance use characteristics, and had no psychiatric or medical disorders. Teens performed a SWM task during fMRI acquisition.

Results: Groups performed similarly on the SWM task, but MJ-recent showed more fMRI response in left superior and medial prefrontal cortices, bilateral insula, left superior temporal cortex, and right superior parietal cortex. MJ-abstinent had more response in the right precentral gyrus (clusters > 1328 microliters, $p < .05$).

Conclusions: Results show that recent marijuana using adolescents have more brain response than abstinent users during a spatial working memory task. Though cross-sectional, this evidence could suggest less compensatory neural response as the brain adjusts to the absence of marijuana through early abstinence. Longitudinal studies are needed to characterize the potential neural recovery during early abstinence from marijuana.

Correspondence: *Alecia D. Schweinsburg, MA, Psychology, University of California San Diego, VA San Diego Healthcare System 151B, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: aschweinsburg@ucsd.edu*

K. SULLIVAN, M. KRENGEL, T. THOMPSON, C. COMTOIS & R. WHITE. Cognitive Functioning in Gulf War I Veterans Exposed to Pesticides, Pyridostigmine Bromide and Khamisiyah Weapons Depot.

Objective: One theory for the continued health complaints in GW I veterans is the combination of multiple chemical exposures. The goal of this study was to evaluate the relationship of the combined exposures of pesticides, pyridostigmine bromide (PB) and sarin on the cognitive functioning of GW I veterans.

Participants and Methods: Study participants included a unique group of 100 pesticide control personnel from the GW including pesticide applicators (high-exposed group) and preventive medicine specialists (low-exposed group). Each study participant completed a comprehensive battery of neuropsychological tests, psychological interviews and health symptom/exposure assessment questionnaires. It was hypothesized that individuals with high pesticide exposure would perform significantly worse on cognitive measures than a group of GW military personnel with low pesticide exposure. It was also hypothesized that multiple chemical exposures (PB, pesticides, sarin) would prove to be synergistic and/or additive in terms of decreased cognitive functioning.

Results: Preliminary results suggested that individuals with high PB and pesticide exposure who were also exposed to the Khamisiyah weapons depot detonations (and exposed to sarin from the explosions) performed more poorly on tests of visuospatial integration, visuconstruction and visuospatial recall than the low exposure group.

Conclusions: These preliminary findings suggest that multiple chemical exposures in the Gulf theatre may have proven synergistic and resulted in impairments in visuospatial functioning. This finding of visuospatial functioning deficit is consistent with what has been documented with other known neurotoxics.

Correspondence: *Kimberly Sullivan, Ph.D., Environmental Health, Boston University School of Medicine, 150 S. Huntington Ave. 116B-4, Boston, MA 02130. E-mail: kjsw118997@msn.com*

S.P. CERCY & M.M. WANKMULLER. A Case of Cognitive Dysfunction Associated with Elemental Mercury Ingestion.

Objective: To describe cognitive dysfunction associated with elemental mercury exposure.

Participants and Methods: A 63 year-old Caucasian man with a history of alcohol dependence ingested elemental mercury as a suicide gesture. One known prior admission for mercury ingestion occurred 4 months previously. He was treated with pro-motility agents and succimer chelation. Through discharge, serial abdominal X-rays showed gradual but incomplete clearance of mercury from the colon. Moreover, routine chest X-ray showed evidence of punctate radiopaque materials in the posterior lower lobe of the right lung. Neurological examination revealed no characteristic evidence of mercury intoxication. Blood mercury levels peaked about 10 days following admission and declined thereafter; urine mercury levels were highest at discharge. Both were well in excess of thresholds considered to be associated with cognitive dysfunction. CT of the head showed mild atrophy. Given the history, he underwent neuropsychological assessment.

Results: Neuropsychological evaluation revealed deficits most prominently affecting cognitive speed, flexibility, and response inhibition. Semantic fluency, visuospatial processing, and recall memory for visual and low-context verbal material were also affected. Behaviorally, affect was irritable, speech volume was increased, and there was a mild upper-extremity action tremor.

Conclusions: Deficits may be attributable primarily to chronic alcohol abuse. Elemental mercury typically is not readily absorbed by the GI tract and does not easily cross the blood-brain barrier. However, in this case, mercury apparently volatilized and was inhaled. Mercury vapor is lipid-soluble and readily crosses the blood-brain barrier. Moreover, high urine and blood mercury levels were found. Therefore we argue that mercury intoxication may have been a factor contributing to the patient's cognitive dysfunction.

Correspondence: *Steven P. Cery, Ph.D., Psychology Division, New York Veterans Affairs Medical Center, Room 2656, 423 E 23rd Street, New York, NY 10010. E-mail: steven.cery@med.va.gov*

Endocrine Disorders/Hormones

L.H. RUBIN, K.L. MORDECAI, M. RAGGOZINO, J. PELLEGRINO & P.M. MAKI. Effects of Ovarian Steroid Hormones on Components of Phonemic Fluency in Premenopausal Women.

Objective: Research demonstrating a female advantage on verbal fluency tasks and enhanced performance during the midluteal (high estrogen and progesterone) phase of the menstrual cycle suggests that estrogen can enhance verbal fluency. The cognitive processes that

could explain this relationship are unknown. Verbal fluency tasks are influenced by two processes: clustering (automatic temporal process) and switching (controlled frontal process). We examined these processes across the menstrual cycle and with oral contraceptive (OC) use. Total words and clusters were expected to be enhanced during the midluteal compared to the follicular phase (low estrogen and progesterone) for non-OC users. Given that OC enhances exogenous estrogen levels, superior performance on total words was expected for OC users.

Participants and Methods: Sixteen women on OCs and 13 women not on OCs completed verbal fluency tests during their midluteal and follicular phases. Outcome measures included total words generated, mean clustersize, and total switches on phonemic fluency.

Results: As expected, Users produced more words and switches than Nonusers. Counter to predictions, women generated more words and larger clusters during the follicular compared to the midluteal phase. The phase effect on phonemic fluency was no longer evident in an analysis covarying for clustering. Estradiol correlated with switching during both phases in Nonusers.

Conclusions: As predicted, OC users showed enhanced verbal fluency, but the pattern of change across the cycle was opposite predictions. It may be that high levels of endogenous progesterone are associated with decreased verbal fluency and decreased temporal function.

Correspondence: *Leah H. Rubin, M.A., Psychiatry and Psychology, University of Illinois at Chicago, 912 S. Wood St., M/C 913, Chicago, IL 60605. E-mail: lrubin@psych.uic.edu*

S. WRIGHT, B. GIORDANI, S.A. LANGENECKER, J.M. BENO, K. GUIRE, E.M. BRICENO, B.D. LONG, D.E. SCHTEINGART & M.N. STARKMAN. Cognition Following Successful Surgical Intervention of Cushing's Disease.

Objective: Cushing's disease (CD) provides the opportunity to investigate the effects of hypercortisolism, as well as the potential reversal of those effects following treatment. Previously, we demonstrated impairments in executive functions and verbal and visual learning in a group of CD patients prior to surgical intervention. For this study, we compared pre-surgical performance in these cognitive domains with performance at up to 18 months following successful surgery. We hypothesized that CD patients would demonstrate improvements post-surgery across the cognitive domains measured as compared to their performance prior to surgical intervention.

Participants and Methods: Twenty-two CD patients, aged 16-59, received the same battery of neuropsychological measures pre- and post-transphenoidal surgery with remission of hypercortisolism.

Results: Using repeated measures ANOVA, we found that patients demonstrated significant improvement on measures of verbal and visual learning following surgical intervention (all $p < .05$), consistent with earlier findings by our group. Measures of executive functioning did not significantly improve.

Conclusions: These findings suggest that not all cognitively impaired areas improve in the months following successful surgery. Some areas, such as executive functioning, may take longer to recover or never improve. The hippocampus, an area dense in glucocorticoid receptors and important for memory functioning, may recover more quickly than other regions of the brain following improvement of cortisol levels. Other areas of the brain also rich in glucocorticoid receptors and associated with executive functioning, such as prefrontal cortex, may respond to reduced cortisol more slowly. Potential modifiers of post-surgical changes, including depression level, age, and time since treatment are explored.

Correspondence: *Sara Wright, Ph.D., Psychiatry, University of Michigan, 2203 S. Huron Pkwy., Unit 1, Ann Arbor, MI 48104. E-mail: sarawrig@med.umich.edu*

Epilepsy

W.B. BARR, S. WEINER, E. LARSON, S. VARDY, K. ALPER & O. DEVINSKY. Rates of Invalid MMPI-2 Profiles in Patients with Epileptic and Nonepileptic Seizures.

Objective: The MMPI-2 often provides useful data for distinguishing between patients with epileptic (ES) and non-epileptic (NES) seizures. The goal of this study was to compare the rates of invalid responding in these groups.

Participants and Methods: MMPI-2 profiles were obtained from 88 patients with ES and 77 with NES, diagnosed by continuous VEEG monitoring. The groups were matched for age, education, and FSIQ. The NES group had a higher proportion of females (76% vs. 53%). Analyses were conducted on standard validity indices (Scales L, F, K & VRIN, TRIN), in addition to Fp (Infrequency-Psychopathology) and FBS (Lees-Haley Fake Bad Scale).

Results: No group differences were found in analyses of mean T-scores for any of the standard validity indices or for Fp. There were no group differences in rates of elevated scores for any of these measures. The NES group exhibited significantly higher mean raw score on FBS ($M = 20.6$ v. 16.9) and higher rates of elevated scores on this measure (17% v. 6%), as defined by raw scores of 26 or more. Rates of invalid responding across all indices differed only when FBS was included in the analysis.

Conclusions: Rates of invalid responding in NES and ES groups are the same when examined with standard validity indices. Higher rates of invalid responding on the FBS indicate that patients with NES are more likely to produce exaggerated symptom profiles than those with ES and suggest that FBS is a useful measure for screening symptom exaggeration in this population.

Correspondence: *William B. Barr, Ph.D., Neurology and Psychiatry, NYU School of Medicine, NYU Comprehensive Epilepsy Center, 403 East 34th Street, EPC - 4th Floor, New York, NY 10016. E-mail: william.barr@med.nyu.edu*

B.D. BELL & B.P. HERMANN. The Tip-of-the-Tongue Phenomenon (TOT) and Famous Person Naming in Temporal Lobe Epilepsy (TLE).

Objective: Individuals with TLE sometimes report the TOT state when attempting to name objects or people. The frequency and correlates of TOT in TLE patients vs. controls have not been investigated. E.g., it is not clear how much a name retrieval deficit versus subnormal semantic knowledge contributes to TOT.

Participants and Methods: 44 controls and 32 TLE Ss were assessed on a new 20-item famous person naming test and other measures. The two groups did not differ on IQ, education, age, gender ratio, or media exposure. The TLE group had worse memory and higher distress about word finding problems. The naming test presented photos of U.S. celebrities. TOT was defined for Ss prior to the test. For famous people who were recognized but not named within 20 sec, the S reported whether a TOT had occurred, based on subjective experience. Names not recognized correctly in a multiple-choice format were not counted as TOTs. Knowledge of the famous people was tested via free recall and recognition.

Results: Nonparametric statistics revealed that the TLE group demonstrated a trend ($p < .10$) to recognize fewer famous people and to name fewer of the people they recognized. The TLE group had a higher frequency of TOT (16% vs. 9%, $p < .05$) for the famous people they recognized. Correlations indicated that 1) for both groups, TOTs were associated with less person knowledge (on both spontaneous recall and recognition) than correct naming responses and 2) higher age was a correlate of TOT in controls, whereas poor cognitive test scores and polytherapy were linked with TOT in TLE.

Conclusions: The TLE group's poor recognition and naming of famous people is consistent with past studies. Additionally, 1) TLE is associated

with a mildly high frequency of TOT for famous people and 2) similar to the case for Alzheimer's disease (Delazer et al., 2003) TOT was related in part to limited semantic knowledge and not solely to a name retrieval deficit. TLE patients as a group have a mild deficit in semantic memory that contributes to TOT experiences.

Correspondence: *Brian D. Bell, Neurology/Neuropsychology, University of Wisconsin Medical School, H4/666, 600 Highland Ave, Madison, WI 53792. E-mail: bell@neurology.wisc.edu*

F. BROWN & M. WESTERVELD. The Role of Anxiety in Memory Performance of Temporal Epilepsy Patients.

Objective: Patients with left temporal lobe epilepsy (LTLE) experience greater difficulties with verbal memory, whereas right temporal lobe epilepsy (RTLE) patients typically perform better on verbal memory tests. Visual memory tests, however, have not been consistently associated with either temporal lobe. While often attributed to verbal encoding or redistribution of function due to chronic epilepsy, these inconsistent findings may also be related to non-cognitive variables such as anxiety. This study explores whether anxiety contributes to inconsistent memory test performance among TLE patients.

Participants and Methods: 244 temporal lobe epilepsy patients were recruited from several epilepsy centers across the United States. Equal numbers of RTLE and LTLE patients took part in the study. While administered a comprehensive battery, the current analysis was limited to self-report measures of anxiety (BAI), intellectual (WAIS-R), and memory (CVLT and RCFT) functioning. Results were analyzed with a MANOVA with side of epilepsy and level of anxiety as independent variables, and intellectual and memory functioning were dependent variables. Bonferroni corrected post-hoc tests were conducted to examine the relationship between test performance and side of epilepsy at each of the levels of anxiety.

Results: LTLE was associated with lower CVLT short and long delay for those with low anxiety, with no differences between groups (right or left) on IQ or visual memory scores. Patients with high anxiety did not differ on any memory tests according to affected side.

Conclusions: Results indicate anxiety is important to consider when interpreting verbal memory results, but indicate drawing-based visual memory tests are not effective in differentiating RTLE from LTLE patients, regardless of anxiety.

Correspondence: *Franklin Brown, Ph.D., Psychology, Eastern CT State University, 83 Windham Street, Willimantic, CT 06066. E-mail: brownf@easternct.edu*

T.A. KEARY, T.W. FRAZIER, R.M. BUSCH & C.S. KUBU. Utility of Neuropsychological Measures in Predicting Ultimate Side of Surgery in Patients with Medically Intractable Temporal Lobe Epilepsy.

Objective: Several studies have demonstrated the value of individual neuropsychological measures, such as BNT, VIQ, and memory discrepancy scores in determining seizure lateralization. However, few studies have examined the utility of multivariate methods to predict seizure lateralization in the individual patient. The present study used a multivariate approach to investigate the lateralizing value of several commonly used neuropsychological measures in patients with medically intractable temporal lobe epilepsy (TLE).

Participants and Methods: This retrospective study examined the presurgical neuropsychological data of 217 patient with TLE (Left = 101; Right = 116) who eventually underwent temporal lobectomies. The relationships between neuropsychological measures, grouped by hypothetical domain, and side of surgery were examined using point-biserial correlations. A series of hierarchical logistic regressions were computed to identify which neuropsychological domains contributed significant incremental variance to the prediction of seizure lateralization. Three potential moderators were also examined (age of seizure onset, duration of epilepsy, and FSIQ).

Results: The results support the incremental validity of neuropsychological measures, other than memory and IQ tests, in predicting seizure lateralization in patients with TLE. A multivariate approach using the Auditory and Delayed Memory indices from the WMS-III, WCST Categories, WRAT-III Reading, and BNT contributed significantly to the prediction of seizure lateralization. When all variables were examined simultaneously, none of the moderator terms were significant, suggesting that moderating effects may be less important when a multivariate approach is used.

Conclusions: This study suggests that a multivariate analysis using neuropsychological measures to predict seizure lateralization may contribute to surgical decision making in patients with TLE. Regression formulas are provided to enhance the clinical utility of these findings.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry and Psychology, Cleveland Clinic, 3672 W. 129th Street, Cleveland, OH 44111. E-mail: buschr@ccf.org*

D.A. CAHN-WEINER, C. HOFFMAN, A.M. TAYLOR, J.S. DAMON, G. WOO, H.E. KIRSCH & J.H. KRAMER. Sensitivity of Process Features of Verbal Memory Performance to Mesial Temporal Sclerosis in Temporal Lobe Epilepsy.

Objective: Studies examining memory performance in patients with temporal lobe epilepsy (TLE) have suggested that different aspects of verbal memory are mediated by separate neuroanatomic substrates. This study examined the sensitivity of several features of verbal memory performance to mesial temporal sclerosis (MTS) in patients with dominant hemisphere TLE.

Participants and Methods: Subjects were candidates for left temporal lobectomy who were classified as having MTS (n=21) or not (NMTS; n=6) according to a consensus of experienced epileptologists and neuroradiologists. The groups were matched on age and education, but the MTS group had longer seizure duration. Subjects were administered the California Verbal Learning Test – II (CVLT-II). All scores were corrected for age.

Results: The MTS group showed more rapid forgetting over the delay ($p < .05$) and less use of semantic clustering ($p < .05$) than the NMTS group. Additionally, the MTS group showed less susceptibility to proactive interference ($p < .01$). There were no group differences on number of intrusions, repetitions, or false positives.

Conclusions: These results indicate that the CVLT-II is sensitive to the retention deficits predicted in patients with MTS, as well as deficits in semantic clustering. Other features of memory failure, such as error types, are less anatomically specific, and may be affected by the integrity of the whole temporal lobe or of other brain regions involved in memory (e.g., dorsolateral frontal regions).

Correspondence: *Deborah A. Cahn-Weiner, Ph.D., Neurology, UCSF, 400 Parnassus Avenue, San Francisco, CA 94143-0135. E-mail: Deborah.Cahn-Weiner@ucsf.edu*

A.M. CHEUNG, J.C. BRUMBERG, K.R. PERRINE, A. ETTINGER & W.B. BARR. Mechanisms of Action of Antiepileptic Drugs and Fine Motor Dexterity in Generalized and Localization-related/Focal Epilepsies.

Objective: Antiepileptic drugs (AEDs) are increasingly prescribed to manage seizures in patients with epilepsy or other neurologic and/or psychiatric disorders. Despite their efficacy in up to 70% of the patients, studies have indicated their worsening of memory, attention, and other abilities such as fine motor dexterity. Questions remained as to what aspects of AED treatment influenced fine motor difficulty. This retrospective study examined the extent to which AEDs' mechanisms of action, duration of treatment, and the type of therapy (e.g., monotherapy vs. polytherapy) contributed to fine motor difficulty in adult patients with epilepsy.

Participants and Methods: A review of medical and neuropsychological records was performed at the NYU Comprehensive Epilepsy Center. A total of 164 patients aged 18 – 50 years met the inclusion criteria, and their relevant medical and neuropsychological data were entered into statistical analysis.

Results: Consistent with previous findings, the results supported monotherapy over polytherapy in minimizing fine motor difficulty. Results also indicated the advantage of monotherapy with sodium (Na⁺)-channel blockers over polytherapy with a Na⁺-channel blocker and a GABAergic enhancer. This combination was also associated with seizure variables such as longer years of seizures and younger ages of seizure onset, suggesting that factors related to the seizure disorder may contribute to the risk of fine motor difficulty. Demographic variables such as gender, years of education, and FSIQ influenced a patient's susceptibility for fine motor difficulty, and indicated the relevance of cognitive reserve. Specifically, higher education and intellectual functioning were associated with better outcome.

Conclusions: These findings suggest the importance of considering mechanisms of action and the type of therapy when devising an AED regimen for patients with epilepsy or other neurologic and/or psychiatric disorders. These considerations would minimize behavioral effects such as fine motor difficulty.

Correspondence: *Angela M. Cheung, Ph.D., Brain Imaging Laboratory, Dartmouth Hitchcock Medical Center, 21 SPENCER ST. APT 103, Lebanon, NH 03766. E-mail: skydiving99@gmail.com*

E. COADY, E. STROUP, N. CHAYTOR, M. HOLMES & D. DRANE. Personality Profiles in a Sample of Patients with Comorbid Diagnosis of Both Epileptic and Psychogenic Nonepileptic Seizures.

Objective: Patients with co-morbid (CO) epileptic (ES) and psychogenic nonepileptic (PNES) events are well documented in the literature, although few studies have used strict criteria for diagnosis of CO. We examined personality inventory results in a sample with video-EEG evidence of both epileptic and nonepileptic events.

Participants and Methods: Twenty-nine patients with CO were identified through long-term monitoring (LTM) at the UW Regional Epilepsy Center from 1999 to 2006. All patients had both ES (definite ictal EEG abnormalities) and PNES (episodes of unresponsiveness or abnormal motor activity in the absence of an electrographic seizure) events documented over the course of one or more LTMs. All participants completed the Minnesota Multiphasic Personality Inventory (MMPI).

Results: Fifty-five percent of CO MMPI profiles met PNES criteria according to Wilkus, Dodrill, & Thompson (1984) decision rules. Prior studies have reported the PNES profile present in 18-35% of ES only samples and 53-71% of PNES only samples, with averages of about 25% and 65%, respectively.

Conclusions: Percentage of strictly defined CO patients obtaining PNES profiles on the MMPI were more similar to previously reported rates in PNES only samples, although this percentage tended to fall at the lower end of the reported range of results. This suggests that the MMPI is likely of limited utility in differentiating CO from PNES and ES patients. Future research should strive to identify additional factors that will improve diagnostic accuracy among these groups, and to determine the relationship between these conditions when they coexist.

Correspondence: *Erica Coady, M.A., Seattle Pacific University, 2403 41st Ave E #306, Seattle, WA 98112. E-mail: coadye@spu.edu*

K.A. DAWSON, L.S. REESE, M.R. SCHOENBERG, M. WERZ & R.J. MACIUNIAS. Pre-surgical RAVLT and ROCFT Performance of Selected Right and Left Temporal Lobe Epilepsy Patients.

Objective: The Rey Auditory Verbal Learning Task (RAVLT) and the Rey Osterrieth Complex Figure Test (ROCFT) are commonly used neuropsychological assessments for verbal and visual memory. Some research suggests patients with left temporal lobe epilepsy (LTLE) have

decreased capacity for verbal memory while patients with right temporal lobe epilepsy (RTLE) have decreased capacity for visual memory, although some patients exhibit bilateral deficits. This study examined the difference in performance on two memory tasks of patients with LTLE and RTLE.

Participants and Methods: The study included review of temporal lobe epilepsy patients who completed a neuropsychological evaluation as a part of their standard treatment. Participants included 21 patients who were diagnosed with temporal lobe epilepsy (7 LTLE & 14 RTLE). All patients completed a comprehensive neuropsychological evaluation.

Results: The participants had a mean age of 40 years of age and 12.4 years of education. There were no significant differences between groups in regards to age, however years of education significantly differed and was used as a covariate for subsequent analyses. An ANCOVA revealed significant differences in the raw scores of trial 1 and in the recall of the words after a 30-minute delay. There was no significant difference in the recognition task. There were no significant differences between groups on the ROCFT on both copy of the design and recall of the design after a 30-minute delay.

Conclusions: In this sample of patients, those with left TLE performed significantly worse on a measure of verbal memory, however there were no differences between groups on the purported visual memory task. These data further support the verbal memory deficits observed with left TLE patients. Association with Intra-carotid sodium amobarbital test (Wada's) results in determination of surgical candidacy will be discussed. Correspondence: *Kyra A. Dawson, MA, Neurology, University Hospitals of Cleveland, 11100 Euclid Avenue, HH 5, Cleveland, OH 44106. E-mail: kyra.dawson@uhhs.com*

C. DOW, B. HERMANN & M. SEIDENBERG. Progressive Memory Decline in Temporal Lobe Epilepsy: A Longitudinal Investigation.

Objective: It is generally acknowledged that memory ability is the primary cognitive morbidity in temporal lobe epilepsy (TLE), however, the nature of memory impairment over the course of the disorder is not well understood. It is also important to determine whether changes in progressive memory functioning can be predicted by brain morphology and seizure factors. We used a longitudinal design to examine progressive changes in memory performance in TLE compared to controls over a four-year interval. The relationship of baseline MR hippocampal volumes and seizure characteristics (i.e. duration, onset) to progressive memory outcome was examined.

Participants and Methods: 53 subjects with temporal lobe epilepsy (TLE subjects who underwent surgery during the interval were not included in this sample) and 70 healthy controls were examined. All subjects underwent baseline and follow-up memory assessment over a four-year test-retest interval using the WMS III. Regression based change scores were utilized to assess the degree of change in memory performance over the test-retest interval. Baseline quantitative MRI scans were also conducted.

Results: As expected, the TLE group showed more decline in episodic memory performance over the 4-year interval than controls. Further, delayed episodic recall declined to a greater extent than immediate recall performance. Deterioration of episodic memory was related to longer duration of seizures, and smaller baseline MR hippocampal volume.

Conclusions: This is the first longitudinal investigation of the course of memory in TLE to integrate volume findings and memory functioning. Memory functioning, particularly delayed memory, significantly declined and both baseline hippocampal volume and seizure duration predicted memory decline. These findings are discussed within the concept of cerebral reserve.

Correspondence: *Christian Dow, Psychology, Rosalind Franklin University of Medicine and Science, 10700 Academy Rd. NE #2332, Albuquerque, NM 87111. E-mail: christiandow@hotmail.com*

P.S. FOSTER, D.W. LORING, K. MEADOR, V. DRAGO, C.P. CRUCIAN & K.M. HEILMAN. Errors on the Trail Making Test in left and right temporal lobe epilepsy.

Objective: Patients with temporal lobe epilepsy TLE have been found to possess slowed performance on the Trail Making Test (TMT). Sex differences among TLE patients have also been reported. However, to date, research has not examined whether there are a greater number of errors on the TMT with TLE and if there are hemispheric asymmetries in the number of errors between patients with left TLE (LTLE) and right TLE (RTLE). Given that the left frontal lobe is dominant for sequencing and working memory and since there are extensive connections between the frontal and the anterior temporal lobes, we hypothesized that patients with LTLE would exhibit a greater number of errors on the TMT than those with RTLE.

Participants and Methods: The TMT was administered as part of a larger neuropsychological battery to patients with LTLE (n = 22) and RTLE (n = 32). The sample included 23 women and 31 men.

Results: The results indicated a significant main effect for Group, but no main effect for Sex or a Group by Sex interaction. Subsequent analyses indicated that LTLE patients exhibited significantly more errors (M = .75) on Part B of the TMT than the RTLE patients (RTLE M = .36). No differences were found in the number of errors on Part A nor in the completion times for either Part A or Part B of the TMT.

Conclusions: These results suggest that LTLE might induce dysfunction within the neural networks important for working memory and sequencing. Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 8001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

E.K. GEARY, J. PARRISH, D. PULSIPHER, J. MORTON, L. GUIDOTTI, J. JONES, B. BELL, M. SEIDENBERG & B. HERMANN. Quantitative MRI Volumetrics of the Basal Ganglia and Negative Symptoms in Temporal Lobe Epilepsy.

Objective: Negative symptoms refer to a constellation of behaviors frequently observed in schizophrenia, including affective flattening, avolition, apathy, and anhedonia. Negative symptoms are observed in other neurological populations, including temporal lobe epilepsy (TLE). The neural system underlying negative symptoms has not been completely identified, but some research suggests involvement of the basal ganglia. The present study compares quantitative MRI volumes of the caudate nucleus, putamen, and globus pallidus in three groups: (1) TLE subjects with negative symptoms (Neg), (2) TLE group without negative symptoms (NoNeg), (3) and healthy controls (C).

Participants and Methods: 29 Neg TLE subjects and 29 NoNeg TLE subjects were matched on age, and gender with 29 healthy controls. TLE groups were also matched on age of epilepsy onset. All participants were assessed using the Scale for the Assessment of Negative Symptoms. Automated neural networks for the caudate, putamen, and globus pallidus were manually edited based on guidelines provided by the University of Iowa Brain Imaging Center. Raw volumes were converted to z-scores using height as a covariate.

Results: Planned comparisons of both raw unadjusted volumes and z-scores indicated that the NEG group had significantly smaller volumes for both the left and right putamen and globus pallidus compared to both the NoNeg and C groups (all p's < .05).

Conclusions: These findings suggest a relationship of basal ganglia structures and negative symptoms in TLE. We suggest that these subcortical structures play an important role in the expression of a system-wide disruption in neural integrity that is associated with negative symptoms.

Correspondence: *Elizabeth K. Geary, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 4455 N. Springfield Rd, Chicago, IL 60625. E-mail: kookerb@mindspring.com*

R.J. HEINRICHS MATSON, L.E. BAADE, D.K. SOETAERT, K. LIOW & R. CRIPPEN. Differential Detection of Non-Epileptic Seizures with the MMPI-2.

Objective: Neuropsychologists are asked to assist in differential detection of non-epileptic (NES) and epileptic seizure patients (ES). The Wilkus MMPI Decision Rules were developed for this purpose and have been modified for the MMPI-2. The FBS (Fake Bad Scale) may also contribute but has not been tested for its ability to identify individuals with NES. Employing video-EEG to establish diagnosis, this study examines the utility of the Wilkus Rules and the FBS in making the differential.

Participants and Methods: This study includes 74 inpatient video-EEG participants; 22 with ES, 47 with NES and 5 with both. Means were calculated for the MMPI-2 Clinical Scales (except Scales 5 and 0) and an ANOVA was performed to evaluate the relationships. Rates of specificity and sensitivity were also calculated for the Wilkus Rules and the FBS.

Results: ANOVA resulted in significant differences between groups on Scale 3, $F(2, 71) = 6.54$, $p = .01$, and Scale 4, $F(2, 71) = 4.16$, $p = .02$. The Wilkus Rules were found to have a sensitivity of 68% and a specificity of 41%. Using a raw score cutoff of 27 for the FBS the sensitivity in detection of NES was 17% and specificity 95.5%.

Conclusions: Differential detection of ES and NES patients by the Wilkus Decision rule and the FBS is not supported. Additional research might examine the role of Scale 4.

Correspondence: *Robin J. Heinrichs Matson, M.A., Psychiatry and Behavioral Sciences, University of Kansas School of Medicine-Wichita, 1010 N. Kansas, Wichita, KS 67214. E-mail: rmatson@kumc.edu*

M.C. IAMPIETRO, R.M. BUSCH, T.W. FRAZIER, J.M. SMERZ & C.S. KUBU. Cross-Validation of a Regression Equation to Predict Side of Surgery in Adult Patients with Medically Intractable Temporal Lobe Epilepsy.

Objective: Busch et al. (2005) developed a regression equation using preoperative Boston Naming Test (BNT) scores, as well as several pertinent moderating variables, to predict ultimate side of surgery in a sample of patients with medically intractable temporal lobe epilepsy (TLE). This equation correctly predicted side of surgery in 69.5% of their sample, with 73.8% of right TLE patients correctly predicted and 65.1% of left TLE patients correctly predicted. The goal of the current study was to cross-validate this regression equation in an independent sample of patients with TLE.

Participants and Methods: The current retrospective study included data from 40 adult epilepsy patients who eventually underwent anterior temporal resections (left=22; right=18) for treatment of intractable epilepsy. Patients were right-handed ($n=36$) or confirmed left hemisphere dominant for speech by fMRI or Wada testing ($n=4$). Preoperative BNT scores, age of seizure onset, duration of epilepsy, and WAIS-III Full Scale IQs were entered into the regression equation reported by Busch et al. to predict side of surgery in this independent sample.

Results: Using the Busch et al. regression equation, ultimate side of surgery was correctly predicted for 70% of patients in this sample. Of the 18 patients who underwent right-sided surgery, 17 (94%) were correctly predicted using this equation, and, of the 22 patients who underwent left-sided surgery, 11 (50%) were correctly predicted.

Conclusions: The results of this study provide adequate cross-validation of the Busch et al. regression equation in an independent sample of patients with TLE. Ultimate side of surgery was best predicted in patients with right TLE, consistent with the findings of Busch et al.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry and Psychology, Cleveland Clinic, 3672 W. 129th Street, Cleveland, OH 44111. E-mail: buschr@ccf.org*

M. KEISKI, D. FUERST, A. SHAH, J. SHAH & C. WATSON. Quantitative MRI Correlates of MMPI Scores in Temporal Lobe Epilepsy (TLE).

Objective: The objective of the current study was to elucidate potential neuroanatomical correlates of scores on the validity scales and the neurotic triad of the MMPI in TLE, using quantitative MRI.

Participants and Methods: The subjects included 72 surgical candidates with intractable epilepsy (35 with left foci, 37 with right foci). Correlation analyses were used to explore relationships between MMPI scores and hippocampal / amygdaloid volumes (corrected for total intracranial volume) and ratios (pathological side to non-pathological side).

Results: Elevations on F were negatively correlated with amygdaloid ratios, hippocampal ratios, and left hippocampal volumes, particularly in left TLE. Smaller amygdaloid ratios were associated with lower scores on K and higher scores on D in left TLE only. Scores on Hs and Hy were positively correlated with right amygdala volumes in left TLE, but positively correlated with hippocampal ratios in right TLE.

Conclusions: Given the correlations between objective neuroanatomical measurements and MMPI validity scales, as well as the observation that some patients with documented hippocampal and/or amygdaloid asymmetries produce MMPI profiles with high scores on F and low scores on K, caution is warranted in attributing physical complaints to strictly psychiatric causes and inferring the absence of neuropathology on the basis of MMPI profiles that suggest over-reporting or a cry for help. On the other hand, hippocampal and/or amygdaloid atrophy are not necessarily associated with clinically significant elevations on somatically loaded scales such as Hs and Hy. Amygdaloid atrophy may be associated with depressive symptoms in left TLE.

Correspondence: *Michelle Keiski, M.A., Neurology, Wayne State University, 4201 St. Antoine, 4J UHC - Detroit Medical Center, Detroit, MI 48201. E-mail: keiski@uwindor.ca*

E. LEE, J.E. JONES, C. DOW, M. SEIDENBERG, F. CHAN & B.P. HERMANN. Patterns of Emotional Distress and Negative Symptoms in TLE.

Objective: Recent cluster analysis of neuropsychological data of temporal lobe epilepsy (TLE) patients yielded a taxonomy of cognition characterized by: 1) minimal impairment, 2) primary memory impairment, and 3) generalized impairment with predominant memory, executive and speed decline. These groups also exhibited different patterns of MRI volumetric abnormalities and distinct prospective cognitive courses. The objective of this study is to determine if there are also differences in mood and behavioral status.

Participants and Methods: People with temporal lobe epilepsy ($n=83$) and healthy controls ($n=78$) completed the Beck Depression Inventory (BDI), the Symptom Checklist-90-R (SCL-90-R) and were rated using the Scale for the Assessment of Negative Symptoms (SANS). Cluster group differences were examined by multivariate analysis of variance (MANOVA) with post-hoc univariate and pairwise comparisons.

Results: Differences between the three clusters groups and controls were significant ($p < .0001$) across all scales (BDI, SCL-90-R, & SANS). Post-hoc tests demonstrated that the most cognitively impaired cluster group exhibited significantly higher scores ($ps < .05$) than the other two cluster groups and controls except on the BDI.

Conclusions: The previously described taxonomy of cognition in TLE includes not only different patterns of cognition, MRI abnormalities and cognitive course, but emotional-behavioral status as well.

Correspondence: *Eun-Jeong Lee, MA, University of Wisconsin-Madison, H4/676 600 Highland Ave., Madison, WI 53792. E-mail: eunjeonglee@wisc.edu*

L.M. LUTON & W.G. HAMILTON. No Laughing Matter: The Neuropsychological Profile of a Child Diagnosed with Hypothalamic Hamartoma and Accompanying Gelastic Seizures.

Objective: Inconsistency has characteristically been the most consistent finding in the few research studies that have focused on cognitive functioning in children with Hypothalamic Hamartomas (HH) and accompanying gelastic seizures. Additionally, research on the neuropsychological functioning of these children is significantly lacking and, when available, discrepant. As such, research on the neurocognitive abilities of children with HH and gelastic seizures is clearly warranted. The following case is presented as the first in a pilot study aimed at developing a more elucidative profile of neuropsychological functioning in these youth.

Participants and Methods: A 7-year-old male diagnosed with HH and accompanying gelastic seizures at age 2 years, 1 month (see included MRI scan) was evaluated on a video-EEG unit.

Results: Results from a flexible neuropsychological battery revealed a consistent discrepancy in verbal and nonverbal functioning, with significantly more robust verbal abilities. Specifically, intelligence testing evidenced low average verbal abilities compared to mildly impaired nonverbal skills. With regard to learning and memory, deficits in both immediate and delayed memory were apparent. Significant weaknesses were also evident on measures of fine motor dexterity and visuosperception, although fine motor speed and visuomotor precision were deemed intact. Finally, deficits in sustained attention and executive functioning were apparent; however, contrary to previous findings, behavioral disturbances were absent, as reported by the child's mother via self-report measures.

Conclusions: These findings are suggestive of the adverse impact of HH and gelastic seizures on neuropsychological functioning in children. To further clarify the neurocognitive effects of HH and gelastic seizures, future studies with additional children are warranted.

Correspondence: *Lindsay M. Luton, M.A., Children's Healthcare of Atlanta-Scottish Rite, 3650 Ashford-Dunwoody Road, #127, Atlanta, GA 30319. E-mail: lindsayluton@hotmail.com*

A. MACIAS, S. HILL, T. FOGEL, M. ROPACKI & L. UBER-ZAK. Neurocognitive Functioning of Women with Psychogenic Non-epileptic Seizures.

Objective: Research has found a general cognitive decline in patients with psychogenic non-epileptic seizures (PNES); however, a consensus regarding their neurocognitive functioning has not been established. The paucity of neurocognitive differences in PNES groups may in part be a sample artifact. Possible methodological confounds of other studies were ameliorated in this design by utilizing video-EEG confirmed diagnoses and excluding mixed etiologies.

Participants and Methods: This study compared the neuropsychological performance of patients with PNES (n1=29) to a normative sample and to a homogenous group of left temporal lobe epilepsy patients (LTLE) (n2=23). The total sample (N=52) was predominately Caucasian (57%) with a mean age of 37.46 years and 13.33 years of education. Patients were administered a comprehensive neuropsychological battery and mood measures.

Results: All assessed cognitive domains fell within the Average range for the PNES group in comparison to the normative sample with measures of attention in the Below Average range. In comparison to the LTLE group, those with PNES obtained significantly higher scores on tests of verbal and visual memory, attention, confrontational naming, and mental tracking. Differences in mood were not found; group means for both the PNES and ES sample reflected moderate elevations of depression and anxiety.

Conclusions: The neurocognitive performance of PNES patients fell within the Average range. Their neuropsychological functioning was significantly better than their ES counterparts, further supporting a psy-

chological versus neurological driven pathology in PNES. Mood differences were not found between the PNES and ES group; both groups reflected moderate elevations of depression and anxiety. Results highlight the limited utility of face valid psychological measures in distinguishing between PNES and ES.

Correspondence: *Adriana Macias, Ph.D., Neurology, Baylor College of Medicine, 6501 Fannin, Houston, TX 77030. E-mail: macias_adri@yahoo.com*

K.A. McNALLY, B.K. SCHEFFT & M.D. PRIVITERA. Discrimination of Frontal versus Temporal Lobe Epilepsy Patients Based on Neuropsychological Assessment and MMPI.

Objective: Few studies have addressed the utility of neuropsychological assessment in discriminating patients with frontal (FLE) versus temporal lobe epilepsy (TLE). We sought to determine the diagnostic utility of neuropsychological assessment and the MMPI in differentiating patients with FLE and TLE.

Participants and Methods: Fifty-six patients diagnosed by video/EEG as FLE and 108 patients as TLE (mesial temporal lobe epilepsy (mesTLE) N = 50; temporal neocortical N = 58) were studied. As part of a larger neuropsychological battery, participants were administered several tests thought to be sensitive to frontal lobe functioning (Wisconsin Card Sorting Test (WCST), Digit Span, Letter-Number Sequencing, Verbal Fluency, Figural Fluency, Stroop, Trail Making Test) as well as the MMPI-2.

Results: Logistic Regression analysis indicated that only the WCST was successful at discriminating the frontal and temporal lobe patients. Number of perseverative errors on the WCST significantly discriminated the two groups ($\chi^2=7.32, p=0.007$). However, when only patients with mesTLE were considered, the WCST was no longer useful at discriminating these patients from FLE ($\chi^2=2.5, p=0.11$). Analysis of the MMPI-2 indicated that scales 3 (Hysteria) and 0 (Social Introversion) significantly discriminated the temporal and frontal lobe patients ($\chi^2=10.31, p=0.006$).

Conclusions: The WCST is useful in discriminating between frontal and temporal neocortical patients; however, the performance of the mesTLE patients was indistinguishable from FLE patients. This suggests a role of the hippocampus in generating perseverative errors. The MMPI-2 results indicate that patients with FLE may be more hysterical and extroverted than individuals with TLE.

Correspondence: *Kelly A. McNally, B.S., Psychology, University of Cincinnati, 3256 Glendora Ave, Cincinnati, OH 45220. E-mail: mcnalka@email.uc.edu*

A. MEIDINGER, R. WATSON, J. JONES, C. DOW, R. SHETH, M. KOEHN, M. SEIDENBERG & B.P. HERMANN. An Investigation Of Sleep And Behavior In Children With New Onset Epilepsy.

Objective: Sleep complaints are common in children with epilepsy. Pilot data from our group suggested sleep problems predict behavior problems and executive dysfunction, and sleep problems were more common in children with new onset epilepsy versus controls. This study evaluates whether these relationships remain stable with our target sample size.

Participants and Methods: Participants included 136 children; 74 with epilepsy (39 localized, 34 primary generalized), 62 controls (age, gender matched first cousins), mean age 12.8 years (range 7.9-13.5). A parent completed the Achenbach Child Behavior Checklist (CBCL) and Behavior Rating Inventory of Executive Function (BRIEF).

Results: Sleep problems were associated with increased behavior problems (CBCL Total Problems) and executive dysfunction (BRIEF Global Executive Composite) across groups ($p \leq 0.05$). Children with epilepsy had more problems on 3 of 4 sleep items examined (sleep less, sleep more, problems sleeping; $p \leq 0.001$). Among children with epilepsy, sleep problems remained a significant predictor of behavior problems and ex-

executive dysfunction ($p \leq .004$). AED use, illness duration, and seizure type did not predict problems with behavior or executive functioning. Regression analyses suggested sleeping less was most strongly associated with executive dysfunction whereas sleeping either less or more contributed significantly to behavior problems ($p \leq .002$).

Conclusions: Consistent with preliminary data, children with sleep problems exhibit increased problems with behavior and executive function, and children with new onset epilepsy exhibit elevated rates of reported sleep disturbance after controlling for seizure-related variables. Data suggest sleep should be investigated when studying behavior and cognitive problems in children with epilepsy.

Correspondence: *Amy Meidinger, PhD, Neurology, University of Wisconsin Hospital and Clinics, 600 Highland Avenue, Madison, WI 53726. E-mail: al.meidinger@hosp.wisc.edu*

J.J. MORTON, M. SEIDENBERG, D. PULSIPHER, C. DOW & B. HERMANN. Right Hemisphere Structure and Function in Left Temporal Lobe Epilepsy.

Objective: We have previously reported that patients with right TLE show impairment on language-based measures, show brain volume abnormalities in the left (contralateral) hemisphere, and that the contralateral abnormalities are associated with the language deficits. We currently report on a sample of left TLE patients to determine if a parallel relationship exists. Specifically, (1) Do left TLE patients exhibit impairment on non-language based measures?, (2) Do left TLE patients exhibit right hemisphere (contralateral) brain volume abnormalities?, and (3) Are right (contralateral) hemisphere abnormalities associated with performance on non-verbal tests?

Participants and Methods: Twenty-one left TLE subjects, and 28 controls underwent quantitative MR imaging and neuropsychological testing. T-tests assessed whether left TLE subjects and controls performed differently on non-language based measures (nonverbal IQ, spatial orientation, face discrimination, visuosperceptual abilities, memory for abstract designs). MANCOVA assessed whether there were significant contralateral brain volume differences between left TLE subjects and controls. Correlations assessed the relationship between cognitive performance and brain volume.

Results: Left TLE subjects performed significantly worse than controls on four out of five non-verbal measures. Left TLE subjects also showed significantly decreased brain volume compared to controls in right temporal and parietal white matter, and in the right thalamus. Significant correlations were observed between non-verbal task performance and right thalamus volume.

Conclusions: These results parallel previous findings implicating the importance of considering the contribution of contralateral brain volume abnormalities to the cognitive performance of lateralized TLE patients.

Correspondence: *Jared J. Morton, M.S., Department of Psychology, Rosalind Franklin University of Medicine and Science, 5511 39th Avenue, Kenosha, WI 53144. E-mail: jared.morton@rfums.org*

D. PULSIPHER, M. SEIDENBERG, J. MORTON, E. GEARY, J.B. PARRISH, C. DOW, L. GUIDOTTI & B. HERMANN. Subcortical Volumetry and Effect Sizes in Lateralized Temporal Lobe Epilepsy.

Objective: Ipsilateral hippocampus volume abnormality is the MR signature of unilateral temporal lobe epilepsy (TLE), but several investigators have also shown volume abnormalities in subcortical structures. Few studies have examined multiple subcortical volumes, making it difficult to determine the overall pattern and degree of loss between struc-

tures. We compared quantitative MRI findings and effects size differences between TLE patients and controls for the hippocampus, thalamus, caudate, putamen, and corpus callosum, both ipsilateral and contralateral to seizure onset. The relationship with clinical seizure variables and volumes in these regions was also examined.

Participants and Methods: 77 subjects (29 controls, 26 right TLE, 22 left TLE) underwent quantitative MRI. TLE patients had a mean age of 36 years and mean epilepsy duration of 23 years. All structures were manually traced. No volume differences were found between the left and right TLE groups, and they were combined for subsequent analyses.

Results: One-way MANCOVA (ICV as covariate) showed a significant overall group effect, $F(9, 66) = 4.09, p < .001$. One-way ANCOVAs indicated significant differences between epilepsy and control groups for the corpus callosum, ipsilateral thalamus, contralateral thalamus, and ipsilateral hippocampus (all p 's $< .001$). Large effect sizes (Cohen's $d > .70$) were evident for the ipsilateral hippocampus, corpus callosum, ipsilateral thalamus and contralateral thalamus, small to moderate effect sizes for the ipsilateral and contralateral putamen (.35-.50), and small effect size for the caudate ($< .30$). Duration of epilepsy was the strongest predictor of MR volume integrity for all structures.

Conclusions: These findings suggest a pattern of subcortical volume loss that may have implications for the development of refractory TLE.

Correspondence: *Dalin T. Pulsipher, B.S., Psychology, Rosalind Franklin University of Medicine & Science, 3333 Green Bay Road, North Chicago, IL 60064. E-mail: dalin.pulsipher@rfums.org*

M. RAMIREZ, B.K. SCHEFFT, S.R. HOWE, M. PRIVITERA & H. YEH. The Diagnostic Utility of Interictal and Postictal Language Disturbances in Lateralizing Language Dominant Temporal Lobe Epilepsy.

Objective: Past research suggests language disturbances occurring immediately after or between seizures accurately predicts language dominant (DOM) lateralization of seizure focus in individuals with temporal lobe epilepsy (TLE). However, diagnostic utility of these methods has not yet been firmly established. The diagnostic accuracy of three language disturbances was investigated: postictal language delay (PILD), time taken to correctly read a test phrase aloud immediately following seizure, and the production of postictal (PPPE) and interictal (IPPE) phonemic paraphasias.

Participants and Methods: Sixty surgically confirmed TLE patients were included. Patients' video/monitoring reports and records were reviewed for indication and number of PPPE and IPPE, and PILD times.

Results: As predicted, DOM TLE patients had a longer PILD and committed more IPPE and PPPE. PILD sensitivity and specificity were 84% and 86%; PPPE were 94% and 64%; and IPPE were 97% and 86%, respectively. Although no single predictor was significantly better, according to area under the ROC curve (AUC) a combination model of all three techniques (AUC=0.991) outperformed each separate predictor model (PILD AUC=0.902, PPPE AUC=0.79, IPPE AUC=.913).

Conclusions: Each separate method of prediction was highly accurate in classification accuracy and their use in clinical decision-making appears warranted.

Correspondence: *Maya Ramirez, MA, Psychology, University of Cincinnati, 1781 William Howard Taft Rd. #2, Cincinnati, OH 45206. E-mail: maya.ramirez@gmail.com*

B.C. SACHS, J.D. NICOSIA, J.F. BOBER, M. LOPEZ, S. EISENSCHENK & R.M. BAUER. Executive Dysfunction and Depressed Mood in Unilateral Temporal Lobe Epilepsy.

Objective: Executive dysfunction in intractable temporal lobe epilepsy (TLE) may be attributable to extratemporal effects of a localized seizure disorder. Similar mechanisms may account for elevated rates of depression in this population. We sought to establish a pattern of executive dysfunction on a wide range of tests in TLE, and to examine the relationship between executive function and self-reported depression.

Participants and Methods: We evaluated (a) whether various aspects of executive function, measured by the WCST, COWA, Trails B, and Go-No-Go (GNG) tasks, was related to self-reported depression (MMPI-2) in intractable epileptics, and (b) whether the relationship between different aspects of executive function and depression varied by seizure laterality. Patients were pre-surgical candidates for ATL (56 left, 61 right). Groups were matched for age, education, and seizure duration.

Results: Depressed patients performed slightly worse on tests of executive function than non-depressed patients, and displayed significantly more errors on WCST and GNG-B. Depressed left TLE patients exhibited significantly more errors on GNG-B, and worse performance on Trails B and COWA, compared to right TLE patients with similar depressive symptoms, who had more perseverative responses and errors on the WCST. Relationships between depression scores and neuropsychological performance on non-executive measures were generally non-significant.

Conclusions: Increased rates of depression and executive dysfunction tend to co-occur in patients with TLE. The type of dysfunction depended on the laterality of seizure focus, as left and right TLE patients showed impairments on separate aspects of executive function. Putative neurobiological mechanisms underlying the relationship between depression, seizure laterality, and executive dysfunction are discussed.

Correspondence: *Bonnie C. Sachs, M.S., Clinical & Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610-0165. E-mail: bsachs@phhp.ufl.edu*

S. SCHAFFER, W. BARR, J. BRAND, K. ALPER & O. DEVINSKY. Use of the MMPI-2 Restructured Clinical Scales in Patients with Epileptic and Nonepileptic Seizures.

Objective: The developers of the MMPI-2 recently introduced Restructured Clinical Scales (RC) that are believed to represent "core" components of the original clinical scales, free from confounding factors. The current study examined whether these new scales were better able to differentiate between patients with epileptic seizures (ES) and nonepileptic seizures (NES) than the original scales.

Participants and Methods: Participants included 59 ES patients and 46 NES patients with valid MMPI-2 profiles. Mean T scores and code-type were compared. Frequency data were obtained to establish the rate of each 2-point code-type in each group.

Results: Comparisons of T score means of each RC scale indicated that only Scale 1 (Somatization) was significantly different between the groups (with higher elevations in NES; $p=.000$). While NES patients showed a significantly higher rate of the 1-3/3-1 code-type when using the original scales ($p<.001$), this was not the case when the RC scales were used ($p=.127$). Instead, NES patients produced a higher rate of the 1-8/8-1 code-type with the RC scales ($p<.01$). The groups had an equally high rate of the 1-2/2-1 code-type when the RC scales were used.

Conclusions: When MMPI-2 profiles of ES and NES patients were examined using the new RC scales, a different pattern of findings emerged. NES patients produced a higher rate of the 1-8/8-1 code-type, which suggests that these patients report a higher level of bizarre sensory experiences than ES patients. Further examination of these scales is required to ascertain its clinical utility/validity in differentiating ES versus NES patients.

Correspondence: *Sarah Schaffer, Ph.D., Comprehensive Epilepsy Center, NYU Medical Center, 403 East 34th Street, 4th Floor, New York, NY 10016. E-mail: sarah.schaffer@med.nyu.edu*

L.S. REESE, K.A. DAWSON, M.R. SCHOENBERG, M. WERZ & R.J. MACIUNAS. Pre-surgical Verbal Fluency Performance of selected right and left temporal lobe epilepsy patients.

Objective: Objective. Epilepsy is a relatively frequent neurological disorder with a prevalence of approximately one-percent. Temporal lobe

epilepsy (TLE) is a common epilepsy syndrome having negative neuropsychological effects. Decline in language has been reported in patients with medically refractory epilepsy. This study evaluated the extent to which verbal fluency measures distinguished between left and right pre-surgical patients.

Participants and Methods: Method. The study included review of temporal lobe epilepsy patients completing a neuropsychological evaluation. Participants: Thirty patients were identified that met study inclusion and exclusion criteria. There were 12 left TLE and 18 right TLE patients. Variables/Measure(s). All participants completed comprehensive neuropsychological evaluations, including the Controlled Oral Word Associations Test (COWAT).

Results: Results. Neuropsychological data are presented. The mean age of the left TLE sample was 46 (SD= 9.98) and had 12.6 years of education. The mean age of the right TLE sample was 40 (SD= 12.4) and had 14.8 years of education. Age and education were both used as covariates in subsequent analyses. ANCOVA revealed significant differences in pre-surgical verbal fluency performance, raw and t-scores, between left and right TLE patients. Left TLE patients scored significantly lower on the COWAT than right TLE patients.

Conclusions: Conclusion. In this sample of patients diagnosed with either left temporal lobe epilepsy (LTLE) or right temporal lobe epilepsy (RTLE), LTLE patients performed significantly worse than RTLE patients. Association with Intra-carotid sodium amobarbital test (Wada's) results in determination of surgical candidacy will be discussed.

Correspondence: *Lynn S. Reese, MA, University Hospitals of Cleveland, 11100 Euclid Ave., Cleveland, OH 44106. E-mail: lynn.reese@att.net*

J.M. SMERZ, R.M. BUSCH, M. DOUGHERTY, C.Q. TILELLI, T. LINEWEAVER, R.I. NAUGLE, R. DIAZ-ARRASTIA & I.M. NAJM. ApoE $\epsilon 4$ is Associated with an Increased Incidence of Postictal Confusion in Patients with Medically Intractable Temporal Lobe Epilepsy.

Objective: Postictal confusion is characterized by impaired awareness and often occurs after complex partial or generalized motor seizures. The causes of postictal confusion are poorly understood. The apolipoprotein E (ApoE) $\epsilon 4$ allele has been associated with poor recovery from various neurological insults. One recent brief report suggested that $\epsilon 4$ may also be related to increased duration of delirium. The purpose of this study is to determine if the ApoE $\epsilon 4$ allele is related to greater incidence of postictal confusion in patients with intractable temporal lobe epilepsy (TLE).

Participants and Methods: Participants included 85 adults who underwent anterior temporal lobectomy for the treatment of intractable epilepsy (right=42;left=43). Postictal confusion, coded by 2 independent raters (JM and MD) based on review of medical history and video-EEG monitoring (interrater reliability for subsample $\alpha=0.86$), revealed that 42 patients (49%) had a history of postictal confusion. ApoE status was evaluated using brain tissue extracted at time of surgery. Patients were grouped by presence ($n=22$) or absence ($n=63$) of an $\epsilon 4$ allele. Groups did not differ on demographic or seizure variables.

Results: Patients with an $\epsilon 4$ allele were more likely to exhibit postictal confusion than those without $\epsilon 4$ ($\chi^2=4.18, p=.04$). Of those with an $\epsilon 4$ allele, 68% ($n=15$) reported postictal confusion versus only 43% ($n=27$) of patients without $\epsilon 4$. The odds ratio for predicting confusion based on the presence of $\epsilon 4$ was 2.86 (CI=1.02-7.94), suggesting that $\epsilon 4$ -carriers are almost 3x as likely to demonstrate postictal confusion than patients without an $\epsilon 4$ allele.

Conclusions: Results of this preliminary study demonstrate that ApoE $\epsilon 4$ increases the risk of postictal confusion in patients with medically intractable TLE and suggest a dysfunction in neuronal recovery mechanisms. This finding extends the literature supporting the effect of ApoE on neuronal repair to include the impact on recovery after seizures.

Correspondence: *Jessica M. Smerz, Ph.D., Psychiatry, Cleveland Clinic, 9500 Euclid Ave P57, Cleveland, OH 44195. E-mail: smerzj@ccf.org*

E. STROUP, N. CHAYTOR, E. SHERMAN, J. TUCKER, N. HANTKE, M. HOLMES & D. DRANE. "Wrong-Way" Wada is Related to Dominant Hemisphere Epileptogenic Focus in Intractable Temporal Lobe Epilepsy.

Objective: Ideally, prior to anterior temporal lobectomy (ATL), the Wada test will indicate that the side of proposed resection has a limited role in memory functioning compared to the contralateral hemisphere. We explored the implications of "wrong-way" (i.e., unexpected asymmetry; UA) Wada findings, with respect to side of epileptogenic focus (EF) and memory outcome in patients undergoing ATL for intractable epilepsy. **Participants and Methods:** A sample of 44 consecutive ATL patients (57% Left) with pre/postoperative memory testing, bilateral Wada results, and left hemisphere speech dominance underwent the Wada procedure at the UW Regional Epilepsy Center from 2001 to 2006. With respect to post-drug recognition for objects presented during the Wada, results were considered UA if % correct ipsilateral injection - % correct contralateral injection was < 0. Significant verbal memory decline was defined as postoperative decline in Wechsler Memory Scale-III Logical Memory I or II, using Reliable Change Indices.

Results: Thirteen of 44 patients (30%) demonstrated UA Wada results. This finding was more common in those with a dominant EF (12/13; Chi Square=9.472; p=.002). There was a trend for increased risk of postoperative memory decline in those with UA Wada results (Chi Square=3.205; p=.076).

Conclusions: "Wrong way" (UA) Wada results were strongly associated with a dominant EF; there was also a trend for increased risk of postoperative verbal memory decline. While the latter was expected, the large number of UA Wadas in patients undergoing left ATL was unexpected. Possible underlying mechanisms include methodological limitations of Wada stimulus presentation and the likely prominence of verbal encoding in visual object presentation.

Correspondence: *Elizabeth Stroup, Box 359745, UW Regional Epilepsy Center, 325 9th Ave, Seattle, WA 98104. E-mail: stroup@u.washington.edu*

S. TESTA, J. WARD, N.E. CRONE & J. BRANDT. Hemisphere Specificity of Memory Stimuli During the Wada Procedure.

Objective: We sought to determine the effects of seizure focus laterality and injection side on memory for various stimuli during the Wada procedure.

Participants and Methods: Following amobarbital injection, 6 real objects, 6 printed words, 4 line-drawn objects, and 4 faces were presented to 35 left- and 30 right- TLE patients (all left hemisphere language dominant). Upon amobarbital clearing, yes/no recognition was evaluated. A 2 (seizure focus group) x 2 (injection side) x 4 (material type) repeated-measures ANOVA was performed.

Results: There were main effects of material type (worst for real objects, best for line-drawn objects) and injection side (worse for left injection). Overall memory was equivalent in the two groups, but it was worse after injection contralateral to the seizure focus (group x injection side interaction). A material x injection side interaction revealed memory was worse after left injection for words and objects (real or line-drawn), and worse after right injection for faces. Importantly, the 3-way interaction was significant. Memory for real objects was worst after injection to the hemisphere contralateral to the seizure focus. This was also the case for line-drawn objects in RTLE, but not LTLE in which memory was intact after both injections. Memory for words was best after right injection for RTLE, and impaired across injections for LTLE. Conversely, memory for faces was best after left injection for LTLE, but impaired after both injections for RTLE.

Conclusions: In the Wada procedure, memory for words depends on left hemisphere functions, whereas memory for faces appears most dependent on right hemisphere processing.

Correspondence: *S. Marc Testa, Ph.D., Johns Hopkins University, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287. E-mail: smt@jhmi.edu*

C.J. YUCUS & D. TRANEL. Why Proper Naming is Sometimes Spared Following Left Anterior Temporal Lobectomy.

Objective: Anterior temporal lobectomy (ATL) is an effective surgical option for managing medically intractable epilepsy. Left ATL patients often develop post-surgical difficulties with proper naming, but there are striking exceptions to this pattern. We used a large sample of patients and an extensive set of stimuli to test the hypothesis that early age of seizure onset would be a reliable and potent factor "protecting" patients from developing proper naming defects following left ATL.

Participants and Methods: Proper naming of unique persons (Famous Faces Test, 155 items) and places (Landmark Test, 65 items) was measured in 24 patients who had undergone left ATL for medically intractable epilepsy. Data were collected in regard to age of seizure onset, age of the patient at the time of surgery, handedness, education, IQ, WADA testing, and seizure outcome after surgery.

Results: The patients were sorted into two groups based on proper naming performance: (1) Unimpaired: 7 patients scored normally (greater than or equal to 80% correct) on both the Faces and Landmark tests; (2) Impaired: 17 patients scored abnormally on one or both of the Faces and Landmark tests. In support of our hypothesis, statistical analysis revealed a significantly earlier age of seizure onset in the Unimpaired group (M = 4.7 years, SD = 4.7) compared to the Impaired group (M = 15.1 years, SD = 11.8) (p = 0.0035 in a t-test). A regression analysis identified age of seizure onset as the most substantial predictor of naming outcome (r squared = 0.25, p = 0.015). The groups did not differ on any other variables.

Conclusions: These findings document the importance of age of seizure onset in predicting outcome following ATL, and extend our understanding of brain reorganization and plasticity.

Correspondence: *Daniel Tranel, PhD, Neurology, University of Iowa, 2155 RCP, University of Iowa Hospitals, Iowa City, IA 52242. E-mail: daniel-tranel@uiowa.edu*

A.N. VAN WINKLE, T.G. BURNS & F. HILL. A Comparison of Performances and Outcomes on the California Verbal Learning Test-Children's Version in Children Diagnosed with Epilepsy and Attention Deficit/Hyperactivity Disorder.

Objective: Children with epilepsy are often at a higher risk for difficulties with attention and memory, regardless of the specific type of seizure diagnosis. While there have been numerous studies investigating verbal memory functioning in children diagnosed with epilepsy, as well as Attention Deficit/Hyperactivity Disorder (AD/HD), few have researched these disabling conditions together.

Participants and Methods: The current study investigated verbal memory functioning in children with epilepsy and AD/HD using the California Verbal Learning Test-Children's Version (CVLT-C). One hundred thirteen children (Epilepsy = 53; AD/HD = 20; Epilepsy/ADHD = 40) were matched on variables of age and gender with 113 controls from the standardized sample from the CVLT-C (N=226).

Results: An analysis of variance indicated that while there was no significant differences between the three clinical groups on short delay of the list learning task, there was a significant difference for all three groups when compared to controls (p<.02). Further, children with epilepsy and co-morbid AD/HD performed significantly worse than children with epilepsy only and AD/HD only (p<.05) on long delay free recall. All three groups performed significantly worse than controls (p<.02).

Conclusions: These results lends credence to the notion that children with epilepsy and co-morbid AD/HD are at risk for difficulties in verbal learning more so than those children with epilepsy and AD/HD

alone. While all three clinical groups demonstrated impairments in short-term memory when compared to controls, those children with dual diagnoses struggled significantly more for encoding verbal information into long-term storage compared to the other two clinical groups.

Correspondence: *Ashley N. Van Winkle, Master of Arts, Neuropsychology; Children's Healthcare of Atlanta, 1001 Johnson Ferry Rd NE, Atlanta, GA 30319. E-mail: ashley.vanwinkle@gmail.com*

F. WINSTANLEY, S.J. SWANSON, D.S. SABSEVITZ, T.A. HAMMEKE, E.T. POSSING, M. RAGHAVAN, W. MUELLER, R. MUSH-TAQ, K. CAPIZZI & J.R. BINDER. Naming Outcome and fMRI Activation Maps in Left and Right Anterior Temporal Lobectomy (ATL) Patients with Bilateral Language Representation on Wada Testing.

Objective: Few studies have examined language decline in R-ATL patients with bilateral language since right hemisphere language is rare in patients with right hemisphere seizures. We examined 1) naming outcome following ATL, 2) distribution of Wada naming scores across the hemispheres, and 3) the fMRI language maps in a group of patients with bilateral language who underwent either right or left ATL.

Participants and Methods: Subjects included 19 ATL (9 right; 10 left) patients with bilateral language as determined by Wada language testing. Patients who underwent R-ATL and had a preoperative Wada laterality index score that ranged from +40 to -40 were selected for the study. A group of L-ATL patients were selected that matched the R-ATL on the Wada LI. Sixteen of these patients underwent preoperative fMRI language mapping using a semantic decision task that produces activation lateralized to the language-dominant hemisphere.

Results: L-ATL patients with bilateral language showed a trend toward greater postoperative naming decline ($M = -3.00$) than R-ATL patients with BL ($M = 2.33$) ($p = .051$). The R-ATL group had better naming performance in the left relative to the right hemisphere on Wada testing, whereas naming abilities were more equally distributed in the L-ATL group. Likewise, the fMRI activation maps showed that the R-ATL group had more left lateralized language ($LI = 37.6$) relative to the L-ATL group ($LI = 19.6$) and this was more pronounced in the temporal lobe region of interest (L-ATL $LI = 67.8$, R-ATL $LI = 10.7$).

Conclusions: The distribution of naming scores on Wada across hemispheres, naming outcome data, and fMRI temporal lobe language activation patterns suggest that L-ATL patients with bilateral language have greater risk for naming decline than R-ATL patients with bilateral language.

Correspondence: *F. Scott Winstanley, Ph. D., Neurology; Medical College of Wisconsin, 9200 W. Wisconsin Ave, Milwaukee, WI 53211. E-mail: swinstan@mcw.edu*

HIV/AIDS

J.T. BECKER, S. JUENGST, N.J. LOBAUGH, P.M. THOMPSON, O.L. LOPEZ & H.J. AIZENSTEIN. Brain Structural Abnormalities in HIV/AIDS Analyzed by the Method of Partial Least Squares.

Objective: The purpose of this study was to examine the pattern of grey matter (GM) and white matter (WM) atrophy, and ventricular (CSF) expansion in HIV/AIDS. We used the method of Partial Least Squares (PLS) which is a robust method for extracting distributed tissue volume differences related to differences in tissue compartment.

Participants and Methods: High resolution anatomical MRI scans (SPGR) were obtained from 68 participants in the Allegheny County Neuropsychiatric Survey (50 HIV/AIDS, 18 Controls). After skull stripping, the brains were segmented into GM, WM and CSF, and the im-

ages were fully normalized to a template using nonlinear deformations. To obtain expansion and contraction measures, each voxel value was multiplied by the inverse of the Jacobian determinant. The images were smoothed (10x10x10 mm), and then analysed using the Task PLS method.

Results: The analysis identified two significant patterns of local regions of tissue expansion and contraction, one related primarily to GM, the other to WM and CSF. PLS also measures a "Brain score" which indicates how strongly each subject expresses the observed differences in regional tissue volumes. After controlling for age, CSF volume was related to viral load, GM to CD4+ cell counts, and WM to vascular risk. We further regressed the global cognitive impairment rating on these variables and found that the grey matter brain scores were significant predictors of impairment in the HIV-infected subjects.

Conclusions: PLS is an important and useful tool for the analysis of brain structural imaging data, although further analysis will be needed to fully understand all of the ramifications of these findings. Nevertheless, these results demonstrate that we can, indeed, find independent effects of HIV-related and medical-related factors on brain structure.

Correspondence: *James T. Becker, Ph.D., Western Psychiatric Institute and Clinic, University of Pittsburgh, Suite S30, 3501 Forbes Avenue, Pittsburgh, PA 15213. E-mail: beckerjt@upmc.edu*

J.B. CASTELO, R.J. MELROSE, R.A. SPERLING & C.E. STERN. Altered Hippocampal-Prefrontal Activation in HIV during Encoding of Novel Face-Name Associations.

Objective: Previous research has documented the effects of HIV on fronto-striatal circuits, and recent evidence extends the scope of HIV-related damage to hippocampal-prefrontal memory systems underlying single-item episodic encoding (Castelo et al., 2006). To further probe the relational encoding systems in HIV, we used fMRI to examine brain activation patterns during performance of a face-name (FN) associative memory task as a function of subsequent recognition (SR) memory, because hippocampal activation has been demonstrated to be modulated by the relational demands of a memory task.

Participants and Methods: Twenty-two non-demented HIV+ patients and 22 age- and education-matched healthy control participants completed 5 runs of the FN task while in the MR scanner and the SR task after scanning (3T scanner, 145 images/run, TR=2, TE=30, slices=28, voxel size=3x3x5mm³, analyzed with SPM2). All participants completed a neuropsychological battery of attention and memory tests as well.

Results: The number of face-name pairs recognized with high-confidence (HC) did not differ between the groups. The fMRI analysis contrasting HC hits versus misses revealed that the control group exhibited significant signal change in the bilateral hippocampus, fusiform gyrus, and inferior frontal regions known to be engaged during memory formation. Contrasted to the control group, the HIV group demonstrated reduced signal change in bilateral inferior prefrontal cortex, right hippocampus, and right parahippocampal gyrus.

Conclusions: These results provide evidence that HIV may detrimentally affect hippocampal and prefrontal areas important for associative memory formation. Our findings of hippocampal change in HIV may help advance understanding of the neural roots of HIV-related cognitive change.

Correspondence: *J. Mimi B. Castelo, M.A., Center for Memory & Brain, Boston University, 2 Cummington Street, Room 109, Boston, MA 02215. E-mail: mboer@bu.edu*

M. COLE, J.B. MARGOLICK, C. COX, X. LI, O.A. SELNES, E.R. MARTIN, J.T. BECKER, H.A. ARONOW & E.N. MILLER. Longitudinal Study of Cognitive Functioning in Long-term Asymptomatic HIV-infected Individuals.

Objective: Recent anecdotal evidence suggests that some long-term asymptomatic HIV-infected individuals are beginning to develop cog-

nitive decline despite suppression of plasma HIV concentrations to undetectable levels in standard tests. However, there are few longitudinal studies of this question. The Multicenter AIDS Cohort Study (MACS) has assessed the cognitive status of these asymptomatic individuals across time.

Participants and Methods: Data from the MACS were used to evaluate whether participants who met criteria for (a) HIV-positive long-term nonprogressors (NP) (AIDS-free >15 years and never received antiretroviral therapy; n=29) or (b) HIV-positive participants receiving highly active antiretroviral therapy (HAART) who have had long-term undetectable viral loads (HAART-UVL) (>5 years after HAART initiation; n=83) differed from HIV-negative controls (n=237) in their performance on the Symbol Digit Modalities test and the Trail Making Tests over a 5 year period (1996-2000). Data were analyzed using linear mixed models and proportional odds logistic regression modeling with GEE.

Results: There were no differences between the HIV-negative and the long-term asymptomatic HIV-positive groups (NP and HAART-UVL) in the cognitive performances measured, nor was there evidence of decline in the cognitive performances measured in the long-term asymptomatic groups over the 5 year period.

Conclusions: Contrary to recent anecdotal evidence, long-term asymptomatic HIV-positive individuals with well-controlled systemic viral loads did not show evidence of decline in psychomotor measures over 5 years of follow-up. These findings suggest that cognitive decline is primarily associated with generalized immune system changes rather than duration of infection. The lack of disparity between viral suppression and cognitive preservation should be further monitored to confirm that it continues.

Correspondence: *Michael A. Cole, Ph.D., UCLA, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, #CS-746, Los Angeles, CA 90095. E-mail: micole@mednet.ucla.edu*

L.A. CYSIQUE, H. JIN, D. FRANKLIN, C. SHI, X. YU, Z. WU, I. GRANT & R.K. HEATON. Neurobehavioral Effects of HIV-1 Infection in China versus the US: a pilot study.

Objective: The HIV epidemic in China is increasing exponentially, yet there have been no studies of the neurobehavioral effects of HIV infection in that country. Existing neuroAIDS research has been mainly conducted in Western countries with Western neuropsychological (NP) methods. It is unclear whether these testing methods can be adapted for use in China.

Participants and Methods: Twenty-eight HIV+ and 23 HIV- individuals matched in gender, age and education were recruited from Beijing and rural Anhui province in China. Thirty-one HIV+ and 39 HIV- individuals were selected from a US cohort at the HIV Neurobehavioral Research Center. Our NP battery includes instruments widely used to study HIV infection. It assesses 7 ability areas (i.e., verbal fluency, abstraction/executive function, speed of information processing, working memory, learning, delayed recall, and motor). We compare our Chinese groups to the U.S. samples on demographically corrected T-scores in order to explore the cross cultural compatibility of the NP tests and their U.S. norms. Because of the questionable appropriateness of the U.S. norms for use in China, HIV+ and HIV- Chinese groups were compared on raw scores as well as demographically corrected T-scores.

Results: On every individual NP measure, the mean of the Chinese HIV+ group was worse than that of the HIV- group, regardless of whether raw scores or T-scores. Summary T-scores for the total battery and the seven ability areas were found to be close to the U.S. normative mean of 50 (i.e., Global of 49, and domains ranging from 45-53). A series of 2X2 ANOVAs involving HIV+ and HIV- groups from both countries revealed highly significant HIV effects. Smaller, inconsistent country effects were seen on three of the seven ability areas.

Conclusions: The neuropsychological test battery that was chosen and adapted for use in this study of HIV in China appears to have reasonable cross cultural equivalence. Similar to findings in the U.S., Chinese HIV+ subjects performed significantly worse than HIV- controls.

Correspondence: *Lucette A. Cysique, Ph.D., Psychiatry, University of California San Diego, HNRC 150 Washington Street, San Diego, CA 92103. E-mail: lcysique@ucsd.edu*

J. IUDICELLO, S. WOODS, M.S. DAWSON, L.M. MORAN, I. GRANT & T. HNRC GROUP. Differential cognitive mechanisms of time- and event-based prospective memory in HIV infection.

Objective: Recent literature suggests that HIV-infection is associated with impairment in both time-based (TB) and event-based (EB) prospective memory (ProM). Given its more prominent demands on self-initiated monitoring and retrieval, it has been hypothesized that TB ProM may nevertheless be more strongly associated with executive functions and prefrontostriatal systems than EB ProM. The current study sought to evaluate this hypothesis in relation to HIV-associated deficits in EB and TB ProM.

Participants and Methods: Seventy-eight HIV-infected individuals were administered a comprehensive neuropsychological battery, which included the Memory for Intentions Screening Test (MIST), a standardized test of eight ProM trials with TB and EB subscales balanced on response type (verbal vs. action), delay interval, and cognitive load.

Results: Although both TB and EB ProM subscales were significantly correlated with measures of processing speed and delayed recall (ps < .05), only TB ProM was significantly related to measures of executive functions and working memory (ps < .05).

Conclusions: Findings suggest that while HIV-associated deficits in TB and EB ProM may be of similar overall severity, they may nevertheless be associated with somewhat different underlying cognitive mechanisms. In particular, TB ProM deficits in HIV may be preferentially driven by executive dysfunction, perhaps of a more prefrontostriatal neuropathogenesis. Future research is needed order to examine whether underlying neural mechanisms of TB and EB task performance in HIV may be dissociable. Correspondence: *Jennifer Iudicello, HNRC, UC San Diego, 150 W. Washington Street, San Diego, CA 92103. E-mail: spwoods@gmail.com*

S.L. NICHOLS, G. MONTEPIEDRA, P. SIROIS, B. KAMMERER, P.A. GARVIE & K. MALEE. Developmental Outcomes of Perinatally-acquired HIV in Late Childhood and Adolescence: Relationship of Cognitive, Academic, and Behavioral Functioning with Disease Severity.

Objective: Advances in HIV treatment during the past decade have enabled many children born with HIV to live well into adolescence and adulthood. Prior studies have demonstrated both global and specific cognitive and academic deficits in these children, but the implications of perinatal HIV infection for neuropsychological and behavioral functioning in adolescence, and ultimately for productive independence in adulthood, are not well understood. This study examined the relationship of disease severity to cognitive and behavioral functioning as part of a study on factors related to medication adherence.

Participants and Methods: The study included 151 perinatally HIV-infected youth, ages 8-18. Measures of intellectual functioning, memory, language, attention, academic skills, processing speed, visual-perceptual organization, and behavior were included. CD4 percent was used as an indicator of disease severity.

Results: Youth with HIV performed significantly below age norms on all cognitive measures with the exception of visual memory. CD4 percent was significantly related to WISC-III Full Scale I.Q., several tests of language-based skills (verbal comprehension, reading comprehension, memory for verbal narratives, and listening comprehension), and caregiver-reported behavioral symptoms. Measures of attention, processing speed, visual organization, visual memory, and math skills did not correlate significantly with CD4 percent.

Conclusions: This study demonstrates that the presence and severity of perinatally-acquired HIV disease in youth are associated with a specific cognitive profile that differs from that observed in adults with acquired HIV infection. Thus, neuropsychological measures often used to detect HIV-related impairment in adults may not be adequate for adolescents or adults with perinatally acquired HIV.

Correspondence: *Sharon L. Nichols, Ph.D., Neurosciences, University of California, San Diego, 9500 Gilman Dr., #0935, La Jolla, CA 92093. E-mail: slnichols@ucsd.edu*

R.N. ROBBINS, M. RIVERA MINDT, B. DESIREE, R. ELIZABETH & S. MORGELLO. Neuropsychological Test Performance, Ethnicity and HAART adherence among HIV+ African Americans.

Objective: HIV/AIDS is a serious and disproportionate problem among African Americans. Adherence to HAART is particularly important in treating HIV/AIDS. Research indicates a strong association between HIV-related neuropsychological (NP) sequela and adherence, but little research has examined the effect of ethnicity and NP functioning on adherence. This study examined these factors in a sample of HIV+ non-Hispanic whites and African Americans.

Participants and Methods: 82 HIV+ participants (38 non-Hispanic white and 44 African-American) with at least 11 years of education completed comprehensive NP and neuromedical evaluations.

Results: Non-Hispanic white and African American participants did not differ significantly on age, CD4 count, viral load, current depression, current alcohol and substance dependence, or overall NP performance. However, mean years of education (14.34 vs. 12.98, $p < .002$) and mean WRAT-3 reading subtest T-score (51.11 vs. 41.52, $p = .000$) were significantly higher among the non-Hispanic white participants. Mean rate of self reported HAART adherence was significantly higher among non-Hispanic whites than African Americans (98% vs. 79%, $p < .001$). A multiple regression using education, ethnicity, WRAT-3 reading score, and 5 NP domains (processing speed, learning, attention, abstraction, and motor functioning) was performed to predict medication adherence. The model was significant ($R^2 = .29$, $p = .01$), but only ethnicity ($p = .04$) emerged as a unique and significant predictor of adherence. However, there was a trend towards reading level ($p = .06$) and attention ($p = .051$) being unique predictors.

Conclusions: These findings raise important issues in understanding adherence among African Americans, and suggest that in addition to NP impairment, sociocultural factors (ethnicity, reading level, and education) may also impact adherence behavior.

Correspondence: *Reuben N. Robbins, Psychology, Fordham University, Dealy Hall, Second Floor, 441 East Fordham, Road, Bronx, NY 10458. E-mail: reroobins@fordham.edu*

R.N. ROBBINS, E.M. TUCKER-DROB & W.G. VAN GORP. Modeling Verbal List Learning Curves within a Sample of HIV + Adults.

Objective: Multitrial free recall (verbal list learning) tasks are popular neuropsychological tools used in the assessment of cognitive impairment related to HIV. Recent examinations of such tasks in aging research suggest that initial recall and subsequent learning (learning rate) represent two distinct factors. Within HIV research, however, investigators have frequently overlooked this distinction. Using latent growth curve modeling, this study examined whether such a distinction was present among a cohort of HIV+ adults.

Participants and Methods: Baseline data were obtained from 118 HIV+ adults (93 diagnosed with AIDS) enrolled in a two-year longitudinal study of neuropsychiatric predictors of returning to work. All 118 participants completed the California Verbal Learning Test (CVLT).

Results: A distinction was found between initial recall and learning rate, such that substantial individual differences were found in both factors. In fact, learning rate was significantly negatively correlated with initial recall. When predicting initial recall, a significant interaction between

AIDS status and viral load was found. Counter to expectations, viral load was positively related to initial recall among the non-AIDS participants, whereas initial recall was not significantly related to viral load among participants with AIDS. When predicting learning rate, no such interaction was found.

Conclusions: These findings suggest that some individuals may benefit from neuroprotective factors more than others, and that distinguishing between initial recall and learning rate may provide information that might otherwise be overlooked. This distinction may allow for the potential of verbal list learning tasks to be even more sensitive in monitoring and detecting HIV-associated cognitive impairment.

Correspondence: *Reuben N. Robbins, Psychology, Fordham University, Dealy Hall, Second Floor, 441 East Fordham, Road, Bronx, NY 10458. E-mail: reroobins@fordham.edu*

S.A. SASSOON, M.J. ROSENBLOOM, R. FAMA, A. O'REILLY, A. PFEFFERBAUM & E.V. SULLIVAN. Long-term Decline in Digit Symbol Performance in Alcoholism and HIV Infection Comorbidity.

Objective: When HIV infection co-occurs with alcoholism, dually affected patients are at risk of compounded cognitive deficits. Whether patients with ALC+HIV comorbidity show faster deterioration over time than patients with either disease alone has been seldom studied.

Participants and Methods: The WAIS-R Digit Symbol (DS) test was administered to 15 ALC, 21 HIV, 22 ALC+HIV, and 9 age-matched healthy controls (NC) on two occasions, 3 years apart.

Results: At baseline, ALC+HIV had poorer DS scores than ALC, HIV, or NC, exhibiting a compounded effect of disease comorbidity. However, all groups were comparable on an incidental recall task, testing paired associative learning of the symbols. Three years later, 47% of ALC and 32% of ALC+HIV maintained sobriety and CD4 count had decreased in 48% of HIV and 23% of ALC+HIV patients. Neither ALC ($p = .50$) nor NC ($p = .95$) showed change in DS score at follow-up, whereas both HIV ($p = .006$) and ALC+HIV ($p = .06$) worsened over time. Incidental recall did not change significantly across time in any group. Decline in DS scores over 3 years was unrelated to length of alcohol sobriety in either ALC group but was related to CD4 cell count decrease in both HIV groups.

Conclusions: In this relatively healthy sample of HIV patients (only one of whom had a CD4 cell count below 100 at follow-up), sustained attention, psychomotor speed, and visual scanning, measured by the DS test, were impaired only in the comorbid group. Further, deterioration occurred at an equivalent rate in both HIV groups and was related to CD4 cell decline but not continued alcohol use. Support: AA12999, AA12388, AA10723

Correspondence: *Stephanie A. Sassoon, Ph.D., Neuroscience Program, SRI International, 333 Ravenswood Ave., BN-165, Menlo Park, CA 94025. E-mail: stephanie.sassoon@sri.com*

D.F. TATE, R. PAUL, T. FLANIGAN, K. TASHIMA, S. ZHANG & D. LAIDLAW. Alterations in the Diffusion Characteristics of the Midsagittal Corpus Callosum and Cognition Among HIV Infected Patients.

Objective: The purpose of this study was to examine the relationship between the diffusion tensor imaging (DTI) scalar metrics and cognition in the midsagittal corpus callosum (CC).

Participants and Methods: Participants included 23 well characterized HIV infected patients and 10 demographically matched controls. The HIV infected patients were divided into two groups according to CD4 cell ($n = 11, < 350$; $n = 12, > 350$) to examine the influence of disease burden. Patients and controls were administered a battery of neuropsychological tests and underwent MRI including DTI.

The midsagittal CC was partitioned into seven functionally relevant areas using the Witelson protocol. FA and MD in each of these areas was examined for alterations relative to measures of disease burden. The relationship between these scalar metrics and several cognitive domains was also examined.

Results: Results demonstrated a dose effect for scalar metrics according to disease status and CD4 count with the controls having the best FA/MD values, higher CD4 cell count patients having middle FA/MD values, and lower CD4 cell count patients having the worst FA/MD values. These differences were more pronounced in the anterior regions of the CC and were significant statistically when comparing controls and HIV infected patients. Trends toward significance were noted when comparing the two HIV groups with increased disease burden having the most affect on diffusion values. FA/MD values in the anterior portions of the CC demonstrated robust relationships with measures of motor speed, semantic fluency, and free memory recall.

Conclusions: This study demonstrated alterations in FA/MD of the midsagittal CC with the most alteration occurring in the anterior regions. Furthermore, these alterations are associated with cognitive deficits often observed in HIV infected patients. Combined, these findings demonstrate the utility of DTI when examining the CNS and cognitive effects of HIV.

Correspondence: *David F. Tate, Ph.D., Department of Psychiatry, Brown Medical School, CORO Building, 5th Floor, One Hoppin Street, Providence, RI 02903. E-mail: dtate1@lifespan.org*

S. WOODS, M.S. DAWSON, S.L. LETENDRE, I. GRANT, J. ATKINSON & T. HNRC GROUP. HIV-associated Prospective Memory Deficits Predict Antiretroviral Nonadherence.

Objective: Recent studies indicate that HIV infection is associated with deficits in the strategic encoding and retrieval aspects of prospective memory (ProM). ProM is a form of episodic memory involving the ability to execute a future intention, which has important implications for successful day-to-day functioning. The present investigation was undertaken to assess whether HIV-associated ProM deficits accurately predict adherence to antiretroviral (ARV) medication regimens.

Participants and Methods: Study participants included 26 individuals with HIV infection who completed a comprehensive neuropsychological battery at baseline and a 5-week assessment of ARV adherence using the Medication Event Monitoring System (MEMS). Participants taking less than 95% of their scheduled doses of a predetermined ARV over the 5-week follow-up period were classified as Nonadherent.

Results: The Adherent ($n = 16$) and Nonadherent ($n = 10$) groups were comparable in sex, education, and psychiatric status at baseline (all $ps > .10$). A nominal logistic regression including ProM (i.e., the expanded Memory for Intentions Screening Test), age, ethnicity, and general cognitive functioning revealed that ProM was a significant, independent predictor of medication adherence ($p = .004$). An odds ratio indicated that individuals with impaired ProM at baseline were six times more likely to be classified as Nonadherent at 5-week follow-up than participants whose ProM performance fell within normal limits (odds ratio = 6.0 [1.1, 31.5]).

Conclusions: Findings provide support for the ecological validity of ProM in HIV disease by demonstrating its importance as a predictor of ARV nonadherence, which further suggests that ProM-based compensatory strategies may be effective for HIV-infected individuals who experience difficulty adhering to their medication regimens.

Correspondence: *Steven Paul Woods, Psy.D., Department of Psychiatry (0847), UC San Diego, HIV Neurobehavioral Research Center, 150 W. Washington St., San Diego, CA 92103. E-mail: spwoods@ucsd.edu*

Medical Disorders

N.R. ANDREWS, R. ZEPHIER, N. PASTOREK, J. MOLD, J. SCOTT & R. ADAMS. Differences in Raw Score Performance Between Hypertensive and Normotensive Community-Dwelling Older Adults on the RBANS.

Objective: Hypertension is not only linked with increased risk for vascular disease and stroke, but is also directly associated with declines in cognitive performance across multiple domains. However, findings have varied as to the type and magnitude of cognitive declines. In the current study, we examined the relationship between scores on specific subtests from the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and the presence of a diagnosis of hypertension.

Participants and Methods: Participants were 798 community-dwelling adults ages 65-94; 106 subjects were not included in analyses due to medical diagnoses having a significant negative impact on cognitive functioning (stroke/transient ischemic attack, head injury, concussion, seizures, Parkinson's disease and brain hemorrhage). Multiple regression analyses were used to examine differences in cognitive functioning between control subjects ($N = 330$) and those diagnosed with hypertension ($N = 311$) on RBANS performance. The six subtests used in this study were chosen based on their content, and on those tests with sufficient range in the distribution for this sample.

Results: Two of the subtests showed a significant main effect of hypertensive status on scores when controlling for age, gender, and ethnicity. Specifically, a diagnosis of hypertension was associated with lower scores on List Learning and List Recall. Post-hoc analyses were conducted with four stratified age groups to further investigate the relationship between hypertensive status and test performance.

Conclusions: The observed findings show declines in performance for the full sample on specific RBANS subtests measuring immediate and delayed recall. Clinical and statistical significance of these findings will be discussed.

Correspondence: *Nicole R. Andrews, M.S., Oklahoma, Oklahoma State University, 215 N Murray, Stillwater, OK 74078. E-mail: nicole.andrews@okstate.edu*

L. BAUER & R.J. MCCAFFREY. Performance on Cognitive and Symptom Validity Measures in Participants with Fibromyalgia.

Objective: Some research studies have shown that people with fibromyalgia (FM) exhibit cognitive deficits, even when controlling for depression and anxiety; however, few have used symptom validity measures to support their findings. The aim of the present study is to examine performance on cognitive and symptom validity measures in participants with FM, and to note possible elevations in depression and/or anxiety in order to clarify this relationship.

Participants and Methods: As part of a larger study, 30 participants diagnosed with FM were recruited through a rheumatologist, support groups, and a newspaper. Participants completed a brief battery which included WAIS-III Digit Span, Trails A/B, COWA/Animals, Word Memory Test (WMT), Test of Memory Malingering (TOMM), and the Millon Clinical Multiaxial Inventory-III (MCMI-III).

Results: Of the participants, 5/30 failed the WMT and 2/30 failed the WMT and the TOMM. After exclusion of these participant's data, performance on all cognitive measures was in the average range (T-score range: 46-54). On the MCMI-III, 3 participants endorsed items that indicated the presence of depression, 6 endorsed items indicative of the presence of anxiety, and 1 participant endorsed items that indicated the prominence of anxiety.

Conclusions: Results fail to provide evidence for cognitive dysfunction in participants with FM on these measures, regardless of anxiety and/or

depression. Findings do suggest that symptom validity measures may be useful when assessing people with FM as 1/6 of the sample failed the WMT. Future studies should examine larger samples and utilize multiple symptom validity tests to further elucidate the relationship between fibromyalgia and cognitive functioning.

Correspondence: *Lyndsey Bauer, M.A., Psychology, University at Albany, 1400 Washington Ave, Albany, NY 12222. E-mail: lt3346@albany.edu*

J.L. HORWITZ, B.W. ESTES, M.T. BARISA, A.S. DAVIS & B.A. HUDSON. CNS Nocardia: A Neuropsychological Case Study.

Objective: Nocardia infection is a rare bacterial disorder, which tends to affect the lungs, brain, or skin. Nocardia occurs primarily in individuals with weakened immune systems and originates the lungs and spreads to other organ systems (typically the brain and the skin). This proposed case study will present an overview of nocardia with a specific emphasis placed on secondary involvement of the central nervous system. Subsequently, the medical and neuropsychological/neurobehavioral data of a middle-aged male who developed multiple brain abscesses secondary to nocardia will be presented.

Participants and Methods: The case presentation includes basic demographic information and results from the medical diagnostic work-up, neuroradiological examination, EEG, and initial and follow-up neuropsychological test data.

Results: The patient presented with a two week history of fluent dysphasia, personality changes, right hemiplegia, diplopia, and memory loss. Brain CT noted multiple focal areas of hypodensity which represented intracranial abscesses in the left frontal, occipital, and right cerebellar areas. The EEG indicated mild to moderate slowing of background rhythm with mild to moderate diffuse encephalopathy. In addition, focal slowing was evident in the left frontotemporal region.

Neuropsychological findings indicated mild to moderate impairments in executive functions consistent with the lesions indicated on neuroimaging. The patient demonstrated impairments in inhibition, mental flexibility, shifting attention, emotional regulation, judgment, and reasoning.

Conclusions: The case study is significant due to the central nervous system involvement of nocardia which is infrequently reported in the literature.

Correspondence: *Andrew S. Davis, Ph.D., Ball State University and Indiana Neuroscience Institute, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

J. DEMANUELE, D.B. TAICHMAN & R.O. HOPKINS. Quality of Life in Pulmonary Hypertension Patients: A Review of the Literature.

Objective: Morbidities in patients with pulmonary hypertension (PH) include cognitive impairments, poor physical function and decreased quality of life (QOL). We conducted a systematic review of all studies evaluating QOL in PH patients.

Participants and Methods: Medline and PsychInfo were searched and reference lists from relevant articles were evaluated. Inclusion criteria were PH populations in which QOL was measured with the Medical Outcomes Study Short Form (SF-36). Two authors independently reviewed and extracted demographic and medical data, study methods, and SF-36 results.

Results: Of eight observational studies (N=777), two were excluded as SF-36 data were not specifically reported and one with comorbid diagnoses of COPD, resulting in 5 studies included in our population (N=540). SF-36 data were reported in 2 studies and data were extrapolated from graphs in 3 studies. The patients' mean age was 51 ± 12 years and 62% were female. The etiology of the PH was 232 (43%) pulmonary arterial hypertension and 308 (57%) with chronic thromboembolic disease. At PH diagnosis, 5 patients (1%) were World Health Organization Functional Class I, 158 patients (38%) Class II, 246 (59%) Class III, and 11 (3%) Class IV. The mean SF-36 scores were: 29.4 for

Physical Functioning, 38.7 Role Physical, 45.6 Bodily Pain, 29.8 General Health, 31.1 Vitality, 48.5 Social Functioning, 40.7 Role Emotional, and 52.9 for Mental Health. PH patients had significantly lower QOL in all domains compared to United States population data (t-tests range 27 to 54, all p-values < 0.001).

Conclusions: The PH patients evaluated here had similar decrements in QOL across studies.

Correspondence: *Joanne Demanuele, Clinical Psychology, Brigham Young University, Comprehensive Clinic, 244 Taylor Building, Provo, UT 84602. E-mail: jgdemanuele@yahoo.com*

J.A. DUQUIN, M.E. ZIMMERMAN, S. HARRIS, B. BORRELLI & M.S. ALOIA. The Effect of Smoking on Obstructive Sleep Apnea and Adherence to PAP.

Objective: The relationship between smoking and obstructive sleep apnea (OSA) has been controversial for over a decade. While some investigations have demonstrated that smoking is an independent risk factor for OSA (Kashyap, Hock, & Bowman, 2001; Wetter, Young, Bidwell, Badr, & Palta, 1994; Bloom, Kaltenborn, & Quan, 1988), other authors (Hoffstein, 2002) argue that it is not. The aim of this study is to provide greater clarification as to whether smoking is associated with greater OSA severity among a clinical sample of patients with OSA. We also sought to examine whether or not smoking at the time of treatment initiation affected treatment adherence and whether smoking status affected cognitive function.

Participants and Methods: One hundred forty-eight participants with moderate-severe OSA were examined prior to treatment initiation and again after 3 months of treatment. Smokers were categorized as non (N=85), current (N=14) and previous (N=67). Subjects completed a neuropsychological test battery and a measure of apathy and sleepiness at each assessment. Adherence was monitored objectively and without participant knowledge.

Results: Smokers demonstrated a greater percentage of stage 1 sleep on polysomnography, had an overall lower estimated verbal IQ and had attained fewer years of formal education. Smoking was also associated with poorer adherence at the 3-month follow-up. Smoking did not affect cognitive function.

Conclusions: Implications for smoking on cognitive dysfunction and treatment adherence are discussed.

Correspondence: *Jennifer A. Duquin, Ph.D., Neurology, SUNY Buffalo School of Medicine, Buffalo General Hospital, 100 High Street, Buffalo, NY 14203. E-mail: jaburhart@hotmail.com*

C. EWING, L. GEMMELL, M. LAZO & F. HILL-BRIGGS. Associations of Sociodemographics and Blood Glucose Control with Problem Solving in Urban African Americans with Type 2 Diabetes.

Objective: Problem solving is a core component of diabetes self-management. In the setting of Project DECIDE, a diabetes problem-solving intervention study with diabetic (type 2) African Americans, we aimed to identify baseline associations of acute (fasting blood glucose) and long-term (HbA1c) glycemic control with problem-solving skills.

Participants and Methods: Fifty-seven African-Americans with type 2 diabetes (59% women, mean age 59 years, 61% with at least high school education, 45% with monthly income ≤ \$800) were administered Wisconsin Card Sort Test (WCST), Tower of London (TOL), Everyday Problems Test (EPT), and sociodemographic measures. Fasting blood glucose and HbA1c were obtained.

Results: WCST raw scores were associated with literacy, but not age, education, or gender. Older age and higher education were associated with better TOL performance. Higher education was associated with better EPT performance.

Standard scores revealed a majority of participants to have deficits in WCST Categories Achieved and Learning to Learn (78% and 67%, respectively). In multiple linear regression analyses, both higher fasting

blood glucose, indicating poorer acute diabetes control, and higher HbA1c, indicating poorer long-term control, were associated with lower learning efficiency ($p \leq 0.05$), with a similar trend for categories achieved. After adjusting for literacy, these associations were only slightly attenuated. TOL and EPT scores were Average or above, with no significant associations with glycemic control.

Conclusions: WCST was most sensitive to glycemic control. Results suggest association of acute and chronic high blood glucose with diminished learning in novel problem-solving contexts in this sample, but not with other problem-solving skills.

Correspondence: *Charisse T. Ewing, MA, MBA, Argosy University/Johns Hopkins Medicine, 908 West Haven Drive, Bowie, MD 20721. E-mail: ewingct@aol.com*

A.P. HALEY, K.F. HOTH, J. GUNSTAD, R.R. PAUL, A.L. JEFFERSON, A. POPPAS, D.E. FORMAN, D. TATE, L.H. SWEET, M. ONO, B. JERSKEY & R.A. COHEN. Reported Cognitive Dysfunction at Baseline Predicts Global Cognitive Decline at One Year Follow-up in Patients with Cardiovascular Disease.

Objective: Elderly patients with cardiovascular disease (CVD) often report cognitive difficulties including reduced cognitive processing speed and attention. On cross-sectional examination, such reports have related more closely to mood than to objective measures of cognitive performance. The aim of this study was to examine the longitudinal relationship between self-reported cognitive difficulties, cardiovascular risk factors, depression, and decline in performance on objective tests of global cognition in patients with CVD.

Participants and Methods: Fifty-five older adults with CVD (ages 55 to 85 years) completed the Beck Depression Inventory (BDI), a perceived cognitive dysfunction measure (Cognitive Difficulties Scale), a medical history questionnaire, and the Dementia Rating Scale (DRS) at baseline and one year later.

Results: Hierarchical linear regression revealed that increased report of cognitive difficulties at baseline was associated with significantly lower one year follow-up DRS performance ($\beta = -.40$, $p = .01$), independent of age, education, cardiovascular risk factors (e.g. smoking, hypertension), baseline DRS performance, and level of depression ($F(5,42) = 4.72$, $p = .002$). Reported cognitive difficulties were not related to DRS performance at baseline ($F(4,42) = .68$, $p = .70$).

Conclusions: Self-reported cognitive difficulties may reflect early changes in cognitive aging that are difficult to detect using global cognitive screening measures at a single time point. Yet, over time, these perceived difficulties are related to an objective measure of global cognitive decline, and may provide important clinical information about early neurodegenerative processes and cognitive changes that should be carefully monitored among patients with CVD.

Correspondence: *Andreana P. Haley, Ph.D., Psychiatry and Human Behavior, Brown University, Butler Hospital, 345 Blackstone Blvd, Providence, RI 02906. E-mail: Andreana_Haley@Brown.edu*

R.C. HILSABECK, G.M. ANSTEAD, A.L. WEBB, P. INGMUNDSON, Q. ZHANG, A. HOYUMPA, A. DEMATATIS, K. MAJOR, G. HUTCHINSON, E. MATA-GALAN, O. ALI, I. POY & S.L. STERN. Relationship of Cytokines to Cognitive Functioning in Patients with Chronic Hepatitis C.

Objective: The etiology of cognitive dysfunction in patients with chronic hepatitis C (CHC) infection is unknown. One hypothesis is that chronic immune system activation and induction of a cytokine cascade may play a role. The purpose of the present study was to examine the relationship between endogenous cytokines, including interferon-alpha (IFN-alpha) and interleukin-6 (IL-6), and cognitive functioning in CHC patients.

Participants and Methods: Thirty-six CHC patients not receiving antiviral therapy completed a computerized neuropsychological test battery after undergoing blood draw for purposes of cytokine assays.

Results: IFN-alpha was detectable in serum of 14 patients, and IL-6 was detectable in all 36 patients. Levels of IFN-alpha ranged from 0 to 247.9 pg/ml, with an average of 23.2 pg/ml, and levels of IL-6 ranged from 0.3 to 12.7 pg/ml, with an average of 2.7 pg/ml. In the 14 patients with detectable IFN-alpha levels, average IFN-alpha level was 57.9 pg/ml, and average IL-6 level was 3.8 pg/ml. When considering the entire sample, Spearman's rho correlational analyses revealed significant relationships between IFN-alpha and math processing accuracy ($r = -.33$; $p = .05$), IL-6 and math processing efficiency ($r = -.41$; $p = .01$), IL-6 and working memory accuracy ($r = -.49$; $p = .003$), and IL-6 and working memory efficiency ($r = -.42$; $p = .01$). However, when only the 14 patients with detectable IFN-alpha levels were considered, these four relationships became stronger at $-.40$, $-.68$, $-.73$, and $-.64$, respectively.

Conclusions: These findings suggest a possible relationship between endogenous IFN-alpha and IL-6 and cognitive functioning in CHC patients. Correspondence: *Robin C. Hilsabeck, Ph.D., Psychology Service (116B), South Texas Veterans Health Care System, 7400 Merton Minter Blvd., San Antonio, TX 78229. E-mail: robin.hilsabeck@va.gov*

K.F. HOTH, A.P. HALEY, J. GUNSTAD, R.H. PAUL, A. POPPAS, A.L. JEFFERSON, D.F. TATE, M. ONO, B.A. JERSKEY & R.A. COHEN. C-Reactive Protein Predicts Longitudinal Cognitive Change in Elderly Individuals with Cardiovascular Disease.

Objective: Cardiovascular disease is associated with cognitive deficits in the absence of stroke or dementia. Recent studies suggest that circulating markers of blood vessel function and inflammation, including homocysteine (HCY) and C-reactive protein (CRP), are involved in the relationships among cardiovascular disease, cerebrovascular disease, and cognitive dysfunction. We prospectively examined HCY and CRP as risk factors for cognitive decline among older adults with cardiovascular disease.

Participants and Methods: Seventy-eight older adults (ages 56-84 years; $M=70.6$ years, $SD=7.4$; 38.5% female) with stable but prevalent cardiovascular disease underwent a blood draw to obtain HCY and CRP levels with simultaneous completion of a comprehensive neuropsychological battery. Cognitive measures were grouped in five domains (i.e., global, attention-executive-psychomotor-speed, visuospatial, memory, and language). Neuropsychological assessment was repeated one year later.

Results: Hierarchical linear regression revealed that higher CRP levels at baseline were associated with performance declines in the attention-executive-psychomotor speed domain at 1-year follow-up ($CRP \beta = -0.25$, $p < 0.05$) after adjusting for age, education, sex, traditional cardiovascular risk factors (i.e., history of hypertension, diabetes, hypercholesterolemia, smoking), and baseline cognitive performance. HCY was not significantly associated with longitudinal cognitive change in any domain.

Conclusions: CRP levels are independently associated with subsequent decline in attention, executive functioning, and psychomotor speed among older adults with cardiovascular disease. CRP may confer a unique risk for cognitive decline in this referral-based sample, and these findings implicate inflammatory processes in the cognitive dysfunction found in patients with cardiovascular disease.

Correspondence: *Karin F. Hoth, Ph.D., Centers for Behavioral and Preventive Medicine, Brown Medical School, One Hoppin St., Coro West 5th Floor, Providence, RI 02903. E-mail: Karin_Hoth@Brown.edu*

M. HUCKANS, J. LOFITS, S. RUIFY, D. BJORNSON, T. PARCEL, J. WOODHOUSE, A. SEELYE, J. NELLIGAN, A. SASAKI & P. HAUSER. Relationship Between Peripheral Cytokine Levels and Neuropsychological Functioning in Patients with Hepatitis C.

Objective: To assess the relationship between plasma interleukin-1beta (IL-1b), tumor necrosis factor-alpha (TNF-a) and interferon-gamma (IFN-g) levels and cognitive functioning in veterans with chronic hepatitis C (HCV).

Participants and Methods: Veterans with HCV ($n=16$) were recruited through the Portland VA Medical Center (age= 53 ± 5 years; 93% male; education= 14 ± 2 years). Subjects participated in blood draws to assess their plasma cytokine levels and a comprehensive battery of neuropsychological tests.

Results: Higher levels of IL-1b were significantly correlated ($p<0.05$) with poorer performance on WAIS-III Letter-Number Sequencing and the CPT, with trends ($p<0.1$) toward poorer performance on WAIS-III Digit Span and Finger Tapping. Higher levels of TNF-a were significantly correlated ($p<0.05$) with poorer performance on the CPT, with trends ($p<0.10$) toward poorer performance on the BVMT-R, WAIS-III Matrix Reasoning, D-KEFS Proverbs, and D-KEFS Sorting. There were trends toward higher IL-1b and TNF-a levels and better performance on Category Fluency. Higher levels of IFN-g were significantly correlated ($p<0.05$) with improved performance on WAIS-III Digit Symbol, Trails A, Letter Fluency, and D-KEFS Color-Word Interference; there was a trend ($p<0.1$) toward higher levels of IFN-g and improved performance on Trails B. Few correlations remained significant after a Bonferroni correction for multiple comparisons, but it is unclear whether this was due to limited power.

Conclusions: Results indicate that, among patients with HCV, higher IL-1b and TNF-a levels may be associated with cognitive dysfunction, while higher IFN-g levels may be associated with improved neuropsychological functioning. Findings suggest that immune activation may be involved in mechanisms affecting cognition in patients with HCV. Correspondence: Marilyn Huckans, Ph.D., Portland VA Medical Center, P3MHDC, 3710 SW US Veterans Hospital Rd., Portland, OR 97239. E-mail: marilyn.huckans@med.va.gov

C.E. JOHNSON, C. PETERSON, L.Y. RAMIREZ, S. HUESTIS & H.A. DEMAREE. Neuropsychological Outcomes of Chemotherapy in Pediatric Acute Lymphoblastic Leukemia: A Meta-analytic Review.

Objective: Cognitive late effects have been associated with treatment for childhood leukemia; however, they have been most frequently linked with radiation to the central nervous system (CNS). Since the 1990s, radiation has been eliminated from standard-risk treatment protocols and replaced with CNS chemotherapy. Research findings on long-term cognitive outcomes of chemotherapy-only treatment have been contradictory. The current study conducted a meta-analysis of neuropsychological outcomes of chemotherapy-only treatment protocols for childhood leukemia to estimate the magnitude of neuropsychological and academic deficits.

Participants and Methods: Fourteen studies met inclusion criteria and provided means and standard deviations for leukemia survivors treated with chemotherapy-only and a healthy comparison group.

Results: The mean effect size for Full Scale IQ was significantly different between leukemia survivors and healthy comparison participants (weighted $d = .62$). Leukemia survivors performed significantly lower than healthy comparison subjects on measures of Verbal IQ (weighted $d = .63$), Performance IQ (weighted $d = .44$), Math Achievement (weighted $d = .79$), Reading Achievement (weighted $d = .73$), and Trails B (weighted $d = .86$). Findings for measures of visual motor integration (Developmental Test of Visual Motor Integration) and visual-motor tracking (Trails Part A) were not significantly different between the two groups. Executive functioning measures were not consistent across studies and could not be meta-analyzed.

Conclusions: These results indicate numerous methodological implications for future examination of neuropsychological outcomes in pediatric cancer survivors. Results indicate that, across studies of neuropsychological outcomes of chemotherapy for leukemia, cognitive ability is significantly lower among leukemia survivors than healthy comparisons. Correspondence: Courtney E. Johnson, MA, Psychology, Case Western Reserve University, 2184 Rexwood Rd, 1st Floor, Cleveland, OH 44115. E-mail: courtneyjohnson@gmail.com

E. KOZORA, C. EMERY, L. ZHANG, M. ELLISON & B. MAKE. Psychological and Exercise Correlates of Cognitive Improvement in Emphysema Patients following Multidisciplinary Treatment.

Objective: We examined cognitive functioning in 56 emphysema patients enrolled in the National Emphysema Treatment Trial following ten weeks of multidisciplinary medical therapy (MT).

Participants and Methods: Fifty-six emphysema patients with a mean age of 64.8 (SD=5.9) and a mean educational level of 12.5 (SD=2.0) were administered neuropsychological, pulmonary and exercise tests at baseline and ten weeks following multidisciplinary treatment. Fifty-four controls with a mean age of 64.2 (SD=5.8) and a mean education level of 13.2 (SD=2.0) were also tested at baseline and ten weeks follow-up. Both the emphysema and control groups were similar in age, gender and ethnicity but, the control group had a higher educational level ($p<0.04$).

Results: Controlling for practice effects and educational level, the cognitive impairment index (CII-derived from 14 test scores) in the emphysema group showed a significant decline following multidisciplinary treatment ($p=0.002$) with an overall score of 3.4 (SD=2.9) reduced to 2.6 (SD=2.2). The emphysema group improved in Trail Making Test A ($p=0.003$) and WMS-III Faces II ($p=0.04$). The emphysema group also had a significant decline in total BDI score ($p<0.001$), increased workload ($p<0.001$) and increased six-minute walk ($p<0.01$). Using a regression model, improvement (decline) in CII for the emphysema group was associated with improved BDI total ($p=0.015$), workload ($p=0.046$) and PaO₂ ($p=0.018$).

Conclusions: Emphysema patients enrolled in a ten-week medical treatment program demonstrated improvement on a global cognitive index, decline in overall depression, and improved exercise capacity. Cognitive improvement was associated with improved psychological and exercise status, highlighting the mechanisms underlying cognitive change in emphysema patients following multidisciplinary treatment.

Correspondence: Elizabeth Kozora, Ph.D., Medicine, National Jewish Medical and Research Center, 1400 Jackson Street, Denver, CO 80206. E-mail: Kozorae@njc.org

S.K. LAGEMAN, L. YUILL, K. VELLINGA-SUPRATA & E.B. FENNEL. Executive Functions in Women With Early-Stage Breast Cancer.

Objective: This study longitudinally investigated cognitive changes related to early-stage breast cancer treatments.

Participants and Methods: Twenty-two women with early-stage breast cancer were administered neuropsychological, mood, and quality of life (QOL) measures. Patients completed three assessments over a year; baseline assessments occurred post-surgery/pre-adjuvant treatment and follow-up assessments occurred approximately one month post-chemotherapy (CT) and radiation therapy (RT), and eight-months after endocrine therapy (ET) began. Three treatment groups were analyzed (CT+ET $n = 6$, CT $n = 7$, and ET $n = 9$) and did not differ with regard to age ($M = 52.54$), education level ($M = 14.94$), and estimated T score of verbal intelligence ($M = 47.74$), but statistically differed in terms of stage of breast cancer and RT use.

Results: Patients endorsed mild-moderate depression at all three assessments and reported slightly less energy at follow-up assessments. Mild reductions in state anxiety and small gains in breast-related QOL were observed at follow-up assessments. Executive functions varied at all three assessments as a function of the level of education, regardless of treatment type, when covariates of age, education, RT use, and self-reported emotional functioning were included. In general, the higher the education completed, the more patients benefited from repeated exposure to testing.

Conclusions: These findings highlight important factors regarding the study of treatment-induced cognitive changes in breast cancer patients. Evaluation of psychological functioning and use of appropriate normative data are imperative in the study of treatment-induced cogni-

tive changes in breast cancer patients. While replication of these findings is needed, cognitive changes experienced during and after treatments for early-stage breast cancer may not be treatment-induced. Future studies need to longitudinally assess patients and exploration of alternative mechanisms for cognitive complaints in breast cancer patients is warranted.

Correspondence: Sarah K. Lageman, Ph.D., Psychiatry and Psychology; Mayo Clinic, 200 First Street SW, West-11, Rochester, MN 55905. E-mail: lageman.sarah@mayo.edu

C. LOWE, K. MILLER, S. ROGERS & G. SMALL. Understanding the Efficacy of Treatment on Neurocognitive Performance Among Individuals Classified as Subclinical Hypothyroid.

Objective: Treatment for Subclinical Hypothyroidism is controversial and often left untreated given normal levels of Free Thyroxine (FT4), but with elevated Thyroid Stimulating Hormone (TSH). However, our study (Miller et al., 2006) indicated significant neurocognitive deficits among individuals with SCH compared to controls. Yet, it is unclear whether treatment for SCH may be efficacious to help improve cognition. This abstract attempts to understand whether untreated SCH individuals performed better on neurocognitive tests than individuals classified as controls who received treatment.

Participants and Methods: A total of 207 participants (10 SCH and 17 Controls; M age = 66 years; M education = 16 years) completed a full neuropsychological battery and testing for thyroid lab values. SCH was defined as high TSH (>4.0 mIU/L) and normal FT4 (4.5 – 10.5 mcg/dL). Univariate analyses were conducted to understand the efficacy of medication.

Results: Main effects were found for SCH status and history of medication indicating decreased performances on Logical Memory F (1, 193) = 7.46, $p < .05$, Rey-O Copy F (1, 193) = 5.33, $p < .05$ and on Trails B F (1, 172) = 22.57, $p < .01$. On Trails B, a main effect was also found for history of medication with no SCH status F (1, 172) = 24.29, $p < .01$.

Conclusions: The results suggest that treating SCH may not be efficacious for all neurocognitive performances. Specifically, individuals who received treatment whether classified as a normal control or as SCH may have subtle executive difficulties. These results warrant further investigation concerning the efficacy of thyroid medication on cognition.

Correspondence: Charmaine Lowe, M.A., Fuller Theological Seminary, 250 North Oakland Avenue #8, Pasadena, CA 91101. E-mail: charis1188@aol.com

C. LOWE, K.J. MILLER, S.A. ROGERS & G. SMALL. Comparing Differences in Neurocognition Among Individuals Classified with Subclinical Hypothyroidism.

Objective: Subclinical hypothyroidism (SCH) has been considered a benign condition by some in the medical community given normal levels of FT4 but clinically elevated levels of Thyroid Stimulating Hormone (TSH). Our recent study (Miller et al., 2006) documented differences between individuals classified with SCH and normal controls with deficits on verbal memory, visual spatial ability, and executive functioning. However, the effect of gender on SCH was not studied. This poster will examine gender as a possible factor on neurocognition among males and females classified as SCH.

Participants and Methods: A total of 207 participants (M age = 66 years; M education = 16 years) completed a neuropsychological battery and testing for thyroid lab values. SCH (4 males, 8 females) was defined as high TSH (>4.0 mIU/L) and normal FT4 (4.5 – 10.5 mcg/dL). T-test analyses were utilized to understand the differences between groups.

Results: No significant gender differences were found between SCH male and females. However, significant differences were found within male SCH and controls on Trails B $t(62) = -3.38$, $p < .01$. Comparisons within female SCH and controls yielded differences in Logical Memory $t(112) = 2.78$, $p < .05$, Rey-O Copy $t(112) = 3.43$, $p < .01$, and Stroop Interference $t(106) = -2.34$, $p < .05$.

Conclusions: The results suggest possible gender specific deficits in neurocognitive functioning among individuals classified as SCH. Additionally, within subject comparisons among males and females suggest an association with executive functioning tasks. These findings warrant further investigation on the relationship between gender effects and neurocognition among SCH individuals.

Correspondence: Charmaine Lowe, M.A., Fuller Theological Seminary, 250 North Oakland Avenue #8, Pasadena, CA 91101. E-mail: charis1188@aol.com

S. MOONEY, R. HILSABECK, A. GODICK, F. BARAKAT, M. CARLSON, D. OLIVER, E. VAN KLEEK, D. OWENS, P. GOSH, D. KELLER, T. TAYLOR, D. KALMAZ, E. ALPERT, J. WINN, T. HASSANEIN & W. PERRY. Utility Of The Brief Visuospatial Memory Test-Revised Copy Trial And Hopkins Verbal Learning Test In Staging Hepatic Encephalopathy.

Objective: Hepatic encephalopathy (HE) is a potentially life-threatening complication of cirrhosis for which early detection and treatment is paramount. Although it has been recommended that neuropsychological measures be used to detect the milder stages of HE, it is unclear which measures are best able to discriminate between minimal HE (i.e., grade 0) and the beginnings of overt HE (i.e., grade 1). Toward this end, we tested the utility of the Brief Visuospatial Memory Test-Revised copy trial (BVMTRC) and Hopkins Verbal Learning Test (HVLTL).

Participants and Methods: Participants were 37 cirrhotic patients with an average age and education of 50.6 and 11.7 years, respectively. HE grade was diagnosed by hepatologists; 25 were identified as grade 0 and 12 as grade 1.

Results: Patients in HE grades 0 and 1 did not differ significantly in age or education. The only neuropsychological measure on which they differed was the HVLTL discrimination index. Linear discriminant function analyses (DFA) indicated that BVMTRC displayed poor sensitivity in detecting HE grade 1 ($R^2 < .004$; 48% sensitivity). Stepwise DFA of HVLTL summary scores indicated that a combination of the discrimination index and total words recalled following a delay successfully classified 77.5% of cases ($R^2 = .24$).

Conclusions: The BVMTRC displayed poor sensitivity when used to identify the mildest form of overt HE, while the HVLTL discrimination index and delayed recall score displayed modest sensitivity. Additional research is needed to confirm these findings in a larger sample and to assess the relative utility of other measures in detecting mild HE.

Correspondence: Scott Mooney, PhD, Wayne State University, 261 Mack Avenue, Suite 555, Detroit, MI 48201. E-mail: scottryanmooney@yahoo.com

F. OKCU, A. RENFRO, B. DINU, L. ZHANG, N. JAIN, J. YAN, L. BOMGAARS, S. BOTTOMLEY, Z. DREYER, P. BROUWERS, D. MAHONEY & K.R. KRULL. Neurocognitive Functioning Related to Glutathione S-Transferase Polymorphisms in Childhood Acute Lymphoblastic Leukemia Survivors.

Objective: Many children who survive acute lymphoblastic leukemia (ALL) suffer from neuropsychological dysfunction. Methotrexate (MTX) use is often associated with attention disorders and slowed information processing speed. Free oxygen radical mediated damage secondary to increased homocysteine and folate depletion may be a potential cause. We hypothesized that folate pathway and glutathione S-transferase (GST) polymorphisms may explain individual variation in developing neurocognitive problems ALL therapy.

Participants and Methods: Fifty-seven survivors of childhood ALL (mean time off therapy 49 months) completed a battery of neurocognitive tests measuring focused attention and processing speed [Trail Making (TMT) A and B], verbal working memory (Digit Span), fine motor speed and dexterity (Grooved Pegboard) and expressive language (Verbal Fluency). No patient received cranial irradiation. We performed peripheral blood DNA genotyping for 5, 10-methylenetetrahydrofolate reductase [(MTHFR) (C677T and A1298C)], GSTM1, GSTT1 and GSTP1 (A1404G and C2294T) polymorphisms.

Results: Two-sample t-test and ANOVA were used to compare the average scores for the genotypes. Mean age at diagnosis was 48 months (range 8 - 109 months). Compared to patients with the GSTP1 "Not AA" genotype, patients with the GSTP1AA genotype scored higher on 3 of the 6 tests administered, including all measures of processing speed. After adjustment for age at diagnosis, patients with GSTP1AA displayed a significantly higher score on a measure of rapid shifting attention (TMT B).

Conclusions: MTHFR was not related to performance on neurocognitive measures. However, preliminary data suggest GSTP1 polymorphisms are related to performance on these measures. Although the difference between groups is small, the uniformity of the relationship direction for measures of processing speed supports the association. Validation in a larger study is underway.

Correspondence: *Kevin R. Krull, Ph.D., Child Psychology, Baylor College of Medicine, 6621 Fannin, CC 1630, Houston, TX 77030-2399. E-mail: kkrull@bcm.tmc.edu*

B. PATRY & B. COLLINS. Relationship Between Self-Reports of Cognition, Emotion, and Fatigue and Objective Cognitive Change Following Chemotherapy in Breast Cancer Patients.

Objective: Breast cancer patients' subjective reports of cognitive dysfunction post-chemotherapy ("chemo fog") have tended to correlate better with psychological distress than with objective cognitive performance. We hypothesized that self-reported cognitive dysfunction captures change from some previously higher level of function that might not be reflected in static test scores. The main goal of this study was to evaluate whether perceived cognitive dysfunction one year post-chemotherapy was related to the degree of objective cognitive change since pre-treatment baseline.

Participants and Methods: Chemotherapy-treated breast cancer patients ($n = 45$) completed a comprehensive neuropsychological assessment prior to, and one year following, treatment. The Alertness subscale of the Sickness Impact Scale was used to measure subjective cognitive function. Psychological distress was assessed with the Profile of Mood States depression and tension/anxiety subscales.

Results: Mean domain-specific and global neuropsychological summary scores were higher at follow-up than baseline, presumably due to a practice effect. Lower subjective cognitive ratings were associated with less improvement in a verbal memory summary score ($p = .022$), with a trend toward significance for the global score ($p = .057$). Psychological distress was related to perceived, but not objective, cognitive change.

Conclusions: This study is one of the first to show a significant correlation between self-reported cognitive function and objective neuropsychological test performance in chemotherapy patients. This may be because change in function was considered rather than static post-treatment test scores. Chemotherapy patients who perceived a greater degree of cognitive change reported higher levels of depression and anxiety, regardless of the actual change.

Correspondence: *Brigitte Patry, MA, Psychology, University of Victoria, 1526 Aline Avenue, Ottawa, ON K4A 3Y7, Canada. E-mail: bpatry@uvic.ca*

J.R. SADEK, S. PERGAM, L. ECHEVARRIA, L.E. DAVIS, D. GOADE, R. NOFCHISSEY, J. HARNAR, S. ARGUELLO, P. ETTESTAD, M. SEWELL, J. HARRINGTON, T. TESHIBA & K.Y. HAALAND. West Nile Virus Infection Can Produce Mild Chronic Neuropsychological Deficits.

Objective: We aimed to measure neuropsychological deficits due to West Nile Virus (WNV) infection. WNV was first studied in 1937 in Uganda and first reported in the U.S. in 1999. West Nile Neuroinvasive Disease (WNND) is most commonly characterized by encephalitis or meningitis, while West Nile Fever (WNF) produces milder symptoms, which can include altered mental status. Studies of self-report have shown that a significant proportion of WNND patients report cognitive complaints up to 1-year post-discharge. In an earlier study (Haaland et al., 2006), we used the Telephone Interview for Cognitive Status (TICS) to objectively evaluate cognitive function in 117 adults reported as WNV-positive in New Mexico in 2003. Those classified with a diagnosis of WNND were mildly impaired relative to the WNF group.

Participants and Methods: In the current study, a neuropsychological evaluation was conducted on a subset of patients who were previously administered the TICS ($N=40$) between 1 and 2 years post-diagnosis. Subjects were included if they had neurological symptoms or did not perform within normal limits on the TICS. The neuropsychological test battery included 10 measures, categorized into four domains: memory, attention, executive function and psychomotor speed.

Results: Mean T-score across all tests (mean = 43.7, SD = 7.4) was consistent with low average functioning overall. However, 53% of the patients were impaired in at least two cognitive domains, with impairment defined as one domain test with $T < 35$ or two or more tests with $T < 40$.

Conclusions: These results extend our earlier findings, and suggest that WNV can produce chronic cognitive deficits.

Correspondence: *Joseph R. Sadek, Ph.D., Behavioral Health, VA New Mexico, 1501 San Pedro SE, (116), Albuquerque, NM 87108. E-mail: jsadek@unm.edu*

T.L. VERAMONTI, C. PAPPAS, C.A. MEYERS & J.S. WEFEL. Factor Analysis of the Functional Assessment of Cancer Therapy-Brain module in a Primary Brain Tumor Population at Time of Diagnosis.

Objective: The routine assessment of quality of life (QOL) in brain tumor patients has been recommended as "standard of care" by the NCI/NINDS Brain Tumor Progress Review Group (2000). QOL measures can afford opportunities for monitoring adverse consequences of brain cancer and its treatment and for identifying interventions to reduce patient burden. The Functional Assessment of Cancer Therapy (FACT) is a QOL measure with demonstrated reliability and validity developed to assess the physical, emotional, functional, and social consequences of cancer. The 19-item Brain module (FACT-Br) was subsequently developed to capture the unique neurologic and neurocognitive difficulties encountered as a consequence of brain tumors and their treatment. The FACT-Br is diverse in content and appears to offer a face valid assessment of several meaningful QOL variables affecting brain tumor patients including, neurocognitive complaints (e.g., forgetfulness), neurologic symptoms (e.g., seizures), and functional limitations (e.g., ability to drive). However, validation of this clinical impression through factor analysis has not been performed.

Participants and Methods: In the present study, we conducted an exploratory, principal axis factor analysis of responses from 119 pre-treatment brain tumor patients to the FACT-Br.

Results: A five-factor solution emerged after varimax rotation and cumulatively accounted for 48% of the variance in the 19 items.

Conclusions: Factor loadings, communalities, and percent of variance explained by each factor are presented and the factor solution is examined with regards to clinical applicability. The factor structure was not consistent with clinical impressions regarding item associations. Caution is warranted in the clinical interpretation of these items based solely on their face validity.

Correspondence: Tracy L. Veramonti, Ph.D., U.T. M.D. Anderson Cancer Center, PO BOX 301402, Houston, TX 77230-1402. E-mail: tveramo@mdanderson.org

J. WEFEL, T.L. VERAMONTI, E. BRUERA, S.D. DAVENPORT & C.A. MEYERS. Cognitive Outcomes of a Pilot Trial Examining Donepezil for the Treatment of Opioid-induced Sedation in Cancer Patients.

Objective: For patients with cancer pain, sedation is a frequent and serious side effect of treatment with opioid analgesics. Psychostimulants are amongst the strategies proposed for management of opioid-induced sedation and previous research has demonstrated the benefit of Methylphenidate for both reducing fatigue and increasing cognitive functioning in patients with cancer pain. However, use of Methylphenidate is limited by concerns about cardiovascular safety, addiction, behavioral changes, and the development of tolerance. Recently, Bruera and colleagues (2003) demonstrated improvement of sedation, fatigue, psychological symptoms, anorexia, and sleep disturbance in 20 cancer patients with opioid-induced sedation who were given donepezil (5mg) daily for seven days. The current study reports the cognitive outcomes associated with this trial.

Participants and Methods: A brief neuropsychological assessment of cognitive functioning was performed at baseline and day 7 in 12 of the 20 patients from the Bruera (2003) study. Improvement was determined through application of the Reliable Change Index for each measure, which controls for improvement related to practice-effects.

Results: After one week of treatment, 50% of patients showed improved cognitive functioning that exceeded the Reliable Change Index. Stable or improved cognitive functioning was most frequently seen on tests of attention and processing speed, while verbal learning generally remained stable or declined. Although 83% of patients showed improvements in fatigue as measured by the Functional Assessment of Cancer Therapy – Fatigue module, there was no significant correlation between such improvements and cognitive functioning ($p > .40$).

Conclusions: This small pilot trial suggests donepezil is an effective therapeutic alternative for the management of sedation and cognitive dysfunction in patients receiving opioid analgesics for pain. Larger, randomized controlled trials appear warranted.

Correspondence: Tracy L. Veramonti, Ph.D., U.T. M.D. Anderson Cancer Center, PO BOX 301402, Houston, TX 77230-1402. E-mail: tveramo@mdanderson.org

F.M. WOON & R.O. HOPKINS. Cognitive Outcome Following Carbon Monoxide Poisoning: A Review of the Literature.

Objective: Carbon monoxide (CO) poisoning results in brain injury, cognitive and neurobehavioral deficits. We conducted a systematic review of all studies from 1995 to 2005 evaluating neuropsychological outcomes following CO poisoning.

Participants and Methods: PubMed and PsycINFO databases were searched and reference lists from relevant articles were evaluated. Inclusion criteria were CO poisoned populations in which cognitive outcomes were measured using standard neuropsychological tests. Two authors independently reviewed and extracted all data. Eighteen group (979 participants) and 16 case studies (35 participants) met inclusion criteria.

Results: The mean age for the group and case participants was 38 and 40 years, respectively. The mean carboxyhemoglobin level for the group and case studies was 23.1% and 23%, respectively. Loss of consciousness occurred in 20.1% (295/979) of group studies and 42.9% (15/35) of the case studies, range of 10.8% to 100% of studies. Cognitive impairments occurred in multiple cognitive domains and were heterogeneous regarding onset, severity, and cognitive domain affected. Of the group studies 12 studies reported impairments in memory, 7 attention,

7 motor impairments, 5 executive dysfunction, 5 slow mental processing speed and 5 studies reported impaired visual spatial abilities. Of the case studies 30 studies reported impairments in memory, 21 executive dysfunction, 18 attention, 16 motor impairments, 13 visual spatial deficits, and 10 studies reported slow mental processing speed.

Conclusions: While memory impairments were the most common deficit, a consistent pattern of deficits or a “CO syndrome” was not observed. CO poisoning is common, often goes unrecognized and may result in significant cognitive morbidity.

Correspondence: Fu Lye (aka Martin) Woon, Brigham Young University, 1200 Terrace Dr. #123, Provo, UT 84604. E-mail: fliszt74@gmail.com

T. YAMADA, A.R. KAUP, A. LALOGGIA, M.D. MCCOY, S.K. SHIV-APOUR, B.A. TALLMAN, B.K. LINK, J.E. WOOLDRIDGE, E.M. ALTMAIER & N.L. DENBURG. Neuropsychological Functioning Predicts Psychosocial Well-Being Among Older Cancer Survivors.

Objective: Recent studies have shown that individuals perceive positive outcomes as a result of illness or trauma, but none have considered the contribution of neuropsychological status to such outcomes. This study examines the relationship between psychosocial well-being via post-traumatic growth, social support, optimism, adaptive functioning, and locus of control, in relation to neuropsychological status, in a group of otherwise healthy cancer survivors. We hypothesized that cognition and mood would be positively associated with psychosocial well-being.

Participants and Methods: Forty older follicular lymphoma survivors ($M = 67.0$; $SD = 9.4$; range 55-85 years) who received adjuvant chemotherapy at least 18 months prior to data collection were administered a 2.5-hour neuropsychological battery, in addition to five self-report questionnaires (Posttraumatic Growth Inventory, Social Provisions Scale, Life Orientation Test-Revised, Functional Assessment of Chronic Illness Therapy-General, and Multidimensional Health Locus of Control).

Results: Participants with higher self-reported psychosocial well-being performed better on the cognitive tasks. In particular, performance on tests measuring attention, concentration, and executive functioning were highly and positively associated with psychosocial well-being (based on correlational analyses and independent samples t -tests). Similarly, from an emotional perspective, Beck Depression Inventory scores were negatively associated with the psychosocial measures. Demographic variables such as age and education did not significantly impact the variables of interest.

Conclusions: In summary, neuropsychological functioning, specifically cognitive abilities dependent on frontal-subcortical brain regions, as well as mood, appear to predict psychosocial well-being for older adult cancer survivors. Implications of our findings are discussed.

Correspondence: Torrii Yamada, Department of Neurology, University of Iowa, 2101 RCP, 200 Hawkins Drive, Iowa City, IA 52242. E-mail: torricia-yamada@uiowa.edu

Multiple Sclerosis/ALS/Demyelinating Diseases

F. BARWICK & P. ARNETT. Stress, Coping, and Intellectual Decline in MS.

Objective: Intellectual decline occurs in some multiple sclerosis (MS) patients, something that may make it more difficult for them to cope effectively with stress. To evaluate this possibility, we compared coping strategies, stress levels, and depressive and anxious symptoms in MS patients showing evidence of intellectual decline with those showing no decline. We hypothesized that the intellectual decline group would report more anxiety and depression, and use more maladaptive coping strategies.

Participants and Methods: Current WAIS-R FSIQ was assessed for 97 MS patients using the Shipley Institute of Living Scale. WAIS-R premorbid IQ was estimated from the Barona-Chastain demographic formula. An “Intellectually Declined” group ($n = 17$) had current IQ at least 10% below premorbid estimates. An “Intellectually Maintained” group ($n = 41$) had current IQ at or above premorbid estimates. Remaining patients comprised a “middle” group ($n = 38$). Coping strategies were assessed using the COPE Inventory, stress levels were measured using the Hassles and Uplifts Scales (HSUP), and depressive and anxious symptoms were measured using the Chicago Multiscale Depression Inventory (CMDI) and State-Trait Anxiety Inventory (STAI), respectively.

Results: Planned comparisons following a significant group effect ($p < .05$) in the MANOVA revealed significantly higher scores in the Intellectually Declined compared with the Intellectually Maintained group on avoidance coping ($p < .01$), combined mood-evaluative depression ($p < .05$), and trait anxiety ($p < .05$). No significant differences between groups appeared on the HSUP, but surprisingly, the Intellectually Declined group reported fewer hassles.

Conclusions: Our data suggest that MS patients who experience intellectual decline use more maladaptive avoidance coping strategies compared to MS patients experiencing no decline. Increased use of potentially maladaptive coping strategies may put these patients at greater risk for anxiety and depression despite their reported lower stress levels.

Correspondence: *Fiona H. Barwick, BA, psychology, pennsylvania state university, 522 bruce v. moore building, college of liberal arts, university park, PA 16802-3105. E-mail: fhb103@psu.edu*

M. BASSO, D. COMBS, I. SHIELDS, T. WARD, V. TRACY, R. SHIELDS, B. BAUGHMAN, P. CANDILIS & J. JOHNSON. Facial Affect Recognition in Multiple Sclerosis.

Objective: Neurobehavioral deficit is common in multiple sclerosis (MS), but disease effects on social cognition are uncertain. Social cognition models assert that emotion perception is necessary for interpersonal relations, and frontal lobe structures are important neural substrates for this function. Beatty et al. (2003) found impaired perception of prosody in a subset of patients, but no investigation has studied facial affect perception in MS. The present investigation assessed facial affect recognition in MS, and examined its neurobehavioral correlates.

Participants and Methods: 33 people with MS were administered Ekman’s Facial Emotion Identification Test (FEIT). Benton’s Facial Recognition Test (FRT) was administered to measure discrimination of facial features. Participants also completed a broad battery of neuropsychological tests.

Results: On the FEIT 30% of the MS patients performed at least 1 SD below normal, and 15% scored 2 SD lower normal. Thus, facial affect recognition was poor in a substantial subset of the sample. Scores on the FEIT and FRT were correlated with measures of neuropsychological function. FEIT, but not FRT scores correlated significantly with measures of executive function (range .3 - .5). FRT scores correlated with measures of new-learning.

Conclusions: To our knowledge, this is the first study to demonstrate impaired facial affect recognition in MS. This deficit corresponded with impaired executive function and working memory, whereas perception of facial features did not. Rather, FRT scores correlated with memory. This pattern of data supports assertions that frontal regions are the neural substrate for facial affect recognition. Implications of these data for future research and clinical practice are discussed.

Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

B. BAUGHMAN, M. BASSO, T. WARD, R. SHIELDS, I. SHIELDS, V. TRACY, P. CANDILIS, J. JOHNSON, D. COMBS & P. ARNETT. Doing Not Alliterating or Categorizing: Verb/Action Fluency Predicts Functional Impairments in MS Whereas Literal and Semantic Fluencies Do Not.

Objective: Prior research indicates that depression, fatigue, pain, and physical disability contribute to poor functional outcomes in multiple sclerosis (MS). Despite these findings, few studies have examined the effects of cognitive dysfunction on quality of life. In studies of other neurological conditions, executive function, especially as indexed by measures of verbal fluency, correspond with impaired functional outcomes (Woods et al., 2006). As yet, no investigation has addressed this issue in MS. Accordingly, this study evaluated whether executive function, as measured by verbal fluency, predicts functional outcomes in MS.

Participants and Methods: 32 patients (25 females, 7 males) with multiple sclerosis were completed multiple measures of quality of life and general physical and emotional status. Independent variables consisted of age, sex, education, a measure of ambulation, and four separate measures of verbal fluency (phonemic fluency, semantic fluency, semantic switching, and verb/action fluency). These variables were simultaneously entered into a forced entry regression equation.

Results: Measures of ambulation and verb/action fluency emerged as the most robust predictors of quality of life. Ambulation predicted physical and emotional status as well as functional incapacity. Verb/action fluency predicted physical function, subjective pain estimates, social function, and emotional status, as well as functional incapacity. Literal and semantic fluency failed to account for significant variance.

Conclusions: Similar to research in other clinical conditions, the present study replicated found that verb/action fluency predicts functional outcomes, but literal and semantic fluency do not. Verb/action fluency may serve as a sensitive indicator of executive dysfunction and functional outcomes in MS. Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

I. SHIELDS, M. BASSO, R. SHIELDS, T. WARD, V. TRACY, B. BAUGHMAN, P. CANDILIS, J. JOHNSON, D. COMBS & P. ARNETT. Personality and Dysexecutive Symptoms in Multiple Sclerosis.

Objective: Ability to self-regulate behavior is diminished in multiple sclerosis (MS), and these deficits may correspond with abnormal personality function (Benedict et al. 2004). This presumably reflects frontal-subcortical dysfunction. However, the relationship between dysexecutive symptoms and personality has not been addressed in people with MS.

Participants and Methods: 20 individuals with MS were administered the NEO Five-Factor Inventory (NEO-FFI). To assess dysexecutive syndrome, participants completed the Frontal Systems Behavior Scale (FrSBe). To examine the relationship between dysexecutive syndrome and personality, FrSBe scores were correlated with NEO domain scores.

Results: Scores on the FrSBe ranged from -2 SD to +5 SD from normal, and averaged from +.5 SD (disconstraint) to +2 SD (apathy). NEO scores ranged from -2.4 to +2.4 around normal, and approximated normal scores. Thus, the sample had a wide range of dysexecutive symptomatology and personality variation. Neuroticism correlated positively with severity of apathy and total score on the FrSBe. In contrast, conscientiousness correlated inversely with apathy and total score on the FrSBe. Correlations ranged from .42 to .49.

Conclusions: These findings imply that as neuroticism increases in MS, increasing apathy and greater tendency towards dysexecutive behaviors occurs. In contrast, more conscientious MS patients are less apathetic and prone to better self-regulation. Because FrSBe scores were abnormal, this presumably reflects MS-related dysfunction. Average NEO-scores were average, implying no disease-relevant change in personality, thereby suggesting that pre-morbid personality may predict how patients may manifest dysexecutive symptoms. Yet, these hypotheses are limited by their cross-sectional nature. Implications of these findings for practice and future research are discussed.

Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

V. TRACY, M. BASSO, I. SHIELDS, R. SHIELDS, T. WARD, B. BAUGHMAN, P. CANDILIS, J. JOHNSON, D. COMBS & P. ARNETT. Neuropsychological Deficits Predict Impaired Functional Outcomes in Multiple Sclerosis.

Objective: Research indicates that patients with multiple sclerosis (MS) report lower quality of life and have difficulty in daily functioning. Factors contributing to functional impairments are not entirely understood. One factor that has received modest attention is neuropsychological impairment. Cognitive deficits are common in MS, and related literature involving other neurological conditions implies that neuropsychological impairments diminish functional outcomes. Yet, this issue has received scant attention in MS. Towards this end, the present study examined the relationship between neurobehavioral impairment and functional outcomes in MS.

Participants and Methods: 33 people with MS were administered a battery of neuropsychological tests which included measures of executive function, working memory, language and new learning. Additionally, measures of activities of daily living and functional outcomes were administered. Mobility was assessed with the ambulation index. Number of impaired neuropsychological test scores, ambulation index, age, and education were forcibly entered into a multiple regression to predict functional outcomes.

Results: Neuropsychological impairment predicted poor social functioning and mental health functioning, and semi-partial correlations exceeded .3. Poor mobility also predicted poor social functioning and need for environmental modifications.

Conclusions: Neuropsychological impairment was shown to be a significant and potent predictor of functioning, especially in the areas of social functioning and mental health. This implies that cognitive deficits in MS may diminish patients' ability to engage and maintain social relationships and regulate emotional distress. This occurs independently of mobility deficits. Implications for clinical practice and future research will be discussed.

Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

J.E. BEENEY & P.A. ARNETT. Stress and Affective Memory Bias Interact to Predict Depressive Symptoms in Multiple Sclerosis.

Objective: This study investigates the moderating effect of cognitive schema on the relationship between stress and depression in individuals with Multiple Sclerosis (MS). A small number of studies support the relationship between cognitive schema and depression, and stress and depression amongst individuals with MS. However, dominant theories of depression in the general depression literature specify that stressful life events will activate depressogenic cognitive schemas, leading to depression. Likewise, a recent model of depression suggests that cognitive schema moderate the effect of several common factors in MS, including stress, on depression.

Participants and Methods: Ninety-three participants were administered the Affective Reading Span Task (ARST), a performance-based measure of affective memory bias as a measure of cognitive schema and the Hassles and Uplifts Scale, a self-report measure of everyday stress.

Results: Results support both direct effects of memory bias and stress on depression, as demonstrated in other studies, and a significant interaction between stress and memory bias in explaining variance in depressive symptomology ($p < .01$). After main effects accounted for over 13 percent of the variance in depression scores, the interaction explained

an additional 8.5 percent. The nature of the interaction was such that individuals with high stress reported greater depressive symptomology if they also evidenced a negative memory bias, while a positive bias, even in the face of high stress, appeared to buffer against depressive symptoms.

Conclusions: The results support the hypothesis that cognitive schema moderates the relationship between stress and depression in MS. The study also provides further evidence that cognitive theories of general depression may be applicable to depression in MS, and supports a portion of a recent model of depression in MS.

Correspondence: *Joseph E. Beene, BA, Joseph Beene, The Pennsylvania State University, 1051 Teaberry Lane A12, State College, PA 16803. E-mail: jeb425@psu.edu*

C. CHRISTODOULOU, P. MELVILLE, W.F. SCHERL, W.S. MACALLISTER, R.L. ABENSUR & L.B. KRUPP. Affective Symptoms Predict Subsequent Neuropsychological Change in Multiple Sclerosis.

Objective: To determine if baseline neuropsychological, psychological, and clinical measures predict one year change in neuropsychological performance in multiple sclerosis (MS) patients.

Participants and Methods: Participants were 37 individuals with definite MS (median EDSS = 3.5, range 1 - 7) without major depression. Their mean age was 43.9 years (SD = 9.6) and mean education was 14.7 years (SD = 2.1). Most were women (54.1%). Their disease course was relapsing remitting (70.3%), secondary progressive (24.3%), and primary progressive (5.4%). Subjects were tested at baseline and year 1 in an ongoing longitudinal study of cognition in MS. Participants completed the Brief Repeatable Battery and additional measures of executive functions (D-KEFS Sorting) and visuospatial abilities (Judgment of Line Orientation). An unweighted mean Z score of neuropsychological scores measured overall cognitive function. They also completed self-report measures of depression, anxiety, fatigue, apathy, and positive and negative affect. Preliminary analyses assessed predictors of overall cognitive change (year 1 Z score - baseline Z score).

Results: Baseline negative affect measures showed relatively consistent correlations with cognitive change from baseline to one year, including: Chicago Multiscale Depression Inventory Mood Subscale ($r = -.449, p = .005$), Center for Epidemiologic Studies Depression Scale ($r = -.332, p = .045$), Positive and Negative Affect Scale Negative Affect ($r = -.358, p = .030$), State Trait Anxiety Inventory State Scale ($r = -.417, p = .010$). Baseline neuropsychological performance, positive affect, apathy, and fatigue did not correlate significantly with cognitive change.

Conclusions: Preliminary analyses showed that measures of negative affect correlated with cognitive change in persons with MS without major depression. Higher levels of negative affect at baseline were associated with relative declines in neuropsychological performance from baseline to one year.

Correspondence: *Christopher Christodoulou, PhD, Neurology, SUNY at Stony Brook, HSC T12-028, Stony Brook, NY 11794-8121. E-mail: christopher.christodoulou@sunysb.edu*

A.M. JOHNSON, L. VELLA & D.C. MOHR. The Effects of Chronic Stress on Memory in Patients with Multiple Sclerosis.

Objective: Exposure to chronic stress has been shown to be related to memory impairment as well as to the progression of multiple sclerosis (MS). The aim of this study was to examine the relationship between chronic stress and memory function in patients with MS and to evaluate employment status as a moderator.

Participants and Methods: 127 MS patients with depression received 16 weeks of telephone-administered cognitive behavioral therapy or supportive emotion-focused therapy and were followed for 12 months post-treatment. Evaluation of neuropsychological function and stress was conducted at baseline, week 16 (end-of-treatment) and 12-month follow-up.

Results: Patients showed a significant reduction from baseline to end-of-treatment in family and financial stress ($p \leq 0.005$). Hierarchical linear multiple regression analyses, controlling for change in depression, found that baseline to end-of-treatment reductions in financial stress were associated with improvements in immediate and delayed recall on Logical Memory from baseline to end-of-treatment ($p \leq 0.038$). The relationship between financial stress and Logical Memory was sustained at 12-month follow-up ($p \leq 0.018$). Employment status moderated the relationship between stressors and Digit Span ($p = 0.004$) such that reduction in family stress was associated with improvement in Digit Span from baseline to end-of-treatment among employed patients. The moderating effect of employment status on the relationship between stressors and Digit Span was sustained for family stress and appeared for financial stress at 12-month follow-up ($p \leq 0.040$).

Conclusions: These findings suggest that stress may impact verbal memory functioning among MS patients in general and that stress may have a greater impact on working memory for employed patients than for patients on disability.

Correspondence: *Andrew M. Johnson, BA, Mental Health, Veterans Affairs Medical Center, 4150 Clement St., 116-S, San Francisco, CA 94121. E-mail: andrew.johnson@ra.gov*

T. MARCOTTE, T.J. ROSENTHAL, E. ROBERTS, S. LAMPINEN, J. SCOTT, R. ALLEN & J. COREY-BLOOM. Driving Performance in Multiple Sclerosis.

Objective: To determine the influence of cognitive function and spasticity on driving performance in patients with multiple sclerosis (MS).

Participants and Methods: Seventeen MS drivers completed a brief neuropsychological (NP) assessment and two driving simulations. Simulation 1 required participants to maintain a constant speed and lane position while attending to a secondary task; Simulation 2 required participants to adjust to lead car speed changes. The MS cohort exhibited a broad range of cognitive functioning and disability (EDDS scores of 3.0 to 7.5). Eight of the MS patients had significant spasticity in their right knee (most proximal to the pedals) based upon the Modified Ashworth Spasticity Scale. Fifteen normal comparison (NC) drivers completed the same driving simulations.

Results: MS patients demonstrated greater variability in lane position ($p < .001$), less ability to respond to changes in lead car velocity ($p < .001$), and drove at higher speeds than the NC participants. Within the MS cohort, in a multivariate model that included NP and spasticity measures, NP functioning was the strongest predictor of variability in lane position during the divided attention task, whereas difficulties in car following (requiring speed changes and more lower limb movement) were best predicted by spasticity scores.

Conclusions: Cognitive and physical impairments associated with MS lead to deficits in specific components of driving, and assessment of these factors may help guide the clinician regarding the types of driving behaviors that would put MS patients at increased risk for a crash.

Correspondence: *Thomas D. Marcotte, PhD, University of California, San Diego, 150 West Washington, 2nd floor, San Diego, CA 92103. E-mail: tmarcotte@ucsd.edu*

B.A. PARMENTER, D.R. DENNEY & S.G. LYNCH. Sex Differences in Verbal Memory in Multiple Sclerosis.

Objective: The prevalence of multiple sclerosis (MS) in women compared to men is approximately two to one. Past research has suggested that men have a poorer prognosis and greater mortality as-

sociated with MS. However, few studies have investigated sex differences in cognitive impairment in this disease. The current study compared men and women on a battery of neuropsychological tests, including measures of learning/memory, language, spatial, and executive abilities.

Participants and Methods: Forty-six men and 194 women participated in the study. Fifty-nine participants were diagnosed with secondary progressive MS and 181 with relapsing-remitting MS. Men had significantly more education ($M = 15.17$ years, $SD = 2.47$) compared to women ($M = 14.31$ years, $SD = 2.05$). However, the two groups did not differ in age, disease duration, type of disease, use of disease modifying medications, or EDSS. The two groups also did not differ on measures of depression, anxiety, or fatigue.

Results: A multivariate analysis of covariance (MANCOVA), with education used as the covariate, showed a significant difference between men and women [$F(9, 181) = 2.01, p < 0.05$] on the cognitive battery. Follow-up analyses of variance (ANOVAs) revealed that the two groups did not differ on measures of language, spatial, or executive abilities. However, compared to women, men performed significantly worse on measures of verbal learning ($p < 0.01$) and verbal memory ($p < 0.01$).

Conclusions: These findings suggest sex is associated with cognitive impairment in MS, and that this may be an important variable to consider when working with patients with this disease.

Correspondence: *Brett A. Parmenter, Ph.D., Psychology, Washington State University, Johnson Tower 354, Pullman, WA 99164. E-mail: parmenter@wsu.edu*

D.M. POLEN & P.A. ARNETT. Learned Helplessness, Coping, and Social Support: Relationship to Depression in MS.

Objective: Individuals with MS consistently show high rates of depression. Shnek et al. (1995) found that a measure of learned helplessness predicted depression better than other attributional measures in these patients, and learned helplessness has been theorized to be a final pathway to depression generally. The present study explored how learned helplessness interacted with two other psychosocial constructs—coping and social support—to predict depression in individuals with MS. The present study also explored the impact of gender on these relationships.

Participants and Methods: Learned helplessness was assessed with the MS Attitudes Index (MSAI), coping was assessed with the COPE (three active and three avoidant coping subscales), social support was assessed with the Social Support Questionnaire (SSQ), and depression was assessed with the Chicago Multiscale Depression Inventory (CMDI; mood and negative evaluative subscales) in 101 definite MS patients.

Results: Correlational analysis revealed that measures of learned helplessness, planning (an active coping index), and social support correlated significantly ($p < .05$) with the CMDI mood and/or negative evaluative subscales. SEM analysis indicated learned helplessness, coping, and social support were best depicted as each significantly independently contributing to depression in MS (15%, 9%, and 24% of variance accounted for, respectively). This was more so the case when avoidant coping indices were removed and an all female sample utilized.

Conclusions: Our results suggest learned helplessness, coping, and social support all independently relate to depression in individuals with MS. Although the cross-sectional nature of these data precludes making causal statements, clinical implementation of these findings suggests psychotherapy focused on improving social support and playful coping, and reducing feelings of learned helplessness, may effectively prevent and/or lessen depression in individuals with MS (especially women). Correspondence: *Dawn M. Polen, PhD, South County Mental Health, 1031 SW 91 Avenue, Plantation, FL 33324. E-mail: Polenpoly@aol.com*

S. ROSENTHAL, L. VELLA, C.M. CATLEDGE & D.C. MOHR. THE RELATIONSHIP BETWEEN OPTIMISM AND NEUROPSYCHOLOGICAL TEST PERFORMANCE IN PATIENTS WITH MULTIPLE SCLEROSIS.

Objective: Optimism, or positive expectancy, has repeatedly been associated with better psychological functioning. However, little work has examined the effect of optimism on neuropsychological performance. The aim of this study was to examine the hypothesis that greater optimism would be associated with improved neuropsychological performance among patients with MS enrolled in psychological treatments that reduced depression and improved optimism.

Participants and Methods: 127 MS patients with depression received 16 weeks of telephone-administered cognitive behavioral therapy or supportive emotion-focused therapy. Optimism was assessed using the Life Orientation Test (LOT) and depression using the BDI. Neuropsychological function, the LOT, and BDI were assessed at pre- and post-treatment.

Results: Paired samples t-test showed a significant improvement in the LOT over treatment ($p < 0.001$). Linear-regression analyses, controlling for baseline predictors, baseline outcomes and depression, found that higher LOT scores at post-treatment were associated with higher scores on the COWAT at end-of-treatment ($p < 0.027$). Contrary to our hypothesis, higher LOT scores at end-of-treatment were associated with lower scores on Digit Span Forward, Digit Span Backward, Digit Span Sum, ($ps < 0.048$) and a similar trend was seen for Letter Number Sequencing at end-of-treatment ($p = 0.051$). Patients' performance on Similarities, Logical Memory, and the CVLT were not found to be significantly related to the LOT ($ps \leq 0.238$).

Conclusions: These findings suggest optimism may not have universally positive effects on neuropsychological performance, as has been seen in others areas of human functioning. It may be that individuals with lower levels of optimism put forth more effort during certain high demand cognitive tasks, while highly optimistic people exert less effort.

Correspondence: *Sheila Rosenthal, B.S., Mental Health, VA Medical Center, 4150 Clement St., San Francisco, CA 94121. E-mail: Sheila.Rosenthal@va.gov*

K. RYAN, L.J. RAPPORT, K. TELMET HARPER, D. FUERST, L. BIELIAUSKAS, R. WHITMAN, R. COLEMAN BRYER & B. WALDRON. Fitness to Drive Among Individuals with Multiple Sclerosis.

Objective: This descriptive study examined relationships between disease characteristics, neuropsychological functioning, unawareness of deficit, external social influences, and fitness to drive among individuals with Multiple Sclerosis (MS).

Participants and Methods: Seventy-eight MS patients participated with a knowledgeable informant. Disease-related indices were obtained from medical records, and cognitive functioning was assessed using a comprehensive neuropsychological battery. Unawareness of deficit was measured as the discrepancy between self-report and informant report of patients' functional abilities. Driving outcomes included whether (status) and how much patients drove, and incidents as documented by Department of Motor Vehicles (DMV) records and participant reports.

Results: 76% of patients were currently driving. Multivariate analyses indicated that illness severity, neuropsychological functioning, unawareness of deficit, and external social influences (e.g., advice from health professionals and caregivers) each made unique contributions to the prediction of driving status. Among drivers, illness severity, neuropsychological functioning, and social influences contributed uniquely to prediction of how much these patients drove. Driving records indicated that accidents were rare, and although a substantial number of patients had committed a traffic violation since the onset of MS, the frequency of these incidents compared favorably to the number committed by their healthy caregivers.

Conclusions: The profile of drivers with MS differs from persons with acutely acquired brain impairment. Few patients with unawareness of deficit continued to drive, yet current drivers included persons with substantial physical and cognitive impairments, and external social influences remained an important predictor of driving habits. The relatively low rate of adverse incidents among drivers may reflect a successful compensatory response to impairment.

Correspondence: *Kelly A. Ryan, Wayne State University, 5057 Woodward, 7th Floor, Detroit, MI 48201. E-mail: kryan@wayne.edu*

N. SESTITO, M.T. SCHULTHEIS, J. ANG & E. ELOVIC. Driving After Multiple Sclerosis: Is There Really a Difference?

Objective: Little attention has been paid to driving performance in individuals with Multiple Sclerosis (MS). Yet the various deficits seen in MS raise questions about driving capacity. This study examined driving performance based on objective (Department of Motor Vehicle (DMV) records) and subjective reports.

Participants and Methods: 54 individuals with clinically-defined MS and 19 matched healthy controls (HC) were included.

Results: Comparison of number of accidents and violations based on DMV did not reveal any significant differences between groups ($F(1,70) = .27, p = .60$). Chi-square analyses were used to examine the influence of driving patterns through measures of self-limitation and driving behaviors. Findings indicated MS drivers were just as likely to drive in hazardous conditions and did not place more limitations on their driving. However, a difference in driving frequency was found, with MS patients driving less days per week ($F(1,71) = 5.34, p = .02$). Because previous research has shown a higher incidence of motor vehicle crashes when cognitive impairment is present, MS patients were divided into cognitive impairment (MS+) and without cognitive impairment (MS-) groups. No differences between groups on number of accidents and violations ($F(2,70) = 4.58, p = .14$) or self-limiting driving behaviors were found. However, post hoc analyses revealed that MC+ patients drove significantly less than HC ($p = .01$).

Conclusions: Results suggest no differences in driving behaviors by individuals with MS, although driving frequency is reduced in those individuals with MS+. This may indicate a level of self-awareness in regards to driving capabilities. The reduced driving frequency may also influence DMV reports, which may not capture a person's driving capacity.

Correspondence: *Nicole Sestito, BA, Psychology, Drexel University, 1214 Daly Street, Philadelphia, PA 19148. E-mail: ns325@drexel.edu*

L.B. STROBER & P.A. ARNETT. The role of disease variables, age, and depression proneness in predicting depression in MS patients.

Objective: To examine the differences in disease variables, age, depression proneness, and reported depression between relapsing remitting and secondary progressive MS patients.

Participants and Methods: Seventy-four (74) Relapsing Remitting (RR) and Eighteen (18) Secondary Progressive (SP) MS patients were given the Beck Depression Inventory-II (BDI-II), Beck Depression Inventory-Primary Care (BDI-PC), Chicago Multiscale Depression Inventory (CMDI) combined mood and evaluative scales, and the Depression Proneness Rating Scale (DPRS). T-tests were used to compare groups.

Results: SP MS patients were older than RR patients ($p < .05$) while having greater symptom duration ($p < .05$), diagnosis duration ($p < .01$), and greater disability ($p < .01$) as measured by the Expanded Disability Status Scale (EDSS). Despite this, there were no differences on any of the depression measures. Stepwise regression analysis predicting CMDI score with illness variables, age, and depression proneness showed that the only significant predictor of depression was depression proneness. Furthermore, depression proneness accounted for about three times the variance in SP patients compared to RR patients ($r^2 = .61$ versus $.20$).

Conclusions: These findings support previous research in which increased age and disease severity have little association with depression in MS. Moreover, it was not age, greater disability, or disease duration that accounted for reported depression, but depression proneness. Our data suggest that clinicians should be aware that depression proneness is highly associated with actual depression, especially in secondary progressive MS patients. Correspondence: *Lauren B. Strober, MS, Psychology, Penn State University, 429 Moore Building, University Park, PA 16802. E-mail: lbs131@psu.edu*

A. TEKOK-KILIC, R. ZIVADINOV, B. SRINIVASARAGHAVAN, D. CARONE, V. YELLA, M. DWYER & R. BENEDICT. Frontal Cortex Atrophy Predicts Defective Learning In Multiple Sclerosis Patients.

Objective: Semi-automated brain region extraction (SABRE) is a new parcellation technique derived from structural MRI. Using SABRE, we previously detected numerous brain regions that are atrophic in MS, and regional gray matter (GM) atrophy was more predictive of MS diagnosis than white matter pathology. In this study we used SABRE to investigate relationships between atrophy in specific regions of the cortex and neuropsychological testing in MS.

Participants and Methods: We studied 64 MS patients. Axial SPGR MRI was obtained and regional gray matter fractions (RGMF) were calculated for 22 regions involving cortex. Neuropsychological testing

included the Paced Auditory Serial Addition Task (PASAT), Symbol Digit Modalities Test (SDMT), California Verbal Learning Test (CVLT-II) and Brief Visuospatial Memory Test-Revised (BVMT-R). We considered total correct scores from the PASAT and SDMT, and Total Learning (TL) and Delayed Recall (DR) memory scores.

Results: There were significant correlations between NP tests and RGMFs. All correlations significant at $p < 0.05$ were carried forward into linear regression models predicting NP tests. Left medial superior frontal region accounted for significant variance in CVLT-II-TL and DR. Right superior and medial inferior frontal regions were significant predictors of BVMT-R TL and DR respectively. Right superior frontal area predicted performance on SDMT and the left superior frontal region predicted PASAT. After accounting for central atrophy (3rd Ventricle Width as covariate), frontal regions were retained in models predicting CVLT-II, BVMT-R and SDMT.

Conclusions: For the first time, we find evidence of additive regression models that include unique variance in cognitive impairment accounted for by both central and cortical atrophy. We also find brain-behavior correlations that are in keeping with previous behavior neurology literature.

Correspondence: *Ayda Tekok-Kilic, Ph.D., Department of Neurology/The Jacobs Neurological Institute, University at Buffalo, Division of cognitive and behavioral Neurosciences, Buffalo general Hospital, 100 High Street, Buffalo, NY 14203. E-mail: atkilic@uludag.edu.tr*

SATURDAY MORNING, FEBRUARY 10, 2007

Paper Session 6

9:00–10:30 a.m.

Adult Imaging

A.B. MOORE, Z. LI, C.E. TYNER & B. CROSSON. Frontal-Subcortical Circuits in Verbal Working Memory: An fMRI Study.

Objective: Past research elucidated a frontal-subcortical circuit for word generation and semantic processing. We built on past findings by examining neural substrates of verbal working memory (VWM) in young adults. In addition to previously reported activity in frontal regions, we hypothesized subcortical structures, (caudate and thalamus), would be active during VWM.

Participants and Methods: Functional (EPI-BOLD) and 3D anatomical (SPGR) MRIs of 5 neurologically normal young adults were acquired at 3T. Using a button press, subjects read and made judgments about the semantic relatedness of 2 words. In the experimental condition (EC) there was a 6s delay between presentation of the words. To minimize rehearsal, the 6s delay was filled with a distractor task. In the baseline condition (BL), the 2 words were presented simultaneously, thereby eliminating the memory component of the task. Statistical parametric maps were generated by a multiple regression analysis. The impulse response function (IRF) for each of the 2 stimulus types (BL and EC) also was generated by a deconvolution algorithm. IRF peak amplitude differences between the BL and EC were compared and regions of brain activity for the EC are reported.

Results: Greater IRF peak amplitude for the EC was observed in the left lateral and medial frontal regions. Subcortical activity was not apparent in the baseline task; as such, peak amplitude comparisons were not conducted for this region. When contrasting the activation map of the EC against the BL, significant activity ($p < 0.01$) was found in the L lateral regions (Brocas area and IFS), L medial frontal regions, putamen, caudate, and thalamus.

Conclusions: There is a frontal-subcortical network supporting VWM. This finding confirms and extends previous studies outlining a frontal-subcortical network for language and semantic processing. Next steps in this line of research are examination of (1) the relative contribution of right hemisphere regions to VWM and (2) change in this circuitry associated with healthy aging.

Correspondence: *Anna B. Moore, Ph.D., Rehabilitation Medicine, Emory University, 1441 Clifton Road, N.E., Room 150, Atlanta, GA 30322. E-mail: abmoore@emory.edu*

N. FITZPATRICK, K.S. CHIOU, J. VESEK, J. WANG, D. GOOD & F.G. HILLARY. Longitudinal Examination of Brain Injury Using Diffusion Tensor Imaging.

Objective: Conventional magnetic resonance imaging (MRI) often underestimates the extent of damage caused by traumatic brain injury (TBI) and cannot adequately characterize the extent of white matter damage. Diffusion Tensor Imaging (DTI), however, has distinct advantages to traditional MRI sequences and has shown promise for examining the extent of lesions in traumatic brain injury (TBI). The purpose of this study is to examine white matter shear injury during the first six months of recovery from severe TBI.

Participants and Methods: Participants included TBI patients ages 18-55 with 24-hour Glasgow Coma Scales from 5-8. All participants signed an IRB approved consent form and underwent scanning using a Phillips 3.0T scanner, acquiring a whole-brain DTI image. Region of interest analyses of lesioned areas were conducted using DTI and a map of fractional anisotropy (FA) was computed for each subject. Images were compared across 3 scans during the first 6 months of recovery to characterize lesion resolution. Fiber-tracking was also used to qualitatively examine lesion resolution and white matter repair.

Results: Early results indicate that FA maps are sensitive to lesion resolution and that fiber-tracking technology is useful for qualitative examination of lesion resolution. These results reveal the sensitivity of DTI for examining longitudinal changes in brain pathology.

Conclusions: The current data indicate that FA mapping in lesioned and peri-lesioned areas is sensitive to detecting lesion resolution during recovery. The current data provide the first longitudinal examination of acute TBI using DTI and may have important implications for integrating information about structural brain changes with cognitive and functional outcomes.

Correspondence: *Neal Fitzpatrick, B.S., Psychology, Pennsylvania State University, 21 Polaris Building, Hershey, PA 17033. E-mail: nmf134@psu.edu*

L.J. JULIAN, D. PELLETIER, M. METCALE, D. MOHR & R. HENRY. Diffusion Tensor Imaging Correlates of Cognitive Functioning in the Earliest Stages of multiple sclerosis (MS).

Objective: Clinically isolated syndrome (CIS) is considered to be the first manifestation of MS. Cognitive impairment has been observed even at this early stage of MS. The first objective of this study is to evaluate cognitive functioning in CIS. The second objective is to evaluate the relationship among cognitive functioning and structural neuroimaging markers including T2-weighted lesion volume (T2-LV) and changes in normal appearing white matter (NAWM) using diffusion tensor imaging (DTI).

Participants and Methods: Participants include 26 (21 female, 5 male) CIS patients [mean age=36.4 (SD=10.4), mean education=14.9 (SD=2.7)]. Cognitive testing at baseline and 1 year included: symbol digit modalities test (SDMT), digit span test (DST), D-KEFS color-word interference test (CW) and card sorting test (CST), verbal fluency (VF), and HVLIT-R (HVLIT Learn and Delay). MRI studies were conducted at 1.5T and markers include: T2-LV and DTI fractional anisotropy (DTI-FA) in NAWM.

Results: Cognitive impairments (defined as ≤ 1.5 SD below normative data) were noted among 23% on CW, 23% on VF, 19% on SDMT, 19% on HVLIT learning and delay, 11% on DST, 5% on CST. At baseline, category fluency was the only cognitive measure associated with T2-LV ($r=0.52$, $p<.05$) and CW was associated with DTI-FA ($r=-0.45$, $p<.05$). Baseline DTI-FA was significantly associated with impairment at Time 2 among a subset with data available (to date $n=12$) on VF ($r=-0.67$, $p<.05$), CW ($r=-.66$, $p<.05$), and total indices impaired ($r=-0.60$, $p=.05$). T2-LV at baseline was not associated with cognitive functioning at Time 2.

Conclusions: These results provide preliminary evidence that cognitive impairments are present early in the course of MS, and are associated with structural changes in NAWM not visible using conventional imaging. Further, early changes in NAWM may be predictive of future cognitive performance after 1 year. These findings are hypothesis generating, and warrant further study to determine if cognition can be an early marker of future prognosis in MS.

Correspondence: *Laura J. Julian, Ph.D., Medicine, University of California San Francisco, 3333 California Street, Suite 270, San Francisco, CA 94143-0920. E-mail: laura.julian@ucsf.edu*

N.M. KLEINHANS, T. RICHARDS, C. JOHNSON, K.C. STEGBAUER, G. DAWSON & E. AYLWARD. Abnormal Amygdala-Fusiform Connectivity in Autism Spectrum Disorders: Relationship to Clinical Severity and Face Memory Performance.

Objective: Social emotional processing deficits are a distinctive, debilitating feature of autism spectrum disorders (ASD), yet links connecting behavioral impairments to neurobiological defects remain unclear. The purpose of this study was to identify neural correlates of social impairment in individuals with ASD.

Participants and Methods: We conducted an fMRI study of face processing; a primary component of social cognition, in 19 high functioning ASD adults and 17 age and IQ matched controls. Perception and recall of neutral faces compared to houses was examined using a one-back working memory paradigm. Standardized face memory testing was

conducted outside the scanner, using the WMS-III: Faces I&II. The FFA was identified in each participant, and used as a seed point for functional connectivity analyses. Degree of synchronization between FFA and bilateral amygdala activation was tested. Clinical severity (ADOS social score) and memory performance were included as orthogonal covariates.

Results: The ASD group performed significantly worse than controls on Faces I (ASD M SS = 7.4; Control M SS = 10.0, $p = .003$) and Faces II (ASD M SS = 7.8; Control M SS = 9.9, $p = .015$). No significant differences in performance were found on the fMRI task. Significant FFA-amygdala connectivity was found in both the ASD and control participants. However, in the controls, better memory performance was correlated to increased connectivity between the FFA and the R amygdala. No relationship was found between memory performance and activation in the ASD group although, greater social impairment was correlated with reduced FFA-R amygdala connectivity.

Conclusions: These results suggest abnormal amygdala-fusiform circuitry in ASD, as evidenced by the atypical relationship between activation and behavioral performance in ASD and the correlation between symptom severity and FFA-amygdala connectivity during face processing. Thus, abnormal neural connections in the limbic system may contribute to the widespread social impairments observed in ASD.

Correspondence: *Natalia M. Kleinhans, Ph.D., Radiology, University of Washington, Box 357115, Seattle, CA 98195. E-mail: nkleinha@u.washington.edu*

Symposium 11

9:00–10:30 a.m.

Holistic Milieu-Oriented NeuroRehabilitation: Philosophical, Clinical and Research Considerations

Chair: Pamela Klonoff

P.S. KLONOFF & L.K. DAWSON. Holistic Milieu-Oriented Neurorehabilitation: Philosophical, Clinical and Research Considerations.

Symposium Description: This symposium will highlight clinical, philosophical and research findings relevant to holistic milieu-oriented neurorehabilitation. The presentations will draw on 20 years of experience, which has culled and refined our understanding of effective techniques to improve patients' independence in the home, community, work and school environments. The first presentation will provide an overview of the major tenets and practices of the milieu approach, with a descriptive overview of individual and group treatment techniques and types of compensatory techniques. Individual and group psychotherapy techniques, with a conceptual model, will be described. The role of family in facilitating and maximizing patients' successful accomplishment and maintenance of goals will be highlighted, based on research and clinical experience. The second presentation will summarize the findings of two research studies conducted at the Center for Transitional NeuroRehabilitation. The first study explores the relationship between pre-injury variables and post-discharge psychosocial status and return to work and driving. The second study evaluates the benefits of Cognitive Retraining exercises for people with brain injuries who return to work and/or school post-discharge. The third presentation will explore innovative research on the phenomenon of change in patients' sense-of-self

post-injury. The development of a sentence completion task and preliminary research results of a pilot study of 42 participants will be described, followed by treatment interventions in individual and group psychotherapy. Lastly, alternative rehabilitation models to the milieu approach will be compared and contrasted, as well as some of the challenges and future directions of milieu-oriented neurorehabilitation.

Correspondence: *Pamela S. Klonoff, Ph.D., ABPP, Center for Transitional Neurorehabilitation, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, 222 W. Thomas Rd., Suite 401, Phoenix, AZ 85013-4496. E-mail: Pamela.Klonoff@chw.edu*

P.S. KLONOFF. An Overview of Milieu-Oriented Neurorehabilitation at the Center for Transitional NeuroRehabilitation.

Objective: This presentation will provide an overview of the major tenets and practices of the milieu approach to neurorehabilitation, drawing on 20 years of clinical experience and research at the Center for Transitional NeuroRehabilitation. A description of the treatment process will be provided, including program admission criteria; treatment staff; nature and goals of individual and group treatment sessions; and, discharge criteria for the Home Independence and Work/School Re-Entry Programs. Integral and unique components of the holistic milieu approach to neurological treatment and recovery will be illustrated. A brief overview of selected group therapies will be provided (e.g., cognitive retraining). The types of compensatory strategies utilized to assist with memory and executive function difficulties will be described (e.g., day planner); Home Independence Checklist; Data Link watch; and procedure checklists. Individual and Group Psychotherapy as avenues to improve patients' awareness, acceptance and realism regarding the effects of their injuries will be described. A conceptual model of psychotherapy with neurological patients will be proposed. The clinical experience of working with families will also be reviewed, including treatment approaches and variables affecting patients' outcomes. Research findings will be provided which emphasize the importance of a positive working alliance with families for patients' progress during and after the rehabilitation process.

Correspondence: *Pamela S. Klonoff, Ph.D., ABPP, Center for Transitional Neurorehabilitation, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, 222 W. Thomas Rd., Suite 401, Phoenix, AZ 85013-4496. E-mail: Pamela.Klonoff@chw.edu*

L. WATT. Outcome and Process Variables in Milieu-Oriented Neurorehabilitation at The Center for Transitional NeuroRehabilitation.

Objective: This presentation describes the findings of two research studies conducted by the milieu-oriented, holistic Center for Transitional NeuroRehabilitation program.

The first study explores the relationship between pre-injury variables and post-discharge psychosocial status and return to work and driving. Findings demonstrate that almost 75% of patients were involved in competitive work and/or school post-injury. Younger age, higher education, non-right hemispheric injury and driving post-injury related to positive work status. Post-injury income was found to decrease significantly and relationship status did not change pre-injury compared with post-injury. Approximately 73% of patients were driving post-injury. Higher education, non-right hemispheric injury, shorter treatment time and return to work were related to return to driving. Participants' pre-injury motor vehicle accident rates related to their post-injury accident rates. The second study evaluates the benefits of Cognitive Retraining exercises for patients with brain injuries who return to work and/or school. Approximately 82% of patients were gainfully employed or at school post-discharge. Empirical quantitative aspects of Cognitive Retraining, including scores on tasks involving speed of information processing and initiation, were related to return to the same level of work without modifications. Qualitative data that assess the patients' ability to improve their level of insight into their capabilities and difficulties, use of compensations, orga-

nizational skills, and ability to "see the big picture" were related to work/school outcome at discharge. Working Alliance (quality of the relationship between patient and family; follow-through on tasks; agreement on therapeutic goals) was related to work/school outcome post-discharge. Correspondence: *Pamela S. Klonoff, Ph.D., ABPP, Center for Transitional Neurorehabilitation, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, 222 W. Thomas Rd., Suite 401, Phoenix, AZ 85013-4496. E-mail: Pamela.Klonoff@chw.edu*

S. MYLES. Changes to Sense-of-Self Post-Brain Injury: Research and Treatment.

Objective: It is recognized in the literature that brain-injured patients often experience "loss of sense-of-self" (LOSS) post-injury. LOSS seems to involve three key factors: (1) a sense on the part of the patient that s/he is somehow "not the same person" as pre-injury; (2) negative self-evaluations about post-injury changes in cognitive, emotional, behavioral, and/or physical functioning; and (3) emotional distress in response to awareness of these changes (the "Catastrophic Reaction"). In neurorehabilitation, an important aim of psychotherapy is to identify and address emotional and behavioral difficulties related to LOSS.

The first part of this presentation describes the background and development of a sentence completion task intended for use in assessing changes in sense-of-self post-brain injury. Preliminary empirical data from a pilot study involving 42 current and former patients of the Center for Transitional Neurorehabilitation (CTN) are reported. Data suggest that in addition to those patients who suffer LOSS post-injury, some patients experience positive changes to their sense-of-self. A frequency analysis of sentence stems identified by participants as being most pertinent to addressing post-brain-injury changes is reported.

The second part of the presentation describes how issues of changed sense-of-self post-brain injury are addressed through Group Psychotherapy in the CTN program. Important steps in guiding patients to develop a new sense-of-self post-injury are awareness, acceptance, and realism. The importance of entering the patient's phenomenological field and the role of exploring important life values are discussed. Examples of therapeutic exercises found to be useful in helping patients to "live their values" are described.

Correspondence: *Pamela S. Klonoff, Ph.D., ABPP, Center for Transitional Neurorehabilitation, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, 222 W. Thomas Rd., Suite 401, Phoenix, AZ 85013-4496. E-mail: Pamela.Klonoff@chw.edu*

M. PEPPING. Treatment Model Comparisons and Directions for Future Research.

Objective: This presentation is intended as a commentary on the intensive milieu model presented today and as a summary overview of the outcome literature on outpatient neurorehabilitation treatment. In particular, specific treatment components and patient characteristics associated with improved long-term outcome after acquired brain injury will be discussed. A brief outline of the strengths and limitations of three common treatment models will be reviewed, starting with the intensive milieu-oriented program discussed today, as well as a comprehensive home and community based model, and a focused vocational model. Factors to consider in finding a "best fit" in program selection will also be discussed. This will include ways to negotiate program approvals, and modify program models in response to marketplace considerations. Finally, suggestions for future research, including a more widespread and systematic use of "waiting group" patients in clinical programs as useful controls for relevant measurable post-acute outcome variables, will be reviewed.

Correspondence: *Pamela S. Klonoff, Ph.D., ABPP, Center for Transitional Neurorehabilitation, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, 222 W. Thomas Rd., Suite 401, Phoenix, AZ 85013-4496. E-mail: Pamela.Klonoff@chw.edu*

Paper Session 7

9:00–10:30 a.m.

Adult Language Functions

K. MARCOTTE, P. VITALI, A. DELGADO & A. ANSALDO. Brain Plasticity in Chronic Anomia: Changes in the Neural Network Following Therapy with Semantic Feature Analysis.

Objective: Anomia is one of the most persistent deficits in aphasia. Semantic feature analysis (SFA) aims at improving naming by modelling the client's spontaneous responses to boost the semantic network and achieve phonological retrieval of the target word. The efficacy of this approach has been consistently reported (Boyle, 2004; Drew et Thompson, 1999; Kiran et Thompson, 2003; Ansaldo et Delgado, 2004). However, the neural structures whose indemnity is required to benefit from this approach remain to be determined. This event-related fMRI study examined the neural substrate sustaining the recovery of naming with SFA, in CM, a participant with chronic and severe anomia.

Participants and Methods: Two stable baselines preceded the experimental phase. A pre-therapy event-related fMRI study during a confrontation naming task was followed by three hours per week of language therapy with SFA, administered during three weeks. Stimuli were pictures depicting objects and action verbs. When CM was unable to name a picture, WH-questions prompted access to semantic features of the target to achieve naming.

Results: SFA resulted in a striking improvement on naming abilities with trained nouns and verbs. Neuroimaging data showed therapy related changes, in line with behavioral improvement. Among them, a concentration of bilateral activations and involvement of both semantic and motor programming related areas, with different networks for naming nouns and verbs.

Conclusions: The results of the present study point to the structures whose indemnity is sufficient for patients to benefit from SFA, and open a new window to the applications of neuroimaging to clinical aphasiology.

Correspondence: *Karine Marcotte, Ph.D. student, Université de Montréal, 4565 Chemin Queen-Mary, Montréal, QC H3W 1W5, Canada. E-mail: karine.marcotte@umontreal.ca*

P.A. ARNETT, M.M. SMITH, F.H. BARWICK, R.H. BENEDICT & B. AHLSTROM. Oralmotor Slowing in Multiple Sclerosis: Relationship to Neuropsychological Tests Requiring an Oral Response.

Objective: Although most neuropsychological batteries used with multiple sclerosis (MS) patients now exclude tests that require significant motor writing speed, many of the most sensitive commonly used measures nonetheless require some type of rapid oralmotor response. The aim of the present study was to examine the extent to which rudimentary oralmotor articulation speed problems in MS patients contribute to performance differences with healthy controls on four commonly used neuropsychological tasks requiring a rapid spoken response.

Participants and Methods: 50 MS patients and 50 healthy controls were administered the PASAT, COWAT, Animal Naming test, and oral Symbol Digit Modalities Test, in addition to measures of rudimentary oralmotor speed known as the Maximum Repetition Rate of Syllables and Multisyllabic Combinations (MRR) tasks.

Results: MANOVAs showed that MS patients performed significantly worse than controls on the MRR tasks ($p < .05$) and the neuropsychological tasks ($p < .005$). Regression analyses showed that the amount of variance accounted for by the group (MS-Control) variable was reduced the following amounts for the tasks when the mean MRR variable was entered before the group variable: Symbol Digit, 10% to 6%;

PASAT, 4% to 2%; COWA, 5% to 2%; Animal Naming, 11% to 7%. Though group effects for the Symbol Digit and Animal Naming remained significant ($p < .05$) when the MRR score was entered first, group variance accounted for was reduced by over a third; the group effects for both the PASAT and COWA were reduced from being significant to non-significant.

Conclusions: Our data suggest that rudimentary oralmotor speed is slowed in MS patients and makes an important contribution to performance differences with healthy controls on commonly used neuropsychological tasks requiring a rapid spoken response. If not taken into consideration when interpreting neuropsychological test results, slowed oral motor speed may result in an over-estimation of cognitive problems in MS patients.

Correspondence: *Peter A. Arnett, Ph.D., Psychology, Penn State University, 522 Moore Building, University Park, PA 16802-3105. E-mail: paa6@psu.edu*

C.A. RACINE, S. AMICI, S.M. BRAMBATI, B.L. MILLER & M.L. GORNO-TEMPINI. Longitudinal Change in Cortical Gray Matter and Neuropsychological Profiles in Three Variants of Primary Progressive Aphasia.

Objective: Primary progressive aphasia (PPA) is a heterogenous clinical syndrome in which language symptoms predominate during the first two years of the disease. Using voxel-based morphometry (VBM) and neuropsychological testing we previously characterized the imaging and clinical profiles of three variants of PPA, progressive nonfluent aphasia (PNFA), semantic dementia (SD), and logopenic aphasia (LPA) (Gorno-Tempini et al. 2004). Briefly, PNFA is characterized by motor speech difficulties, agrammatism, and left frontal/insular atrophy. SD is typified by anomia, semantic loss, and bilateral atrophy of the temporal poles, and LPA is associated with word-finding pauses and left temporo-parietal atrophy.

Participants and Methods: In this study, we examined the longitudinal change in cortical gray matter and neuropsychological profiles in patients diagnosed with PNFA (N=8), SD (N=8), LPA (N=13), and healthy controls (N=29). We used tensor-based morphometry (TBM), a novel imaging methodology that allows for voxel-wise estimation of contraction in cortical gray matter over time.

Results: TBM results indicated a differential pattern of cortical degeneration in each PPA variant. PNFA demonstrated longitudinal decreases in left frontal operculum, SDs showed expected decreases in bilateral temporal lobes, and LPAs showed progression of atrophy in medial temporal and inferior parietal regions. Longitudinal change in neuropsychological performance was consistent with TBM results. Over one year, PNFA showed moderately progressive deficits in fluency and motor speech, SDs had slight progression of naming and comprehension deficits, and LPAs demonstrated decreases in repetition and sentence comprehension.

Conclusions: These results extend our previous work and suggest unique imaging and neuropsychological phenotypes for three variants of PPA. Correspondence: *Caroline A. Racine, Ph.D., Neurology, University of California San Francisco, 350 Parnassus Ave., Suite 706, San Francisco, CA 94143. E-mail: caroline.racine@gmail.com*

C.L. CAREY, S.P. WOODS, K. FREEMAN, V. SAMARINA, B.L. MILLER & J.H. KRAMER. The Cognitive Mechanisms and Neuroanatomical Correlates of Verbal Fluency Impairment in Frontotemporal Dementia.

Objective: Verbal fluency deficits are common in Frontotemporal Dementia (FTD) and consistently discriminate FTD patients from other neurodegenerative diseases. The present study investigated the cognitive mechanisms and neuroanatomical correlates of verbal fluency deficits in FTD, to further elucidate the nature of the impairment.

Participants and Methods: Category (animals) and letter (FAS) fluency was examined in 33 FTD patients and 34 healthy controls. Protocols were scored for total correct words, rule violations, repetitions, average lexicosemantic cluster size, and switches between lexicosemantic subcategories. Fluency variables that discriminated the FTD group from controls were correlated with cognitive tests and brain volumes for bilateral frontal, temporal, and parietal lobes obtained from structural MRI scans that corrected for total intracranial volume.

Results: Consistent with prior research, FTD patients produced significantly fewer correct words than controls on both category and letter fluency. FTD patients also made significantly fewer switches and more repetition errors, but did not differ from controls on cluster size or rule violations. Within the FTD group, category and letter switching deficits were associated with poorer response inhibition, set-shifting, and list learning, but not retention, semantic knowledge, or confrontation naming. Multiple regression analyses revealed that left frontal volumes were the best predictors of both category and letter switching.

Conclusions: FTD-associated verbal fluency deficits are associated with executive dysfunction driven by frontal pathology. Results are consistent with functional neuroimaging findings that implicate the left frontal lobe in switching and may reflect dysfunction in the search for and selection of competing lexicosemantic representations during word retrieval in FTD, rather than a breakdown in lexicosemantic memory stores.

Correspondence: Catherine L. Carey, Ph.D., UCSF, 491 29th Street, San Francisco, CA 94131. E-mail: ktcarey@gmail.com

Poster Session 10: Neurocognitive Functions/Learning Disabilities

9:30–11:00 a.m.

Epidemiology

A.L. JEFFERSON, R. AU, J.M. MASSARO, S. SESHADRI, A. BEISER, E.J. BENJAMIN, P. GONA, M.G. LARSON, C. O'DONNELL, P.A. WOLF & W. MANNING. **Aortic plaque and neuropsychological functioning in the Framingham Heart Study.**

Objective: Few studies have examined relations between aortic atherosclerosis and neuropsychological functioning in community-based samples. Among a dementia-free cohort, we hypothesized that aortic atherosclerosis would be associated with poorer cognitive performance, specifically executive functioning and memory.

Participants and Methods: Participants included 1534 Framingham Heart Study Offspring free from clinical stroke or dementia, ranging 33 to 83 years (59.9±9.1 years; 54% women). Aortic atherosclerosis was detected using cardiac MRI (CMR) and categorized as n-plaque (any aortic plaque) and t-plaque (any thoracic plaque). Dichotomous CMR plaque measures (i.e., presence vs. absence) were related to raw neuropsychological performances, including Logical Memory, Visual Reproduction, Paired-Associates (PA), Boston Naming Test, and Similarities, and to log-transformed performances, including Trail Making Test (A & B) and Hooper Visual Organization Test (HVOT). Multivariable linear regression models adjusted for age, sex, education, systolic blood pressure (BP), body mass index, total/high density lipoprotein, smoking, fasting glucose, triglycerides, diabetes, BP treatment, lipid lowering treatment, and prevalent CVD.

Results: N-plaque (prevalence 47%) was significantly related to PA delayed total recall ($\beta=-0.18$, $p=0.01$) and HVOT ($\beta=-0.01$, $p=0.03$). T-plaque (prevalence 7%) was unrelated to any of the neuropsychological variables.

Conclusions: Our cross-sectional analyses suggest aortic plaque is related to learning and, to a lesser extent, perceptual integration in a community-based sample of middle-aged adults. The lack of an association between t-plaque and cognition may be related to the reduced prevalence of thoracic plaque in our relatively healthy sample. Longitudinal research may provide insights regarding relations between atherosclerosis and neuropsychological changes with age.

Supported by: HC25195, AG08122, NS017950, AG16495, HL070279, HD043444

Correspondence: Angela L. Jefferson, PhD, Alzheimer's Disease Center, Department of Neurology, Boston University School of Medicine, Robinson Complex, Suite 7800, 715 Albany Street, Boston, MA 02118. E-mail: angelaj@bu.edu

Learning Disabilities/ADHD

R. ADAMS, P. FINN, E. MOES, A. GRENGA & A. RIZZO. **A Virtual Reality ADD Classroom and Galvanic Skin Response: A Preliminary Investigation of Response in Children with and without Attention Deficit Disorder.**

Objective: This study investigated the relationship between galvanic skin response and performance on a vigilance task, presented in a Virtual Reality (VR) Classroom, in order to better understand the attention processes underlying error patterns in children with ADHD.

Participants and Methods: Eighteen participants between the ages of 8 and 14 participated in this study. Nine of the participants had been previously diagnosed with Attention Deficit Disorder (ADD), and nine were controls with no diagnosis. Following attachment to a galvanic skin response recorder, participants were placed in an Elumens Dome and presented a vigilance task within a Virtual Reality Classroom. Participants were instructed to press a button each time they saw the letter A followed by the letter K. Data was coded to determine if changes in level of activation (GSR) occurred immediately following the letter A, K, or another letter.

Results: Results indicate a significant negative correlation between galvanic skin response in response to the letter K and the overall percent of correct targets identified in the VR Classroom for the ADD group ($r(9) = -.709$, $p < .05$, but not the control group, $r = .204$, $p > .05$). In addition, a significant relationship was found between galvanic skin response in response to the letter K and the number of omission errors committed during the task for the ADD group only ($r(8) = .741$, $p < .05$).

Conclusions: These results support the hypothesis that increases in arousal reflect awareness of errors, which is discussed in relation to prior research.

Correspondence: Rebecca Adams, B.A., Suffolk University, 113 Cluff Crossing Rd, Apt. 27, Salem, NH 03079. E-mail: Rebecca.Adams@suffolk.edu

L. ANLLO-VENTO, B.N. CIPOLLINI, V. LÓPEZ-HERNÁNDEZ & D.L. WOODS. **A New Continuous Attention Tracking Task for the Comprehensive Assessment of Attention Processes.**

Objective: Continuous Performance Tests (CPTs) have proven useful in the assessment of attention impairments associated with developmental disorders. However, attention is a complex concept that comprises multiple cognitive operations. And yet, current computer-based CPTs have a limited capability of detecting and profiling such processes. Here we present a newly developed Continuous Attention Tracking Task (CATT) that quantifies more than 30 measures of at-

tention in an immersive 3D video-game environment with subsecond temporal resolution.

Participants and Methods: A preliminary study was conducted with 9 ADHD adults and 7 non-ADHD comparison subjects. Continuous EEG was recorded from 62 scalp sites while subjects engaged in the CATT in 4 blocks of 5 min each. We recorded responses to targets and non-targets, tracking accuracy, and latency of stop-signal responses at 60 Hz, as well as event-related potentials at 500 Hz.

Results: While tracking accuracy during regular tracking was comparable for ADHD and non-ADHD subjects ($p=0.13$), inhibition of tracking in the presence of a stop-signal was more effective in control than ADHD subjects ($p=0.02$). Similarly, the non-ADHD group stopped tracking faster than the ADHD group ($p=0.04$). Target responses were also faster ($p=0.008$) and more accurate ($p=0.04$) for non-ADHD than ADHD subjects. Event-related potentials evoked by the target and non-target signals showed that the brain activity of non-ADHD subjects was selectively modulated starting at about 180 ms following stimulus onset (i.e., N1) and became more apparent as attentional processing proceeded (i.e., P3).

Conclusions: The CATT replicates prior CPT and Stop-Signal Task results in ADHD subjects within a more ecologically valid experimental setup that could be used in a clinical setting. As we extend our analyses to utilize the numerous behavioral and physiological measures provided by CATT, we hope to further characterize the patterns of attentional impairment associated with distinct developmental disorders.

Correspondence: *Lourdes Anllo-Vento, Ph.D., Neurosciences, University of California, San Diego, 9500 Gilman Drive, MC 0608, La Jolla, CA 92093-0608. E-mail: lanllo@ucsd.edu*

R. BRAHMACHARI & M.Y. KIBBY. Executive Functioning and IQ among Children with ADHD-PI or Dyslexia.

Objective: While executive dysfunction is common in ADHD, some research has shown IQ may be better able to discriminate between ADHD and controls than executive functioning (EF) deficits. Our study sought to determine whether executive dysfunction was present after controlling for IQ in children with ADHD-PI or dyslexia, as individuals with dyslexia also may present with EF deficits.

Participants and Methods: 57 children (25 controls, 16 ADHD-PI, 16 dyslexia), ages 8-12 years, were administered a neuropsychological battery as part of a larger study (R03 HD048752-01). Participants with ADHD-C or co-morbid dyslexia and ADHD were excluded. The WCST, WJ-III Decision Speed, NEPSY Tower and Design Fluency, and CMS Sequences and Numbers Backward were used as measures of EF, and IQ was measured with the WISC-III or IV.

Results: Using ANOVA, the ADHD group performed worse than controls on Decision Speed and WCST Categories Achieved, while the dyslexia group performed worse than controls on WISC Processing Speed and worse than controls and ADHD on CMS Sequences.

When gender and FSIQ were entered as covariates, gender was related to Decision Speed, Tower, Design Fluency, and Processing Speed, and it approached significance for Sequences. FSIQ was related to Decision Speed, Tower Rule Violations, Design Fluency, Numbers Forward, and Processing Speed, and it approached significance for WCST Perseverative Errors. After controlling for FSIQ and gender, groups only differed on Sequences, with the dyslexia group performing worse than controls and ADHD.

Conclusions: Future research should take into account gender and IQ when examining executive dysfunction in ADHD, particularly when studying ADHD-PI.

Correspondence: *Ruchi Brahmachari, M.A., Psychology, Southern Illinois University at Carbondale, 1615 Logan Drive, Apt.# 18, Carbondale, IL 62901. E-mail: ruchi@siu.edu*

M. BUBNIK, M.J. DAVID & J.M. HALPERIN. Cluster Analysis of Preschoolers using Objective Measures of Inattention, Impulsivity and Activity Level.

Objective: Based upon ratings and interviews, children with Attention Deficit/Hyperactivity Disorder are classified into Inattentive, Hyperactive/Impulsive, and Combined subtypes. However, research has been primarily conducted in school-age children and distinctions among these subjectively-determined subtypes have not been consistently validated. This study investigated preschool children classified using objective measures of attention, impulse control and activity level.

Participants and Methods: Children (mean age = 4.31 years; approximately 2:1 boys:girls) were recruited from local preschools. A preschool continuous performance test (CPT) assessed inattention and a Go/No-go task evaluated inhibitory control. Children wore solid-state actigraphs to measure movement. Parents, teachers and clinicians rated children's behavior on several scales. Data from the three objective measures were submitted to a two-step cluster analysis.

Results: Three clusters of children emerged; one with very high levels of inattention as measured by the CPT, and somewhat elevated impulsivity. A second cluster consisted of children with elevated levels of activity and impulsiveness, but relatively lower inattention. The third group was low in all three domains. The groups did not differ significantly in age or Full Scale IQ, but did differ in gender distribution such that disproportionately more boys were in the asymptomatic group and more girls in the highly inattentive group. Across measures, in general, parents, teachers and clinicians rated the hyperactive/impulsive group as having more behavioral difficulties than the other two groups.

Conclusions: These data indicate that hyperactivity and impulsiveness in preschool children is associated with behavioral difficulties and dissociates from inattention.

Correspondence: *Michelle Bubnik, Queens College, 65-30 Kissena Blvd, Flushing, NY 11367. E-mail: Michelle_Bubnik@yahoo.com*

A.R. JOHNSON, S. BRAUN, A. LA MACCHIA, M. KIBBY & G. HYND. Relationship of Pars Morphology to Phonological Processing in Children with and without ADHD and Dyslexia.

Objective: Prior literature has linked weaknesses in phonological processing to dyslexia. Functional neuroimaging studies have found the pars triangularis (PT) and pars opercularis (POP) to be active during phonological processing tasks; however, morphological examinations of the PT and POP have found mixed results regarding their relationship to phonological processing. The present study examined PT and POP gray-matter volume in children with developmental dyslexia (DD) and/or ADHD and controls, and related brain morphology to performance on phonological processing measures.

Participants and Methods: The sample contained 25 children with dyslexia (DD, DD+ADHD) and 25 children without it (ADHD, controls), ages 8-12 years. The groups were comparable in ADHD severity, FSIQ/PIQ and demographics, but differed on VIQ. MRI scans and neuropsychological test data were acquired as part of a NIH-funded grant (R01 HD26890-07). The POP and the anterior ascending (AA) and horizontal (AH) rami of the PT were manually traced following the guidelines of Foundas et. al, 1998 as part of a separate study (R03 HD048752-01). Phonological awareness, rapid naming, and phonological memory were assessed using the CTOPP and Numbers Forward and Backward from the CMS.

Results: Correlations between phonological processing and brain morphology were run within diagnostic group. In the non-DD group, Left AH volume was positively correlated with phonological awareness and Numbers Backward. In the DD group, Right AH volume was related to rapid naming, and the right AA, left AH and left POP were related to phonological memory.

Conclusions: Implications, along with the relationship of the children's brain morphology to their parents', will be discussed.

Correspondence: *Abigail R. Johnson, B.S., Psychology, Southern Illinois University, mailcode 6503, Carbondale, IL 62901. E-mail: abbyrj@siu.edu*

A.C. LAMACCHIA, S. BRAUN, M.Y. KIBBY & G.W. HYND. Phonological Processing and the Supramarginal Gyrus; a Structural MRI Approach.

Objective: The planum temporale has been implicated in phonological processing and dyslexia. However, the supramarginal gyrus (SMG) has not been well-studied in dyslexia, despite its involvement in phonological working memory (pWM) according to functional neuroimaging literature. Hence, the goal of this study was to examine SMG size in dyslexia and investigate its relationship to phonological processing.

Participants and Methods: 25 children with dyslexia and 25 children without it between the ages of 8-12 years were assessed using neuropsychological testing and MRI scans as part of a larger study (R01 HD26890-07). Children with and without dyslexia were comparable in age, gender, race, FSIQ and PIQ. Groups differed in VIQ, with the dyslexia group scoring lower. The SMG was manually traced following a modified approach from Plante et al. (2001), as part of a subsequent project (R03 HD048752-01). Five subtests from the CTOPP were used as measures of phonological processing.

Results: Using ANCOVA with VIQ as a covariate, groups were comparable in right SMG volume and SMG asymmetry. However, children with dyslexia displayed greater left SMG volume than controls. Correlations between brain morphology and aspects of phonological processing were assessed within group, as groups differed on many of the cognitive measures. For the non-dyslexia group, Nonword Repetition was correlated with leftward asymmetry (left > right SMG volume associated with better performance). For the dyslexia group, Digit Naming correlated with right SMG volume.

Conclusions: Implications of these findings will be discussed, along with the relationship of children's brain morphology in this region to their parents' brain morphology.

Correspondence: *Angela C. LaMacchia, Clinical Child Psychology, Southern Illinois University-Carbondale, 900 S. Elizabeth, #11, Carbondale, IL 62901. E-mail: lamac31@hotmail.com*

Q.R. MANO, L.A. KLEIN & D.C. OSMON. Structural Equation Modeling of Visuo-perceptual-Orthographic (VPO) Reading Abilities.

Objective: The aim of this study was to examine the psychometric properties of visuo-perceptual-orthographic (VPO) reading abilities.

Participants and Methods: Data from non-impaired college students (n=152) were submitted to structural equation modeling. The following standardized and experimental tasks were included: Letter-Word Identification, Rapid Automatized Naming, Letter-Identification, Same/Different Letter(s) Decision, Homophone Decision, Pseudohomophone Decision, Word Matching Selection, and Word Jumble Decision. Three models of VPO abilities were tested: (1) single-factor, (2) three uncorrelated factors, and (3) a hierarchical model.

Results: Only the hierarchical model had satisfactory goodness-of-fit statistics ($\chi^2 = 90.024$, $df = 73$, $p = 0.085$, CFI = 0.950, RMSEA = 0.039; GFI = 0.921; NNFI = 0.938), demonstrating three aspects of VPO: perceptual processing speed, prelexical accuracy, and lexicosemantic accuracy.

Conclusions: In contrast to the current unifactorial processing speed model, results indicate that VPO is a multifaceted, hierarchically organized construct that reflects three distinct aspects of visual word recognition. These findings agree with cognitive and neuroscientific studies supporting the notion that VPO is as a unique ability to be considered in dyslexia research.

Correspondence: *Quintino R. Mano, M.S., Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford Ave., Garland Hall 224, Milwaukee, WI 53221. E-mail: qrmanno@uwm.edu*

S.J. MCCANN, T. CONWAY, PH.D., A. SLINGER, M.D., F.A.A.P., A. ALEXANDER, M.D. & J.K. TORGESEN, PH.D.. Does Phonological Intervention Improve Reading Comprehension in Children with Developmental Dyslexia.

Objective: Gough and Tunmer's (1986) simple view of reading proposes reading comprehension is facilitated by word recognition and language comprehension. Remedial intervention that improves phonological awareness and phonological working memory also improves word recognition (Torgesen et al., 2001). Thus, we hypothesized that phonological intervention that improves phonological working memory and word decoding would consequently improve reading comprehension.

Participants and Methods: This study examined the association between phonological intervention and changes in phonological awareness, word recognition, phonological working memory, and reading comprehension. 55 children ages 9 through 11 with dyslexia due to a phonological deficit underwent 135 hours over 18 weeks of treatment targeting phonological awareness and word recognition skills. Comprehensive neuropsychological testing occurred pre- and post-treatment. Participants had a FSIQ over 70, Basic Word Reading Skills below 78, no neurological disorders, and no uncontrolled attention deficits.

Results: Hierarchical regressions conducted pre- and post-intervention identified significant predictors of reading comprehension, controlling for oral language and rapid naming skills. Pre-treatment, only word recognition significantly predicted comprehension ($p < .002$). Post-treatment, phonological awareness and word recognition significantly predicted comprehension ($p < .005$ and $p < .028$, respectively). A hierarchical regression of difference scores indicated that increased word recognition significantly predicted increased reading comprehension ($p < .019$).

Conclusions: Pre-treatment word recognition skills being associated with reading comprehension ability and improved phonological awareness and word recognition also contribute to improved reading comprehension is supportive of Gough's model. Implications and future directions will be discussed.

Correspondence: *Sarah J. McCann, University of Florida, Dept. of Clinical and Health Psychology, PO Box 100165, Gainesville, FL 32610. E-mail: smcann@phhp.ufl.edu*

G.R. MESMAN & M.Y. KIBBY. Examining Multiple Theories' Contribution to Orthographic Functioning.

Objective: Several theories have attempted to explain what constitutes orthographic functioning. Boder suggests there is a strong visual component whereas Stanovich takes a linguistic approach arguing one's exposure to print predicts orthographic functioning beyond phonological processing. Bowers proposes that rapid naming is related to orthographics. Nonetheless, no one has systematically tested these theories in one study to determine how well they explain orthographics.

Participants and Methods: Participants included 92 children, ages 8 to 12 years, who were diagnosed with dyslexia, ADHD, co-morbid ADHD and dyslexia, other language-based disorders, or were controls. Participants were administered a neuropsychological battery as part of a larger study (R03 HD048752-01). Orthographic measures included those with and without a timed component. Lingual measures included WISC-III or IV Vocabulary, CTOPP phonological awareness and rapid naming subtests, and the Title Recognition Test to assess exposure to print. The TVPS-R was used to assess visual perception and visual STM.

Results: Hierarchical regression equations were used, one set comparing lingual measures and another visual measures. For the lingual models, all variables were significant predictors of both orthographic tasks, regardless of their position. For the visual model, visual STM was the only significant predictor for both orthographic tasks, but only in the first position. When visual STM and lingual measures were entered into one equation, visual STM was only significant when in the earlier positions whereas most of the lingual measures were significant predictors regardless of position.

Conclusions: Results suggest multiple lingual components play a role in orthographic functioning, whereas visual components may play a smaller role.

Correspondence: *Glenn R. Mesman, MA, Southern Illinois University, Carbondale, 1200 E. Grand Ave 8-3B, Carbondale, IL 62901. E-mail: glnmsmn@siu.edu*

A.S. PRESTON, A.S. EVANS, J.M. WILSON & A. PALAV. Comparison of WISC-IV Working Memory and Processing Speed Indices Between Children with ADHD and Clinical Controls.

Objective: A few studies suggest that children with ADHD perform worse on WISC-IV Working Memory (WMI) and Processing Speed (PSI) indices compared to healthy controls and relative to their own performance on other WISC-IV indices. The current study compared WISC-IV performance by children with ADHD to clinical controls. Subtype and gender differences were also examined.

Participants and Methods: 46 children with ADHD and 28 clinical controls aged 6-16 were included. The ADHD group included 18 with ADHD-Inattentive Type and 27 with ADHD-Combined Type. The ADHD group included 31 boys and 15 girls. The clinical control group included children with various psychological conditions. Subjects completed the core battery of the WISC-IV. Chi-Square tests compared the proportion of participants in each group whose lowest score was either the PSI or WMI index. An independent samples t-test compared children with ADHD to clinical controls. An ANOVA and post hoc analyses compared ADHD subtypes to clinical controls. Independent samples t-tests examined gender differences within the ADHD group.

Results: The PSI or WMI indices were the lowest scores for the majority of children in both groups, but chi-square analyses did not reveal differences between groups. No significant differences were found in performance between the groups on any WISC-IV index. There were no significant differences based on subtype or gender within the ADHD group.

Conclusions: Performance on the WISC-IV indices did not differ significantly between subjects with ADHD and clinical controls, and was not impacted by subtype or gender within the ADHD group.

Correspondence: *Andrew S. Preston, M.S., Psychiatry and Human Behavior, Brown University, 68 Parkview Drive, #1S, Pawtucket, RI 02861. E-mail: apreston@phhp.ufl.edu*

J.M. SCHUSTER. Students Diagnosed With ADHD Receiving Special Education Services: Predictors of Math Achievement.

Objective: Much of the research on the academic difficulties that accompany ADHD has focused on verbal skills and reading difficulties, with less attention given to math performance. This study explores the relationship between select child, family and school service factors and change in math achievement scores over time in a sample of elementary school-aged children with ADHD.

Participants and Methods: Secondary analyses were conducted on data collected through the Special Education Elementary Longitudinal Study (SEELS), a national probability sample of children participating in special education services. The sample includes 3116 children diagnosed with ADHD, ages 6 through 12. A subset of the data was used in the current study, including WJ-III Applied Problems and Calculation subtests, and parent and teacher interviews collected during Wave 1 and Wave 2.

Results: Linear regression revealed that primary disability, family income, intensity of services, and child's classroom behavior served as significant predictors of change in math achievement. In addition, medication interventions were more highly related to change in math achievement in some subgroups of children with ADHD compared to others, with differences traced to primary eligibility classification. When controlling for the other predictors, participation in mental health services was not a significant predictor of math achievement.

Conclusions: Children with ADHD enrolled in special education services represent a diverse group in terms of comorbid disabilities, and child and family demographics. Each of these factors has a unique relationship to progress in math achievement. Implications for school-based academic interventions will be discussed.

Correspondence: *Joneen M. Schuster, Ph.D., Frank Porter Graham Child Development Institute, University of North Carolina, Chapel Hill, 521 South Greensboro St., CB #8185, Carrboro, NC 27510. E-mail: schuster@mail.fpg.unc.edu*

A. STUBBS, B. SMITH-CHANT, S. LANDRY & M.A. BARNES. Informal Math Skills and Cognitive Correlates in Five-Year-Old Children with Spina Bifida and Typically Developing Controls.

Objective: School-age children with spina bifida (SB) often have difficulty with math, but not reading. This study compared preschoolers with SB and typically developing controls on those informal math skills thought to provide the foundation for later math learning.

Participants and Methods: ANOVA and multiple regression analyses were used to compare 53 children with SB and 56 typically developing children just after their fifth birthdays. Math skills examined were: rote counting, conceptual counting knowledge, quantity matching, and non-verbal small set addition and subtraction. It was predicted that rote counting would not differ between groups given the relative verbal strengths of children with SB. Based on math disability models, the relation of preschool literacy skills (phonemic awareness, alphabet knowledge), fine motor ability, and visual-spatial ability to math measures was also tested.

Results: The SB group performed less accurately than controls on all math measures. For both groups, alphabet naming accounted for significant variance on multiple math outcomes. In the group with SB, fine motor ability predicted accuracy on some counting measures. For controls, phonemic awareness and visual-spatial skills contributed significant, unique variance on several math outcomes.

Conclusions: For children with SB difficulties with conceptual and procedural mathematical knowledge emerge early in development. Alphabet knowledge and early math may be related to the extent that the learning of symbols characterizes both letters and numbers. The relation of fine motor skills, visual-spatial skills, and phonemic awareness to different math skills in the two groups is discussed in relation to cognitive and neuropsychological models of math disability.

Correspondence: *Allison Stubbs, MA, Psychology, University of Guelph, 50 Stone Road East, Guelph, ON N1G 2W1, Canada. E-mail: aley@uoguelph.ca*

D. WITTENBERG, N. KOBAYASHI, A. GANTMAN, C. HO, X. ROTIMI OJO, A.L. REISS, J.D. GABRIELI & F. HOEFT. Gender Differences in Parieto-Temporal Activation During Phonological Processing in Poor and Normal Readers.

Objective: To determine gender differences in hemispheric asymmetry in the parieto-temporal region during phonological processing for male and female adolescents with dyslexia and with normal reading ability.

Participants and Methods: Forty-four right-handed dyslexic and normal readers were matched for age (mean age = 14; SD = 2.2), gender and reading skills within diagnosis (i.e., amongst dyslexia and normal readers). We conducted functional magnetic resonance imaging (fMRI)

while the subjects performed a block design real-word rhyme judgment task to interrogate phonological processing.

Results: Statistical parametric mapping (SPM2) was used to process and analyze data. Hemispheric asymmetry in the inferior parietal lobe was investigated in dyslexic and control females and males using three different methods. Control males and females showed leftward asymmetry, while dyslexic males showed rightward asymmetry. However, no significant asymmetry was seen in dyslexic females.

Conclusions: Together with our previous study in the inferior frontal region (Koshiishi et al., American Psychological Association Annual Meeting abstract 2006), our study is the first to investigate functional hemispheric asymmetry in male and female dyslexic individuals. Our results show that adolescents with dyslexia have abnormal hemispheric asymmetry in the parieto-temporal region which could potentially be related to either their underlying pathophysiology or compensatory mechanisms.

Correspondence: *Fumiko Hoeft, M.D., Ph.D., Stanford University, #01 Quarry Rd. M/C 5795, Stanford, CA 94305. E-mail: fumiko@stanford.edu*

E.L. WODKA, S.H. MOSTOFSKY, J.C. LARSON, C.M. PRAHME, C. LOFTIS, M.B. DENCKLA & M.E. MAHONE. Process Examination of Executive Function in ADHD: Gender and Subtype Effects.

Objective: The “process approach” to neuropsychological assessment purports to offer additional information when considering brain-behavior relationships. We examined group (ADHD vs. control), gender, and ADHD subtype differences on “process” measures of executive functioning in children.

Participants and Methods: Children (N = 123; 54 ADHD, 69 controls) ages 8-16 completed the D-KEFS Trail Making, Verbal Fluency, Color-Word Interference, and Tower as part of a larger study. Children were screened for Reading Disability and comorbid psychiatric conditions, and those with ADHD were removed from stimulant medication.

Results: Controls made significantly more Set-loss Errors on Trail Making than children with ADHD. Girls performed significantly better than boys on Verbal Fluency (First Interval Total), and there was a significant group-by-gender interaction for Verbal Fluency (Total Repetition Errors) such that control girls had fewer errors than girls with ADHD while there was no difference between control boys and boys with ADHD. Children with Hyperactive-Impulsive/Combined subtype (ADHD-C/HI) performed better than children with Inattentive subtype (ADHD-I) on Trails (Letter-Number Switching Total Errors) and Verbal Fluency (First Interval Total), but had faster (more impulsive) First-Move Time on Tower. On Verbal Fluency (Total and Percent Repetition Errors), boys with ADHD-HI/C performed better than girls with ADHD-HI/C, whereas girls with ADHD-I performed better than boys with ADHD-I.

Conclusions: Children with ADHD did not differ from controls on most process measures from the D-KEFS. When gender and ADHD subtype were considered, girls with ADHD and children with the ADHD subtype less common for gender (i.e., girls with ADHD-C/HI and boys with ADHD-I) were at greater risk for poorer performance.

Correspondence: *Ericka L. Wodka, Ph.D., Neuropsychology, Kennedy Krieger Institute, 817 S. Hanover St., Baltimore, MD 21230. E-mail: wodka@kennedykrieger.org*

Memory

C. ADAMS, M. WELSH & L. PHILLIPS. The Effect of Cognitive Load, Interference Type, and Timing on Working Memory Performance in a Dual-Task Paradigm.

Objective: The influence of various factors on working memory capacity was examined using a primary task, the Modified Mental Counters (MMC) involving number manipulations, combined with a secondary task that required maintaining and answering simple questions in which there was only one possible answer, or many possible answers. Three hypotheses were tested: (1) open-ended questions would result in more

errors due to cognitive effort required to evaluate many options, (2) later timing of the question response would lead to more errors as the answer is maintained in working memory, interfering with the number manipulations, and (3) the more numbers manipulated by the participant (cognitive load), the greater the errors.

Participants and Methods: Twenty-three male and female college students participated in this pilot study in which the MMC was manipulated in terms of load, interference (question) type, and interference timing.

Results: As expected, increasing load resulted in increasing errors. Unexpectedly, the prompting of a response early in the arithmetic manipulations led to more errors overall. A time X question interaction indicated that later timing of question response resulted in more errors for open questions and fewer errors for closed questions. The time X load interaction suggested that the later timing produced a more linear increase in errors across load in comparison to the earlier timing. The question type X load interaction reflected that closed questions produced more errors than open questions, but only at the smallest load.

Conclusions: The results suggest that the limited capacity of working memory resources may be differentially affected by load, the timing of interference, and long-term memory search strategies.

Correspondence: *Christy Adams, MA, University of Northern Colorado, Box 94, Psychological Sciences, Greeley, CO 80639. E-mail: adam7227@unco.edu*

N. CARLOZZI, C. REESE & D.G. THOMAS. Memory Problems in Posttraumatic Stress Disorder: Objective Findings versus Subjective Complaints.

Objective: Studies across a variety of populations suggest that subjective memory complaints are often not matched by objective memory testing. Although memory complaints are common in posttraumatic stress disorder (PTSD), there are no data comparing subjective and objective memory in this population. Further, the literature examining cognitive complaints in this population has yielded contradictory findings (for review see Golier & Yehuda, 2002). This study examined both subjective and objective memory in PTSD.

Participants and Methods: PTSD patients (N=21), combat controls (N=21), and non-combat controls (N=25) completed a metamemory questionnaire (the Memory Functioning Questionnaire; MFQ) and two memory tasks (Rey Auditory Verbal Learning Test and Verbal Paired Associates). The MFQ examines four different dimensions of memory functioning: Frequency of Forgetting, Seriousness of Forgetting, Retrospective Functioning, and Mnemonics Usage.

Results: ANCOVAs showed no differences between any of the three groups on any of the memory tasks (all $p > .40$). ANOVAs for the four different dimensions of memory functioning and the MFQ total score indicated that there were group differences (all p 's $< .02$). Tukeys post hoc analyses indicated that PTSD participants indicated more problems with memory than either control group for Frequency of Forgetting, Seriousness of Forgetting, Mnemonics Usage and MFQ Total Score. Further, PTSD participants had more problems with retrospective functioning than non-combat controls. Combat controls did not differ from non-combat controls on any MFQ scores.

Conclusions: Although PTSD participants reported more subjective memory complaints than controls, these difficulties were not supported by objective measures of memory. Implications will be discussed.

Correspondence: *Noelle Carlozzi, Ph.D., Department of Psychological and Brain Sciences, Indiana University, 2784 N Andy Way, Bloomington, IN 47404. E-mail: ncarlozz@indiana.edu*

M. CARSWELL, K.A. LAWLER, K. WEINER & J. DALMAU. Paraneoplastic Limbic Encephalitis (PLE): A Case Study of Long-term Cognitive and MRI Findings.

Objective: Paraneoplastic neurological syndromes are rare remote effects of different types of cancer, most often associated with small cell lung carcinoma, or malignancies of the testis or breast. PLE typically presents with acute memory loss, seizures, or other limbic system abnormalities.

Participants and Methods: In this case, a 55 year-old, right-handed male with clinically diagnosed PLE secondary to thyroid cancer is described.

Results: Clinical symptoms included severe anterograde and retrograde memory impairment, and subsequent development of seizures, dysphasia, cerebellar ataxia, pharyngeal dysphagia, and emotional lability. Initial neuropsychological evaluation was consistent with an amnesic syndrome and revealed severely impaired anterograde and retrograde memory for verbal information and moderately impaired visual memory. Recognition memory of words was significantly poorer than faces, which correlated with MRI findings suggesting more damage in the left mesial temporal region. Visuospatial abilities remained intact. Expressive and receptive language functions were initially intact, although they diminished over the course of illness. Executive functions also declined from initial onset, including verbal fluency, perseverative behavior, and significant emotional lability. Neurocognitive abilities continued to deteriorate with progression of significant behavioral and cognitive deficits, despite medical intervention. Repeated MRIs revealed bilateral mesial temporal lobe hyperintensities (L>R), elevated T2 signal in the right insula, and atrophy of the temporal lobes and cerebellum. A brain PET scan demonstrated abnormalities in the temporal lobes bilaterally.

Conclusions: This case of PLE demonstrates that related atrophy may present as progressive and multifocal and that associated cognitive impairments may include several domains other than circumscribed amnesia.

Correspondence: *Melissa Carswell, Psy.D., Neurology, Hospital of the University of Pennsylvania, 3400 Spruce St., 3 West Gates, Philadelphia, PA 19104. E-mail: Melissa.Carswell@uphs.upenn.edu*

T. YANG, R.C. CHAN, H. LIN & L. ZHENG. Aging Effect on Prospective Memory in Healthy Elder People: Convergent evidence from experimental and ecological valid tasks.

Objective: The present research aimed to examine the aging effect of prospective memory (PM) in a group of healthy Chinese elder people. In particular, it aimed to examine: (1) any aging effect on different domains of PM, (2) the validity of laboratory-based PM (3) The possible relationship between executive function (EF) and PM, retrospective memory (RM) and PM.

Participants and Methods: A sample of 55 elders was recruited from the community and was divided into two groups: Young-old (60-70), older-old (over 71). All of them completed the experimental paradigms and ecologically valid tests of PM capturing specific domains of Event-based, Time-based and Activity-based.

Results: The findings showed that (1) Aging effects was evident only in laboratory Event-based PM ($p < 0.001$), aging effects in laboratory Time-based PM only evident when comparing the young and young old ($p = 0.102$), no aging effect was found in laboratory Activity-based PM ($p = 0.64$), which may due to its implicit nature. (2) No relationship was found between the ecological valid and laboratory-based PM tests. (3) the performance of Hotel Test (one of the tests of ecological valid time-based PM) was related to executive function though these correlations disappear after Bonferroni corrections except one Chinese Letter Number Span Test ($r = 0.3418$, $p = 0.002$).

Conclusions: Present research studying aging effects of three types of PM in a holistic way and revealed its relationship with EF.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan2003@yahoo.com.hk*

R.C. CHAN, R.Y. CHEN, T.C. HUI, E.Y. CHEN, E.F. CHEUNG, H.K. CHEUNG, P. SHAM, T. LI & D. COLLIER. T102C polymorphism of serotonin-2A receptor gene and working memory dysfunction in Chinese schizophrenic patients.

Objective: This study attempted to explore the associations between 5HT2A T102C polymorphism, working memory function and clinical symptoms in Chinese schizophrenic patients.

Participants and Methods: Eighty-four in-patients with schizophrenia were recruited from the Castle Peak Hospital, Hong Kong. All met the DSM-IV (American Psychiatric Association, 1994) diagnostic criteria of schizophrenia. Genomic DNA extraction was performed by standard procedures. The T102C polymorphism was detected using the oligonucleotide primers 5'-TCTGCTACAAGTTCTG-CCTT-3' and 5'-CTGCAGCTTTTCTC-TAGGG-3' modified from the procedure of Warren et al. (1993).

Results: The present findings demonstrated that 5HT2A T102C polymorphism was associated with visual working memory performance in patients with schizophrenia. In particular, patients with homozygous TT or CC genotypes had poorer visual working memory performances in addition to the WCST. Moreover, the homozygous group tended to exhibit more negative symptoms than the heterozygous group.

Conclusions: Since the distribution of CC alleles in this sample was very small, we do not know whether there would further differential pattern found in the TT and CC combination. Since there is ethnic variations of TT and CC alleles distribution in western and eastern populations, the present findings could not be generalized into western samples, particularly first onset schizophrenic cases.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan2003@yahoo.com.hk*

Y. CHANG & R.M. BAUER. Verbal Memory Interference in Temporal Lobe Epilepsy: A Temporal Lobe or Frontal Lobe Problem?

Objective: Previous studies investigating interference susceptibility in temporal lobe epilepsy patients evaluated patients who did not undergo surgical intervention. The current investigation explored the roles of proactive interference (PI) and retroactive interference (RI) associated with verbal memory deficits in epilepsy patients before and after anterior temporal lobectomy (ATL). The relationship between interference susceptibility and executive function was also examined.

Participants and Methods: Patients with unilateral ATL (15 left and 15 right ATL) were administered a verbal list learning task (CVLT) pre- and post-surgically as part of a larger set of neuropsychological tests. All were left-dominant for language. Patients were matched on age, education, sex, onset age, and seizure duration. The indices of accumulated PI and RI and a composite measure of executive function were calculated.

Results: Student's t-tests and correlational analyses were used to analyze the results. The findings suggested that presurgical LATL group demonstrated greater interference compared to presurgical RATL group, a discrepancy that disappeared after surgery. The LATL group demonstrated substantially decreased PI post-surgically while RATL showed no pre-post change. Susceptibility to interference was unrelated to executive function either pre- or post- surgically in the current sample.

Conclusions: These findings demonstrated (1) that left temporal lobe epilepsy patients were more susceptible to PI and RI before but not after ATL and (2) that susceptibility to interference in memory was not correlated with executive function. This suggests that removing an epileptogenic hippocampal formation contributes to decreased interference susceptibility.

Correspondence: *Yu Ling Chang, Clinical and Health Psychology, University of Florida, 101 South Newell Drive, Room 3151, Gainesville, FL 32611. E-mail: ychang@phhp.ufl.edu*

R. CHILVERS, J. BRISCOE, T. BALEWEG & D. SKUSE. A Dominantly Inherited Lexical Memory Disorder in a Large Family With Four Living Generations.

Objective: An investigation of an unusual and highly specific dominantly inherited disorder of lexical memory is reported in a large multi generational family

Participants and Methods: Six affected females (aged 15-75) spanning three generations were examined in detail using standardized assessments of intelligence and memory. Three key linguistic markers for heritable language impairment were also administered.

Results: Results showed a remarkably consistent profile of high intelligence and superior non verbal memory in the presence of marked deficits in recalling verbally presented material. All family members showed a marked deficit on one marker of language impairment: sentence repetition. Only two members showed evidence of wider language impairment on these marker tasks including weak past-tense inflection and repetition of nonsense words

Conclusions: These data suggest lexical memory is dissociable from language disorders, and may provide a basis for discovering the genetic basis of such memory abilities.

Correspondence: *Rebecca Chilvers, BSc, Behavioural and Brain Sciences, Institute of Child Health, 30 Guilford Street, London WC1N 1EH, United Kingdom. E-mail: r.chilvers@ich.ucl.ac.uk*

C.P. CONTARDO, J. BEAUVAIS, K. DIECKHAUS & M. ROSEN. The Memory for Intentions Screening Test: Validity in an HIV+ Sample.

Objective: The Memory for Intentions Screening Test (MIST) is a putative measure of prospective memory (ProM), the ability to "remember to remember." The MIST requires participants to perform tasks in the future while distractor tasks are presented. The goal of the current study is to describe the divergent validity of the MIST in an HIV+ sample when compared to traditional neuropsychological tests. A valid measure of prospective memory in HIV+ patients is important because failures to "remember to remember" to take prescribed medication may reflect specific deficits in prospective memory.

Participants and Methods: Ninety-seven HIV+ participants were recruited from local treatment centers as part of a larger study on medication adherence (Rosen et al., In Press). They were administered neuropsychological screening tests and the MIST. These measures were added to a factor analysis.

Results: Factor analysis showed that two MIST factors accounted for almost 50% of the variance in cognitive functioning. Two other separate factors, retrospective memory (HVLT) and frontal abilities (COWAT and Trails B), accounted for a significant amount of additional variance. There was a high correlation between the two MIST factors and a weaker, albeit significant, correlation with the other factors.

Conclusions: These preliminary results suggest that the MIST assesses a memory function that can be distinguished from traditional retrospective recall and executive functions. Future studies should examine the relationship between the MIST and behavioral measures of ProM such as remembering to take prescribed medications. Implications will be discussed.

Correspondence: *Christopher P. Contardo, Clinical Psychology, University of Connecticut, 406 Babbidge Road U1020, Storrs, CT 06269. E-mail: christopher.contardo@uconn.edu*

R.D. CREAN, S.A. DAVIS & M.A. TAFFE. The Effects of Chronic Alcohol Exposure on Spatial Delayed Memory and Brain Functioning in Adolescent Nonhuman Primates.

Objective: Alcohol use and abuse often develops during adolescence and is thought to effect brain function and structures. Alcohol studies in humans are limited by ethical considerations; therefore, nonhuman primate models are useful in delineating the cognitive risks of adolescent drinking. **Objective:** To determine if chronic alcohol impairs performance on a task assessing spatial delayed memory and brain functioning.

Participants and Methods: Two groups (Alcohol, n=4 and Control, n=3) of adolescent male rhesus monkeys completed a human analogue computer task of visuo-spatial paired associates learning (PAL), adapted from the Cambridge Neuropsychological Test Automated Battery, along with electrophysiological assessments measuring auditory brain stem functioning. The Alcohol group was exposed to daily access sessions for one year of 3.0g/kg Ethanol plus Tang and the Control group received 3.0g/kg Tang only. Cognitive performance was measured over the course of six months at five timepoints.

Results: Significant differences in accuracy between the two groups were observed on all five occasions. As delays increased, the Alcohol group performed significantly worse than the Control group, and these deficits increased over time. Brain functioning, measured by peak latencies, was significantly slower in the Alcohol compared to the Control group.

Conclusions: Chronic alcohol consumption impairs spatial delayed memory performance in adolescent rhesus monkeys, and these deficits appear to increase over time. Furthermore, as delays and task complexity increased, significant differences between groups were observed. Finally, chronic alcohol consumption significantly impairs brain functioning. The results further our understanding of the cognitive risks posed by early alcohol exposure in adolescence.

Correspondence: *Rebecca D. Crean, Ph.D., Molecular and Integrative Neurosciences Department, The Scripps Research Institute, 10550 N. Torrey Pines Rd., La Jolla, CA 92037. E-mail: rcrean@scripps.edu*

S. DAVID, L.M. ERCOLI, P. SIDDARTH, K. MILLER, J. DUNKIN & G. SMALL. The Relationship of Memory Controllability Beliefs to Memory Enhancement Training in Healthy Older Adults.

Objective: Few studies have evaluated the relationship between memory controllability beliefs and memory training. We report findings of memory controllability beliefs in a randomized clinical trial on the effects of a 7-week memory enhancement training intervention in healthy older adults.

Participants and Methods: The Memory Training (MT) group consisted of 23 participants (age range 50-79 years) who underwent pre- and post-intervention cognitive testing for word lists. Participants were instructed in Method of Loci and Categorization techniques and completed the Memory Controllability Inventory (MemCI; Lachman et al., 1995) at baseline and follow-up. The MemCI measures four subscales: Present Ability; Potential Improvement; Effort Utility; Inevitable Decrement.

Results: Within group analyses indicated that, following Method of Loci training, the MT group significantly improved on word list learning from baseline ($p < 0.001$). MT group participants improved significantly on three of four MemCI subscales from baseline to post-intervention (p value range, $p < .005$ to $p < .05$). However, MemCI subscales at baseline did not significantly predict memory test performance after memory training.

Conclusions: Word list learning and memory controllability beliefs improved after a memory training intervention. However, baseline memory controllability did not predict memory training outcomes. Clinicians should be aware that memory controllability beliefs at baseline may not be useful for predicting response to memory training interventions.

Correspondence: *Steven David, Ph.D., Geriatric Psychiatry, UCLA David Geffen School of Medicine, 760 Westwood Plaza, C9-747, Los Angeles, CA 90024-1759. E-mail: sdavid@mednet.ucla.edu*

M.F. DE MARTINO. Analysis of Psychophysiological Parameters in Shiftworking Nurses.

Objective: Study the characteristics of the psychophysiological variables linked to memory and attention in the diurnal and nocturnal shifts of women nurses.

Participants and Methods: This study was carried on with the help of 59 healthy female volunteer nurses, aged 23-53 y, divided into two groups according to their shift of work (daytime or nocturnal). Specific psychophysiological tests (Span Digit Test, Digit Symbol and character cancellation) were applied at beginning and at end of working periods.

Results: The psychological variables in spite of not being significant, the results showed that nurses working in the night shifts had worse performances compared to daytime workers. In addition, regardless to the period of work, the nurses had better performances at the beginning of the period (Wilcoxon Test, $p=0.001$) The results of Span Digit Test of night group, the values are better in the beginning working period.

Conclusions: The results suggest an effect of the night shift in all the studied variables.

Correspondence: *Milva F. De Martino, Associate Professor, Nursing, UNICAMP, Rua Renato Reis, 56, Campinas 13084445, Brazil. E-mail: milva@unicamp.br*

J.A. FIELDS, K. DOYLE, A. HESTER, C. CULLUM & L.H. LACRITZ. Differences in Recognition Performance on the CVLT and CVLT-II in Alzheimer's vs Parkinson's Subjects.

Objective: To evaluate recognition performance on the CVLT-II (Form 2) vs CVLT (Form 1) in Parkinson's disease (PD) vs Alzheimer's disease (AD). Based on clinical observation, more false positives (FPs) were expected on Form 2, particularly in the AD sample.

Participants and Methods: CVLT data from 67 AD (M age = 72, M education = 14) and 83 PD (M age = 66, M ed = 14) subjects and CVLT-II data from 27 AD (M age = 71, M ed = 14) and 27 PD (M age = 66, M ed = 14) subjects were examined relative to hits, FPs, and discriminability (DSCR; hits minus FPs), compared within and between groups by form.

Results: There were no differences in age, education, Dementia Rating Scale (DRS) total score, or long delay free recall (LDFR) for AD subjects who had Form 1 vs 2 or PD subjects with Form 1 vs 2. However, AD subjects were older, had lower DRS total scores, and exhibited poorer LDFR than PD subjects. AD subjects made more FPs and had poorer DSCR on Form 2 than 1, while no differences by form were seen in the PD group, even when covarying for age and LDFR.

Conclusions: More FPs were noted on Form 2 vs 1 (hits did not differ), but only in the AD group. Elevated FP errors are a common CVLT finding in AD and may be more frequent on Form 2 due to inclusion of more higher frequency items than on Form 1.

Correspondence: *Julie A. Fields, BA, Psychology, UT Southwestern Medical Center, 7940 N Glen Dr #40S7, Irving, TX 75063. E-mail: Julie.Fields@UTSouthwestern.edu*

K. GOODALL, M. LIZAK, S. MALLOY & M. CROSSLEY. Happy Faces and Spaceships: Representational Strategy Predicts Poor Recall on the Rey Complex Figure Test.

Objective: The purpose of this study was to determine whether a representational strategy for remembering the Rey Complex Figure (RCF) improved delayed recall. Performance was examined across young, middle-aged and older participants. We anticipated a representational strategy would lead to better recall among all age groups and relatively preserved performance among older participants.

Participants and Methods: Forty-two participants (16 younger, 10 middle-aged, 16 older) were asked to copy the RCF, then at immediate recall, verbally describe the figure rather than draw it. They were then asked to draw the figure after a 30-minute delay. Descriptions were subsequently coded for their content into two categories, linear/geometric and representational. Linear/geometric descriptions contained predominantly references to linear directions and geometric shapes (e.g. "rectangle with a line bisecting") whereas the representational descriptions contained predominantly references to abstractions of components (e.g. "rocket ship with a happy face").

Results: Inter-rater reliability was good. Delayed recall scores did not differ from a standard administration control group matched on age and estimated intelligence. Results indicated better recall after 30 minutes for younger and older participants who used a linear/geometric strategy. Stepwise regression (age, verbal strategy, estimated intelligence, years of formal education and sex) indicated that only age and verbal strategy accounted for significant proportions of variance in the delayed recall scores (51% and 12% respectively).

Conclusions: Contrary to expectations, these findings suggest a representational strategy results in poorer delayed recall performance among younger and older adults. Furthermore, these results suggest that verbalizing rather than drawing at immediate recall had no effect on delayed recall performance.

Correspondence: *Kathleen Goodall, Ph.D., F.Spellacy & Associates, 1005 Balmoral Rd, Victoria, SK V8T 1A7, Canada. E-mail: kmg126@mail.usask.ca*

S. HAN, K.J. BANGEN, K. RESTOM, T.T. LIU, L.T. EYLER, A.S. FLEISHER & M.W. BONDI. Functional Neuroimaging of Age Differences in Face-Name Associative Memory.

Objective: The ability to pair faces with names is an ecologically valid measure of associative learning. Previous studies have confirmed the facilitatory role of repetition in memory, although age effects on face-name associations have received little attention. We sought to determine with a face-name encoding task (1) whether activation in memory-related cortical regions would vary inversely and systematically as a function of repetition, and (2) whether older subjects would show greater activation in right hemisphere areas consistent with an aging-related right hemisphere compensatory response.

Participants and Methods: Twelve subjects observed face-name pairs that were either new or repeated once, twice, or three times in random order. EPiBOLD and structural scans were acquired in the same session and BOLD responses were analyzed using a general linear trend methodology.

Results: Between-group analyses revealed areas of greater activation in the right parahippocampal, right superior temporal, right cingulate, and right medial and middle frontal gyri for older participants, whereas younger participants showed greater activation in the left inferior frontal and occipital gyri, and left insula. Both groups showed a cortical adaptation response to repetition (i.e., a step-wise decreasing pattern of activation in response to more stimuli repetitions) in select regions irrespective of age.

Conclusions: Younger and older participants show different patterns of activation to repeated face-name stimuli. These results provide tentative support for an aging-related right hemispheric compensatory response and may serve as a useful early marker of associative encoding failure in Alzheimer's disease.

Correspondence: *S. Duke Han, PhD, Psychology, Loyola University Chicago, Dept. of Psychology, 6525 N. Sheridan Road, Chicago, IL 60626. E-mail: dhan2@luc.edu*

K.M. HARRIS, K. DOMBOSKI, D. HARVEY & C. GOLDEN. Examination of the Own-Race Bias on the WMS-III Faces Subtests.

Objective: Previous research suggests people demonstrate more rapid and accurate recognition for faces of their own racial group than faces from other groups. This own-race bias has been extensively explored in forensic studies, such as eyewitness recognition, and the effect is most consistently exhibited in Caucasians. The present study examined the Faces subtests of the Wechsler Memory Scale-III (WMS-III) for evidence of the own-race bias. It was hypothesized that Caucasian participants would show better recognition for Caucasian faces on the subtests as compared to faces of other racial groups.

Participants and Methods: Participants were 77 neuropsychologically normal older adults. Sample age ranged from 55 to 93 ($M = 72$; $SD = 9.25$). Mean education was 14.29 ($SD = 2.80$). All subjects were self-identified as Caucasian. Participants were administered the Faces subtests as part of a comprehensive neuropsychological exam.

Results: Two independent-samples *t*-tests were run to examine mean percentages of Caucasian versus other race faces correctly recalled on the Faces I and Faces II subtests by a group of Caucasian participants. No significant differences were found between percentage of faces correctly recalled on Faces I ($t[46] = -1.613$, $p = 0.057$) and Faces II ($t[46] = .258$, $p = 0.399$) based on racial group.

Conclusions: No significant differences were found between percentages of Caucasian and non-Caucasian faces recalled on the Faces subtests. Findings did not support the hypothesis of own-race bias.

Correspondence: *Kristen M. Harris, M.S., Nova Southeastern University, 411 NW 87th Dr., Apt. 104, Plantation, FL 33324. E-mail: krissy122@hotmail.com*

L.L. HOWE, A.M. ANDERSON, D.A. STIGGE-KAUFMAN & D.W. LORING. More than Meets the Eye: The Medical Symptom Validity Test (MSVT) as a Memory Measure in Impaired Populations.

Objective: In impaired populations patients can fatigue and become incompletely engaged in neuropsychological testing quickly. The time spent with the patient should be maximized and considerations of time efficiency are important. In 2005, NAN published a position paper stressing the importance of symptom validity testing in neuropsychological assessments and the use of such instruments is increasing. The MSVT is a symptom validity measure. However, it also has a memory component consisting of two indices that are thought to assess true memory abilities. In order to examine the MSVT's validity as a measure of memory functioning, we compared performance on the MSVT memory indices of Paired Associates (PA) and Free Recall (FR) with the Hopkins Verbal Learning Test (HVLT) Total Score, Delayed Recall, Discrimination, and Recognition scores.

Participants and Methods: We prospectively looked at 42 consecutive referrals to a memory disorders clinic who were given the MSVT and HVLT as part of their regular clinical evaluation. We investigated the relationship between the variables using Pearson correlation coefficients.

Results: HVLT total score was significantly related to PA ($r = .624$, $p < .001$) and FR ($r = .786$, $p < .001$). HVLT Delayed Recall was significantly related to PA ($r = .617$, $p < .001$) and FR ($r = .713$, $p < .001$). HVLT Discrimination was significantly related to PA ($r = .603$, $p < .001$) and FR ($r = .698$, $p < .001$). HVLT Recognition was only significantly correlated with the MSVT FR variable ($r = .423$, $p < .005$).

Conclusions: Although preliminary, these data suggest that components of the MSVT may accurately reflect memory performance in patients undergoing clinical evaluation.

Correspondence: *Laura L. Howe, PhD JD, Department of Psychology, University of Florida, 205 SE 16th Ave, Apt. 3G, Gainesville, FL 32601. E-mail: lauralshowe@yahoo.com*

I. KELLISON, C.C. PRICE, M. WOOD & D. BOWERS. Mild Cognitive Impairment: Memory, Cortisol and Hippocampal Volumetrics.

Objective: This study investigated the relationships among memory impairment, structural brain changes and abnormal cortisol stress responses in elderly subjects with mild cognitive impairment amnesic subtype (MCIa).

Participants and Methods: Twenty-six subjects over age 55 (13 met criteria for MCI; 13 age and education matched controls) underwent neuropsychological testing, salivary cortisol assessment (three days) and structural magnetic resonance imaging. Average salivary cortisol levels

were calculated over two days (excluding the initial buffer day). Slope of the curve was measured by subtracting cortisol levels at time five (before bed) from those at time one (awakening). Memory was assessed with the Hopkins Verbal Learning Test (HVLT). Hippocampal and whole brain volumes were measured by raters blind to diagnosis.

Results: Only MCI participants demonstrated abnormal diurnal curves as measured by reduced difference scores between time one and time five ($p = .03$). Flattening of the diurnal cortisol curve correlated (at the level of a trend) with memory deficits as measured by a composite of the delayed and total recall trials of the HVLT ($r = .376$, $p = .053$). There was no evidence of reduced hippocampal volume in MCI subjects, nor was there a relationship between hippocampal volume and flattened cortisol curves.

Conclusions: Relative to 'healthy' age matched adults, MCI patients experienced a flattening of the diurnal cortisol curve. This cortisol pattern related to poor memory scores but not hippocampal volume. (Supported by I. Hermann Anesthesia Foundation [CP]).

Correspondence: *Ida Kellison, M.S., University of Florida, 1810 NW 23rd Blvd, #213, Gainesville, FL 32605. E-mail: ikellison@phhp.ufl.edu*

T.R. LUBINSKY, N.D. ANDERSON & J.B. RICH. Source Memory in Amnesic Mild Cognitive Impairment.

Objective: By definition, amnesic MCI affects item memory, but relatively little is known about its effects on source memory. This study investigated two types of source memory in amnesic MCI versus healthy older adults, and explored whether source memory is enhanced when learning is errorless (subjects are not allowed to guess during learning) and self-generated (target information is generated by the subject), as we have shown is the case for item memory.

Participants and Methods: Twenty four healthy older adults (M age = 73.25) and 24 individuals with amnesic MCI (M age = 74.96) learned and recalled four lists of 16 words. The words completed medium-close sentences and learning conditions represented the crossing of errorless / errorful and self-generated / experimenter-provided learning. Twenty minutes later, participants determined whether the completing words of 256 sentence stems were words to-be-remembered, said aloud but not to-be-remembered (i.e., errors), or not encountered that day (a "type" discrimination). Participants then decided whether previously-encountered words were presented by the examiner or generated themselves (a "person" discrimination).

Results: Healthy controls demonstrated greater "type" and especially "person" discrimination accuracy than individuals with amnesic MCI. Errorless learning and self-generation enhanced "type" discrimination in both groups. By contrast, in the errorless learning conditions for both groups, "person" discrimination was considerably disrupted by self-generation.

Conclusions: This study provides evidence that amnesic MCI affects source memory in addition to item memory. Source memory may benefit as much as item memory from rehabilitation, but different strategies may need to be employed depending on type of information to be remembered.

Correspondence: *Tobi R. Lubinsky, M.A, Psychology, York University, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: tobi@yorku.ca*

K.L. MORDECAI, J.L. WOODARD, J.E. CALAMARI, M.C. DUX, M. MESSINA, N. PONTARELLI, B. GOLDMAN, H. CHIK & S. ARORA. Objective Memory Functioning and Subjective Memory Complaints in Healthy and Mood Disordered Elderly: Influence of Negative Affect.

Objective: Our previous research suggests that negative affect moderates the relationship between subjective memory complaints and objective memory functioning. This investigation examined whether depression and anxiety disorders influence subjective memory complaints in the elderly.

Participants and Methods: Ninety-nine older adults without psychological diagnoses, 30 with primary depression diagnoses, and 11 with primary anxiety diagnoses completed measures of objective memory functioning (Rey Auditory Verbal Learning Test, Mattis Dementia Rating Scale-II (DRS)), subjective memory complaints (SMCs; Memory Functioning Questionnaire (MFQ) Frequency and Seriousness subscales), and negative affect (Geriatric Depression Inventory, Hamilton Anxiety (HARS) and Depression Rating Scales, State-Trait Anxiety Inventory, Penn State Worry Questionnaire, Perceived Stress Scale, Positive and Negative Affect Schedule).

Results: Objective memory performance of the healthy, depressed and anxious groups did not significantly differ. Contrary to predictions, there were also no significant differences in SMCs between the mood or anxiety disordered groups and the healthy group. A consistent positive linear relationship between all measures of negative affect and SMCs (e.g., MFQ Frequency and HARS, $r(134) = .48$, $p < .001$), but not objective memory functioning (e.g., DRS Total and HARS, $r(134) = -.05$, $p > .10$), was present for the sample as a whole.

Conclusions: Findings indicate that older adults with mood or anxiety disorders do not differ in terms of SMCs compared to healthy elders. Negative affect, however, enhanced SMCs without affecting objective memory performance in our sample. Endorsements of depression, anxiety, and stress should be considered when evaluating SMCs in older adults.

Correspondence: *Kristen Mordecai, MA, MS, Rosalind Franklin University of Medicine and Science, 7321 N. Honore St., #1-S, Chicago, IL 60626. E-mail: kristen.mordecai@rfums.org*

J. MORRONE-STRUPINSKY, S. GALE & L. BAXTER. Amygdalar-Hippocampal Activity Generated by Arousing Novel Faces in the Elderly.

Objective: Neuroimaging studies have associated amygdalar-hippocampal (AH) activity with memory, using fear-inducing stimuli. "Pleasant" stimuli may show this effect, but it is unclear whether this is primarily due to valence or arousal. Previously, we showed a robust AH fMRI novelty effect using both happy and sad baby faces. We hypothesized that stimuli that induce higher arousal (regardless of valence) generate greater AH activation.

Participants and Methods: Behavioral ratings were first obtained from 15 elderly to determine possible differences between happy and sad elderly (EH, ES) and baby (BH, BS) faces using valence and arousal ratings. Baby faces were more arousing than elderly faces, regardless of stimulus valence. fMRI results were obtained for 11 cognitively and affectively intact participants (6F/5M; age 61-79) using a novelty memory task. Four presentations of 10 familiar faces (3EH, 2ES, 3BH, 2BS) were intermixed with 40 novel faces (equal number of each condition). "Novel vs familiar" (NvF) comparison of the 4 stimulus types was performed using SPM5. Post-scan recognition, valence, and arousal for fMRI faces and a set of novel faces were assessed.

Results: NvF analysis produced activation in the right fusiform and AH. This effect was specific for baby, not elderly faces. Recognition accuracy did not differ for baby and elderly faces in scanner or post-scan tasks. Valence and arousal ratings for EH and BH faces were significantly higher than for both ES or BS.

Conclusions: Encoding of arousing stimuli induces activation specific to the right AH. While studies focus on fear-inducing stimuli, general arousal may also be important for AH activation.

Correspondence: *Jeannine Morrone-Strupinsky, Ph.D., Dept. of Clinical Neuropsychology, Barrow Neurological Institute, 222 W. Thomas Road, Suite 315, Phoenix, AZ 85013. E-mail: Jeannine.MorroneStrupinsky@chw.edu*

N. PARE, A.J. SAYKIN, L.A. RABIN, M.S. NORDSTROM, H.H. WISHART, L.A. FLASHMAN & R.S. SANTULLI. Characterization of Verbal Learning Processes in MCI and AD.

Objective: List-learning tests are among the most sensitive measures for early detection of MCI. However, little is known about which underlying memory processes are affected in MCI and differentiate this population from normal aging and AD patients. To determine which processes are most vulnerable to preclinical and early AD, we analyzed different components of list-learning performance.

Participants and Methods: We examined the CVLT-I/II components (total learning, free immediate recall, cued immediate recall, interference list recall, free delayed recall, cued delayed recall, recognition, false positives), in participants of the Dartmouth Memory and Aging Study at baseline evaluation (HC, $n=47$; MCI, $n=48$; AD, $n=18$). Diagnostic criteria were the Petersen et al. criteria for amnesic MCI and the NINCDS/ADRDA criteria for AD. Multivariate analysis of variance was used to characterize memory process for each group and discriminant function analysis was used to determine which component would best predict group classification.

Results: All components of the CVLT showed significant differences between groups.

Discriminant function analysis comparing ADs and HCs indicated that four CVLT measures (short and long delay free recall, trial B, and false positive response) correctly classified all participants. When comparing MCIs and HCs, two CVLT measures (total learning score and long delay free recall) correctly classified 91.8% of HCs and 95.8% of MCIs.

Conclusions: Verbal learning component scores were highly accurate classifiers for MCIs and ADs versus HCs. When misclassification occurred, it was most likely between MCIs and HCs.

Correspondence: *Nadia Pare, PhD, Psychiatry, DHMC, 1 medical center drive, Lebanon, NH 03756-0001. E-mail: nadia.pare@dartmouth.edu*

S. RANE, J. NAJERA, M. HISCOCK & L. DAVIS. Verbal and Non-verbal Recognition Tasks Yield Similar Serial Position Curves: More Evidence in Favor of a Unitary Short-Term Memory System.

Objective: Baddeley and Hitch's (1974) model of working memory fractionates short-term storage into separate verbal and nonverbal components. On the other hand, analyses of serial-position curves from recognition tasks suggest that there is a single mechanism that underlies memory for both verbal and nonverbal stimuli (e.g., Jones, Farrand, Stuart, & Morris, 1995). In a previous experiment, we replicated and extended the Jones et al. findings. It is possible, however, that our results were affected by inclusion of a selective interference manipulation (i.e., a secondary task). Consequently, we repeated the earlier experiment without the selective interference task.

Participants and Methods: Participants were 48 undergraduates (24 males and 24 females). Each participant was tested in two conditions, one of which entailed sequential presentation of 7 letters and one of which entailed sequential presentation of 7 dots that were positioned randomly on the computer screen. After the final stimulus had been presented, all 7 stimuli reappeared on the screen and the participant used a computer mouse to indicate the order in which the stimuli had been presented. Each condition comprised 6 trials.

Results: Serial position curves for recognition of both letter names and dot positions showed significant linear and quadratic trends, $p < .0001$. The quadratic trend, which did not interact with stimulus category, reflects similarly bowed curves for both letters and dots. Analysis of the final three positions yielded comparable linear and quadratic recency effects for both stimulus categories. Analysis of the first three positions yielded only a linear primacy effect, which also was comparable for both kinds of stimuli.

Conclusions: The experiment yielded no evidence that would support the existence of separate systems for verbal and visuospatial short-term memory. Without the potentially confounding influence of a selective interference task, the results were very similar to the results of our previous experiment.

Correspondence: *Merrill Hiscock, Ph.D., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: mhiscock@uh.edu*

J.B. RICH, K.J. ZILBERBERG & C.L. BARR. A Comparison of Verbal and Nonverbal Memory Immediately and at 25-minute and 72-hour Delays.

Objective: One's choice of tests in a neuropsychological evaluation is necessarily limited by time, budget, and patient fatigue constraints. To determine whether the same patterns of performance would be observed with different measures that presumably tap the same function and over longer delays than are typically obtained, we compared performance on two verbal and two nonverbal memory tests immediately and after 25-minute and 72-hour delays.

Participants and Methods: A total of 133 healthy, undergraduate men participated in two test sessions scheduled 3 days apart. The primary measures of immediate and delayed memory included the CVLT-II, Brief Visuospatial Memory Test-Revised, WMS-III Logical Memory, and WMS-III Faces subtest. Delay intervals were filled with tests of working memory, mood, word reading efficiency, and cheek swabbing for genetic analysis. Participants completed 72-hour delayed recall and recognition of the four primary measures in Session II.

Results: Analyses revealed significant linear effects over the three test points for the CVLT-II, WMS-III Logical Memory, and BVMT-R, all $p < .001$, but a quadratic effect for the WMS-III Faces, $p < .001$ ($T2 < T1 = T3$). Correlational analyses indicated that the CVLT, Logical Memory, and BVMT-R were highly intercorrelated at all three test points. In contrast, performance on the Faces subtest was unrelated to the other three measures.

Conclusions: Three of four memory measures provided similar information in healthy young men. Prose passage recall, list learning, and visuospatial memory were highly intercorrelated and declined significantly in a linear fashion across three time points: from immediate to 25-minute and 72-hour delays. Memory for faces and visuospatial memory are not equivalent measures of nonverbal memory. The latter has more in common with standard verbal memory tests than with facial memory. These results highlight the difficulty posed when trying to generalize from a single measure of a particular cognitive domain.

Correspondence: *Jill B. Rich, PhD, Psychology, York University, 4700 Keele Street, Toronto, ON M3J1P3, Canada. E-mail: jbr@yorku.ca*

S.M. RUMBLE, T. BURNS & N. DEFILIPPIS. Processing Speed and Memory Performance in a Neurological Sample.

Objective: The objective of this study was to further investigate the relationship of processing speed and memory in a pediatric neurological sample. Donders, J. & Minnema, M.T. (2004), reported that deficits in speed of information processing were primarily responsible for learning deficits on the California Verbal Learning Test- Children's Edition after pediatric Traumatic Brain Injury. Rumble et. al. (2006) found similar results with a broad pediatric neurological sample. The current study investigated the relationship between processing speed and memory using the Wide Range Assessment of Memory and Learning- 2 (WRAML-2) Screening Index, which evaluates both verbal and visual memory subtests. It was hypothesized that Processing Speed Index scores on the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) would be positively correlated with WRAML-2 Screening Indices.

Participants and Methods: Fifty-five boys and 32 girls ages 6 to 16 were evaluated using the WISC-IV and the WRAML-2 Screen ($N=87$). The subjects were evaluated after referral to the Neuropsychology Department in a children's hospital in the Southeast They were evaluated in association with a variety of neuropsychological disorders, including both inpatient and outpatient assessments.

Results: A Pearson correlation was used to evaluate the relationship between the Processing Speed Index scores on the WISC-IV and WRAML-2 Screening Index score. Results indicated a statistically significant positive correlation between the two variables ($r=.523$, $p<.001$).

Conclusions: Results support the hypothesis that scores on the WISC-IV Processing Speed Index are positively correlated with WRAML-2 Screening Index scores, thus supporting the relationship between processing speed and both visual and verbal memory in this sample.

Correspondence: *Susan M. Rumble, Master of Arts in Clinical Psychology; Neuropsychology; Children's Healthcare of Atlanta, 1001 Johnson Ferry Rd, Atlanta, GA 30342. E-mail: susanrubble@bellsouth.net*

K.A. RYBALSKEY, S.M. HORNING, B.E. KNAUF, F.E. KLEIN, J.M. BAILIE & R.A. FRANK. The Influence of Flavor Labeling on Memory in Adults and Children.

Objective: Deficits in olfaction and memory are common features of some neurodegenerative disorders. Our lab has been working on the development of the test of olfactory memory that can be used to better characterize the relationship between olfaction, memory and neurodegenerative disorders. Lumeng et al., (2005) noted that in an old-new flavor recall task the mean performance for children was only slightly better than chance. No comparative data on adult performance was obtained. The objective of the present study is to determine how healthy adults perform on various flavor recall tasks so as to further explore memory for flavors and the role of verbal labeling on the encoding of flavors to memory.

Participants and Methods: One hundred and fifty adults, ages 18 to 47, were recruited for this study. The sample was 60% female and 74.7% Caucasian. In the first experiment, participants received ten randomly selected flavors of jelly beans and were asked to identify the flavor. After a fifteen minute retention interval, the participants were asked to taste twenty more jelly beans, with ten previously presented and ten new distractors. The participants were asked whether they had previously tasted the jelly bean and to again identify the flavors. The second experiment employed a similar protocol, but the tasks were modified to use a forced-choice paradigm.

Results: Adults performed significantly better than children on the flavor recall task ($p<0.01$). However, adults identified on average only 4 jelly bean flavors more than chance. Adults performed significantly better when four alternatives were provided compared to unrecued identification.

Conclusions: Overall, flavor memory tasks are difficult for both adults and children. Adults' performance on the flavor recall task was significantly better than children's due to their ability to more consistently label the flavors. These results provide a foundation for further development of a clinical test of olfactory memory.

Correspondence: *Konstantin A. Rybalsky, Psychology, University of Cincinnati, 9947 Timbers Drive, Cincinnati, OH 45242. E-mail: rybalska@email.uc.edu*

E.G. SCHLICHTING, S. CORREIA, P. MALLOY & S. SALLOWAY. N-back Performance and Standardized Measures of Processing Speed, Executive Function, and Working Memory in Mild Cognitive Impairment vs. Normal Controls.

Objective: To determine the discriminative ability of an n-back task vs. standardized measures of processing speed (PS), executive function (EF), and working memory (WM) for identifying patients with amnesic mild cognitive impairment (MCI) vs. cognitive normal controls (NC).

Participants and Methods: Twenty-two patients with amnesic MCI (Petersen criteria) and 17 age-matched NCs undertook a cognitive test battery as part of a study on frontal systems functioning in MCI. Tests of interest were PS: Trail-Making Test part A (TMT-A) and Symbol-Digit Modalities Test (SDMT); EF: TMT-B and TMT-A – TMT-B

(TMT_DIF); WM: n-back (2 and 3-back) and WMS-III Working Memory Index (WMI). Statistical tests were MANOVA and follow-up discriminant function analysis (DFA). To limit the number of variables in the DFA, we selected the one measure from each domain with the largest effect size (Hedges' g) in the MANOVA.

Results: The MCI group performed more poorly on all measures ($p=.003$). Tests entered into the DFA were TMT-B ($g=-1.09$); SDMT ($g=1.78$), and 3-back accuracy ($g=1.44$). The DFA produced one significant function (Wilk's lambda = .40, $p < .001$). Discriminant loadings were SDMT ($r=.83$), 3-back accuracy ($r=.67$), and TMT-B ($r=-.55$).
Conclusions: The results comport with prior findings of deficits in PS, EF, and WM in MCI. SDMT was a stronger discriminator of MCI vs. NC than 3-back accuracy or TMT-B. The SDMT may place greater emphasis on incidental learning than n-back or TMT-B and as such may be more sensitive to the entorhinal cortex and hippocampal changes that characterize amnesic MCI.

Correspondence: *Erin G. Schlichting, M.S., Psychology, University of Rhode Island, 33 Pinecrest Drive, Exeter, RI 02822. E-mail: esch1509@postoffice.uri.edu*

R.J. SPENCER, S. RICE, P.P. GIGGEY, S.L. SELIGER, L.I. KATZEL & S.R. WALDSTEIN. Symbol-Digit Modalities Test-Incidental Learning: Preliminary Findings in Older Adults.

Objective: Incidental learning is a supplementary task of the Symbol-Digit Modalities Test (SDMT-IL), the validity of which remains largely unexplored.

Participants and Methods: This investigation examined SDMT-IL in predicting performance on other measures of memory. Participants were 58 well-educated ($M=15.4$ years) older adults ($M=68.2$ years) who were enrolled in studies assessing the effects of hypertension or chronic kidney disease on the brain. Participants were free from major neurologic illness. Participants completed a minimum of 50 symbol-digit pairings before engaging in SDMT-IL. Performance on SDMT-IL was used to predict performance on tests of memory including Logical Memory, Immediate and Delayed (LMI & LMD) and Visual Reproductions Immediate and Delayed (VRI & VRD) from the WMS-R.

Results: SDMT-IL performance ($M=5.1$, $SD=1.9$) was significantly correlated with age ($r= -.40$) and SDMT items completed within 90 seconds ($r= .43$). SDMT-IL performance was moderately correlated with the four measures of memory (LMI: $r= .28$, $p= .03$; LMD: $r= .39$, $p= .001$; VRI: $r= .34$, $p= .001$; VRD: $r= .35$, $p= .001$). The immediate and delayed portions of the criterion measures correlated at $r= .33$ ($p= .01$) and $r= .37$ ($p= .01$), respectively.

Conclusions: These preliminary results suggest that SDMT-IL, a supplementary task that is straightforward to administer, provides a quick approximation of verbal and nonverbal memory. Further research is needed investigating the association between SDMT-IL and other tests of memory.

Correspondence: *Robert J. Spencer, M.S., Psychology, UMBC, 1000 Hilltop Circle, Baltimore, MD 21250. E-mail: rspencer@umbc.edu*

E. STEFFEN, S. CAPOZZI, C. FORTIER, G. LAFLECHE, J.F. DISTERHOFT & R. MCGLINCHEY. The Role of Awareness in a Delay Eyeblink Discrimination Task.

Objective: Whether or not awareness of stimulus contingencies is necessary to acquire differential delay eyeblink conditioning has recently been debated. While data from some studies show a significant positive association between eyeblink discrimination and awareness with no significant conditioning in subjects classified as unaware, other studies have found that conditioning can indeed occur in the absence of awareness. Across studies thus far, awareness has mainly been measured using a post-experimental questionnaire. The current experiment sought to create a more accurate method of measuring awareness.

Participants and Methods: 19 currently abstinent chronic alcoholic individuals and 18 normal control participants were given an online button press device and were asked at the beginning of the experiment to press the button whenever they thought they were about to get an air-puff. The experiment itself was a delay eyeblink conditioning discrimination reversal task with 60 discrimination trials followed by 60 reversal trials. Awareness was assessed by subtracting %incorrect button presses from %correct button presses.

Results: The aware group (classified by awareness scores of at least 70%) contained 21 participants and the unaware group had 16 participants. Although the data show that some subjects were clearly unaware of the US-CS relationship, there was not a significant difference in learning between the aware group (mean %CRs= 64.52) and the unaware group (mean %CRs= 57.71).

Conclusions: Results from this study support the idea that contingency awareness is not required for learning to occur in a delay eyeblink conditioning task.

Correspondence: *Elizabeth Steffen, B.A., VA Boston Healthcare System, 150 South Huntington Ave, Boston, MA 02130. E-mail: esteffen@heartbrain.com*

B. UTTL & A.L. SIEGENTHALER. Age Declines on Free Recall are Larger than on Old/New Recognition Memory Tests. True or False?

Objective: According to widespread beliefs, age-related declines are larger on free recall than on old/new recognition tests. However, an examination of test manuals and published research shows that old/new recognition is often perfect or nearly perfect, artificially reducing the size of age declines. We examined the possibility that larger age declines on free recall vs. old/new recognition memory tests are artifacts of easy ceiling-limited tests.

Participants and Methods: Study 1: We searched the literature to identify studies that (a) employed both free recall and old/new recognition tests, (b) included at least one group of younger and one group of older participants, and (c) reported both means and standard deviations for each condition. We then examined the size of age declines as a function of severity of ceiling effects. Study 2: We analyzed several large data sets that included both recall and recognition tests that were not afflicted by ceiling effects and examined the magnitude of age declines on the two kinds of tests.

Results: Study 1 revealed that recognition vs. recall tests were more frequently afflicted by ceiling effects and that ceiling effects artificially reduced observed age declines on old/new recognition but not on free recall tests. Study 2 showed that when free recall and old/new recognition tests were not afflicted by ceiling effects, the magnitude of age declines were comparable.

Conclusions: Thus, the belief that old/new recognition is less affected by aging than free recall appears to be nothing but a myth.

Correspondence: *Bob Uttl, Private, 33 Scenic Glen Mews, Calgary, AB T1L3L1, Canada. E-mail: uttlbob@gmail.com*

D. VELIKONJA, E. WARRINER, B. DERYCK & C. WEBER. Visual and Verbal Memory Performance in Patients with Acquired Brain Injury (Traumatic Brain Injury and Acute Stroke).

Objective: Work with temporal lobectomy patients has suggested distinct verbal and visual memory systems. Many studies support the lateralization of verbal memory to the left hemisphere, whereas research on visual memory has been inconclusive. This may be attributed to differences in stimuli and test procedures found across different visual memory tests, which is not the case for tests of verbal memory. The purpose of the current study was to (i) explore whether a group of patients perform similarly on two theoretically comparable measures of visual memory - Brief Visuospatial Memory Test (BVMT-R) and the Rey Osterrieth Complex Figure Test (ROCF); and (ii) to explore whether these patients perform similarly on tests assessing visual and verbal memory modalities.

Participants and Methods: Participants included 58 patients with traumatic brain injury and acute stroke referred to neuropsychological assessment services.

Results: A repeated measures ANOVA between the BVMT-R and ROCFT showed significant differences in patient performances across all measures other than the recognition trial. The repeated measures ANOVA used to examine the relationship between verbal memory (RAVLT/CVLT-II) and the BVMT-R showed no significant difference in performance; however, there was a statistically significant difference between the ROCFT on the immediate memory trial.

Conclusions: These findings demonstrate that different patterns of performance occur on visual memory measures that use different test procedures and complexity of stimuli. Similarities in performance were found between verbal and visual memory measures employing similar procedures. Therefore, stimuli complexity and test procedures are important constructs in building a more consistent model of visual memory.

Correspondence: *Diana Velikonja, Ph.D., Psychiatry and Behavioural Neurosciences, Hamilton Health Sciences/ McMaster University, Box 2000, Hamilton, ON L8N 3Z5, Canada. E-mail: dvelikonja@cogeco.ca*

M.E. WETZEL, C.A. RACINE, C.A. WOODS, J.H. KRAMER, B.R. REED, D. MUNGAS, A. DU, M.W. WEINER, H. CHUI & C. BUTLER. The Role of Entorhinal Cortex in Memory Consolidation in Mild Cognitive Impairment.

Objective: The entorhinal cortex (ERC) is atrophic in Mild Cognitive Impairment (MCI) and may be an important mechanism of impairment in early neurodegenerative disease. Our goal was to study the relationship between ERC and memory consolidation in MCI and dementia patients.

Participants and Methods: We examined 35 MCI and 38 demented subjects with structural MRI and immediate and delayed verbal memory assessment (MAS list learning). ERC and hippocampal (HP) volumes were manually-measured using coronal T1-weighted images. To examine the independent contribution of ERC to memory consolidation, we performed multiple regression analyses with delayed recall as the dependent variable. Age, gender, education, total intracranial volume and total MAS immediate recall (learning) were entered into the model first, followed by left HP volume, and then left ERC volume. We hypothesized that ERC would contribute to verbal memory independent of HP volume in MCI.

Results: In MCI patients, left ERC predicted delayed recall after accounting for demographic variables, total learning, and left HP volume, explaining an additional 8.2% of the variance ($\beta = .381, p < .02$). In the dementia group, however, left HP explained an additional 10.1% of the variance while the contribution of left ERC did not reach significance.

Conclusions: The ERC plays a role in verbal memory consolidation in MCI that is independent of hippocampal volume, whereas in dementia, hippocampal volume is a stronger predictor. These results are consistent with studies suggesting that ERC atrophy may be a very early indicator of neurodegenerative disease, and highlights the functional significance of ERC atrophy on memory performance.

Correspondence: *Margaret E. Wetzel, Neurology, UCSF Memory and Aging Center, 350 Parnassus Ave, Box 1207, San Francisco, CA 94143-1207. E-mail: mwetzel@memory.ucsf.edu*

B.R. WILLIAMS. Do Verbal Tasks Really Cause More Retroactive Interference Than Nonverbal Tasks on the CVLT-II?: Results from a College Population.

Objective: In order to minimize the effects of retroactive interference on recall of words after a delay, the authors of the California Verbal Learning Test-II (CVLT-II) suggest that a nonverbal task be administered during the test's delay interval. The purpose of this study was to evaluate the influence of retroactive interference on recall of words during the Long-Delay recall trials of the CVLT-II.

Participants and Methods: Participants were 120 undergraduate students ($n=30$) randomly assigned to one of four conditions. First, all participants completed the CVLT-II Immediate Recall and Short-Delay Free and Cued recall trials. Following these trials was a 25-minute delay interval during which each group received either a verbal (WAIS-III Vocabulary or Peabody Picture Vocabulary Test-III) or nonverbal (Raven's Standard Progressive Matrices or WAIS-III Block Design) interference task. At the end of the 25-minute delay period, the CVLT-II Long-Delay Free and Cued recall trials were administered.

Results: It was hypothesized that due to verbal interference, individuals given a verbal task during the delay would produce more intrusions and recall fewer words during the Long-Delay Free and Cued recall trials than individuals administered a nonverbal task. Statistical analyses revealed that regardless of the type of interference task received, participants in all groups recalled the same number of words and produced a similar number of intrusions during the Short and Long-Delay recall trials.

Conclusions: The results of this study suggest that, in a college population, there is no difference in the amount of retroactive interference produced by verbal and nonverbal tasks on the CVLT-II Long-Delay recall. Correspondence: *Bethany R. Williams, BA, Clinical Psychology, Binghamton University (SUNY), 55 Riale Avenue, Johnson City, NY 13790. E-mail: buillias@binghamton.edu*

Psychopharmacology

S.E. CHRIST, R.D. STEINER, D.K. GRANGE & D.A. WHITE. Relationship between Blood Phenylalanine Levels and N-back Working Memory Performance in Children with Phenylketonuria.

Objective: Children with phenylketonuria (PKU) are believed to experience prefrontal dysfunction related to excessive phenylalanine and depleted dopamine levels. Consistent with this notion, past studies have documented impairments in children with PKU in prefrontally-mediated abilities such as working memory, inhibitory control, and cognitive flexibility. Recent findings have been mixed, however, regarding a possible inverse relationship between the severity of such impairment and the extent of adherence to a phenylalanine-restricted diet (as measured by blood phenylalanine levels). In the present study, we examined the relationship between recent blood phenylalanine levels and performance on a working memory task.

Participants and Methods: Twenty-four children (mean age = 11.4 years; age range: 6 to 17 years) with PKU performed an N-back task consisting of two conditions: a 0-back (control) condition and a 2-back (working memory) condition.

Results: Performance in the working memory (2-back) condition was significantly correlated with recent blood phenylalanine levels. Higher phenylalanine levels were associated with slowed and more variable responding ($r > .50, p < .05$ in all instances). This relationship remained statistically significant even after controlling for performance in the control (0-back) condition, suggesting that the finding was attributable to effects on working memory performance and not processing speed.

Conclusions: The results suggest that blood phenylalanine levels continue to have an influence on prefrontal function even in children with very well-controlled diets. Of note, the present N-back task represented a highly sensitive response time measure that may have allowed us to detect such a relationship that was not evident in other recent studies utilizing less-sensitive measures.

Correspondence: *Shawn E. Christ, Ph.D., Psychological Sciences, University of Missouri-Columbia, 210 McAlester Hall, Columbia, MO 65211. E-mail: research@shawncrist.com*

B.D. STEH, T.A. KALEITA, D.K. WELLISCH & T.F. CLOUGHESY. A Modafinil Therapeutic Trial for Adult Brain Tumor Patients: Neurocognitive Outcomes.

Objective: Brain tumor patients experience various neuropsychological deficits related to their illnesses and associated treatments. We tested the efficacy of modafinil at improving attention, psychomotor speed, and verbal fluency.

Participants and Methods: Participants: 30 adults, 63% male, mean age=45.3 (sd=11.7) years. Locations of tumors were as follows: left frontal (30%), right frontal (7%), left temporal (7%), right temporal (23%), left parietal (3%), right parietal (10%), bifrontal (10%), optic chiasm (3%), cerebellum (3%), third ventricle (3%). Treatments: neurosurgical resection (93%), radiotherapy (87%), and chemotherapy (70%). All had moderate to severe fatigue and/or neurocognitive impairments. Measures: Trail Making A&B (TM-A, TM-B); Symbol Digit Modalities (SDM); Verbal Fluency (VF). Methods: 3-week, randomized, double-blind, dose-controlled phase followed by a 1-week washout and an 8-week open-label extension (50-600 mg/day after 100 mg/day x 3 days, 200 mg/day x 4 days). Statistical Analysis: Percent change from baseline: totals of patient standard score mean changes at designated points divided by the total sample means at baseline. Probability estimates: paired t-tests or Wilcoxon Signed Rank Tests.

Results: Outcomes 8 and 12 weeks post modafinil initiation include (shown as percent change): TM-A, 20% ($p=0.003$) at 8 and 20% ($p=0.003$) at 12 weeks; TM-B, 24% ($p<0.0001$) at 8 and 25% ($p<0.0001$) at 12 weeks; SDM-Oral, 31% ($p=0.0003$) at 8 and 28% ($p=0.005$) at 12 weeks; SDM-Manual, 30% ($p<0.0001$) at 8 and 27% ($p=0.0005$) at 12 weeks; VF, 33% ($p<0.0001$) at 8 and 27% ($p=0.001$) at 12 weeks. An aggregate variable (the Attention Functional Index), empirically derived from the five cognitive measures, produced the most robust outcomes: 121% ($p<0.0001$) at 8 and 110% ($p<0.0001$) at 12 weeks.

Conclusions: Patients showed improvements on all neuropsychological measures, with more statistically significant and clinically meaningful outcomes at 8 weeks compared with 12 weeks post modafinil initiation. Correspondence: *Bill D. Steh, Ph.D., Semel Institute/Resnick Neuropsychiatric Hospital, UCLA, 760 Westwood Plaza, Room CS-734, Los Angeles, CA 90095. E-mail: bsteh@mednet.ucla.edu*

Sex Differences/Sex Hormones

L. COX, J.L. WOODARD, P. MAKI, J. KWAK-KIM, K. BEAMAN, J. GEORGE & V. MONTGOMERY-RICE. The Effects of Ovarian Hormone Suppression on Episodic Memory in Premenopausal Women.

Objective: There is conflicting evidence concerning the cognitive effects of medical treatments that suppress ovarian hormones in women of reproductive age, with some data suggesting a negative effect on verbal memory and other data suggesting no effect. The purpose of this observational study was to characterize the effects of pharmacologic suppression of ovarian hormones on verbal memory in comparison to other cognitive abilities.

Participants and Methods: Six women (age 30 to 36 years) with laproscopic confirmed endometriosis or uterine fibroids who completed a 3-month course of the gonadotropin-releasing hormone agonist, leuprolide acetate depot (LAD) were compared to 6 healthy controls on a battery that included the California Verbal Learning Test - 2nd edition (CVLT), the Logical Memory subtest from the Wechsler Memory Scale - 3rd edition, Matching to Sample, Continuous Performance Test, Spatial Processing Discrimination, and Simple Reaction Time subtests from the Automated Neuropsychological Assessment Metric, Judgment of Line Orientation Test, Controlled Oral Word Association Test, and mood and affect measures.

Results: Results indicated a selectively negative effect of ovarian hormone suppression on verbal memory. Relative to healthy controls, participants treated with LAD recalled significantly fewer words on the immediate and delayed recall trials of the CVLT. Significant group differences were not found for the other cognitive measures.

Conclusions: The present preliminary findings confirm previous findings that ovarian hormone suppression differentially affects verbal memory functions and extend the range of cognitive abilities that are not affected by hormone suppression to include working memory, verbal fluency, visuospatial processing, and visuomotor processing speed. These results illustrate the clinical importance of examining the cognitive side effects of medications that affect sex steroid hormone levels.

Correspondence: *Lisa Cox, Ph.D., MCW Clinics at Froedtert, Medical College of Wisconsin, 9200 West Wisconsin Avenue, Milwaukee, WI 53226. E-mail: lrcox@mcw.edu*

L. LEJBAK, S. LANTING, H. NICOLE & M. CROSSLEY. Sex Differences in Neuropsychological Predictors of Verbal Fluency Output and Strategy.

Objective: Weiss and colleagues (2006) reported sex differences in the relationships among verbal fluency (output and strategy) and other neuropsychological tests in a younger sample; for example, performance on the Digit Symbol Test was related to output and strategy in males only. This study investigated sex differences in neuropsychological predictors of verbal fluency output and strategy in younger and older populations.

Participants and Methods: The sample included 60 younger (31 female and 29 male) and 72 older (43 female and 29 male) participants. Hierarchical regression analyses were performed separately for males and females using output and strategy (clustering and switching) during phonemic and semantic fluency as dependent measures. Covariates age and vocabulary were entered in the first step and, consistent with Weiss and colleagues' findings, Symbol Digit Modality Test (SDMT) and Logical Memory I were the neuropsychological predictors entered in the next step.

Results: SDMT and Logical Memory I differentiated females from males: these predictors did not add any unique variance for females' output but added a significant amount of unique variance on both phonemic ($R^2=14%$, $p<.01$) and semantic ($R^2=10%$, $p=.04$) output for males. Further analyses revealed that SDMT accounted for the males' significant findings. The only significant unique neuropsychological predictor for strategy was observed for females on semantic switching ($R^2=12%$, $p<.01$) with SDMT accounting for the significant findings.

Conclusions: These results support the theory that males and females complete neuropsychological tasks using different cognitive strategies, possibly related to fundamental differences in brain processing.

Correspondence: *Lisa Lejbak, Department of Psychology, University of Saskatchewan, 9 Campus Drive, Saskatoon, SK S7N 5A5, Canada. E-mail: lk1341@mail.usask.ca*

C. LIOSSI & R. WOOD. Sex specific neuropsychological and affective trajectories after traumatic brain injury.

Objective: Clinical studies have only begun to decipher and probe the role of gender in outcome after TBI. The aim of the present investigation was to compare cognitive and affective functions in males and females who had suffered comparable injuries, to determine if females are more cognitively impaired than men and if they have worse affective outcome, compared to their male counterparts.

Participants and Methods: In a prospective matched cohort design 150 male and female community dwelling patients who had sustained traumatic brain injury were individually matched on the basis of age,

severity of injury, premorbid IQ, and time since injury. Patients were assessed with the Beck Depression Inventory, the Beck Anxiety Inventory, the Wechsler Adult Intelligence Scale, the Wechsler Memory Scale, three tests measuring executive function and their general cognitive decline was determined.

Results: Women were significantly more impaired on all neuropsychological functions compared to men, with specific effects found in verbal and visual memory. The degree of cognitive decline was significantly positively correlated with age in women but not in men. Women had marginally higher scores on measures of anxiety and depression.

Conclusions: Gender is a moderator of cognitive and affective outcome after brain injury.

Correspondence: *Christina Liossi, Psychology, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom. E-mail: cliossi@soton.ac.uk*

K.L. MORDECAI, L.H. RUBIN & P.M. MAKI. Memory Across the Menstrual Cycle and with Oral Contraceptive Use in Young Women.

Objective: Previous research indicates that estrogen therapy and fluctuations in sex steroid hormones throughout the menstrual cycle may influence memory and other cognitive abilities, yet little is known about the effects of oral contraceptives (OCs) on cognition. This study investigated the effects of OCs, as well as the effects of normal hormonal fluctuations during the menstrual cycle, on memory in healthy young women.

Participants and Methods: Sixteen women currently taking estrogen-based OCs (Users) and 14 normally menstruating women (Nonusers) completed neuropsychological testing once during the midluteal (high estrogen and progesterone) phase and once during the follicular (low estrogen and progesterone) phase. Main outcome measures included tests of verbal (CVLT) and visuospatial (BVRT) memory. Cycle phase at first testing session was randomized and hormone levels were confirmed with radioimmunoassay techniques.

Results: Verbal memory performance was enhanced for Users during the luteal phase and for Nonusers during the follicular phase. A negative relationship was found between progesterone levels and verbal memory performance during the follicular phase for the Users and during the luteal phase for Nonusers. Performance on tests of visuospatial memory, attention, verbal fluency, and mental rotation did not differ significantly between Users and Nonusers or across the menstrual cycle.

Conclusions: Findings indicate that verbal memory is the primary cognitive domain affected by the menstrual cycle and OC use. Further, progesterone appears to be antagonizing the beneficial effects of estrogen on verbal memory. These results are consistent with recent findings indicating a potential negative impact of progesterone/progestins to memory in animals and postmenopausal women.

Correspondence: *Kristen Mordecai, MA, MS, Rosalind Franklin University of Medicine and Science, 7321 N. Honore St., #1-S, Chicago, IL 60626. E-mail: kristen.mordecai@rfums.org*

C.H. MORTON, J.L. WOODARD, S. MILLER, E. CRESS & L.W. POON. Are Male Centenarians Super-Survivors?

Objective: Longevity research has identified clear gender differences in life-expectancy, even among the oldest-old. Although women show longer survival than men, an open question is whether cognitive, physical and functional capacities are equally preserved or lost among male and female centenarians.

Participants and Methods: We compared 177 centenarians and 77 octogenarians participating in the Georgia Centenarian Study. Participants completed measures of Basic (BADLs) and Instrumental Activities of Daily Living (IADLs) using the Direct Assessment of Functional Status, cognitive functioning (Severe Impairment Battery), health-related problem solving skills (Health and Safety subtest of the Independent Living Scales) and physical functioning (NIA Short Physical Performance Battery) as part of a larger evaluation.

Results: While 33% of octogenarians were male, only 16% of centenarians were male. There were no gender differences on any measure for octogenarians. However, male centenarians demonstrated significantly better BADL ($p < .03$), IADL ($p < .006$), cognitive ($p < .001$) and physical ($p < .03$) functioning, and health-related problem solving skills ($p < .018$) than their female counterparts. Female centenarians showed greater variability than male centenarians.

Conclusions: Male centenarians show consistently better cognitive and physical functioning as well as activities of daily living competency. Although preserved health status in males has been posited to account for this gender disparity, the underlying cause remains unclear. Male gender may somehow counter the deleterious biological effects associated with extreme old age, or the men who do survive to the upper limits of longevity may be "super-survivors" who have circumvented the influence of age-associated disease.

Correspondence: *Carla H. Morton, M.S., Psychology, Rosalind Franklin University of Medicine & Science, 3333 Green Bay Rd., North Chicago, IL 60064. E-mail: carla.morton@sbcglobal.net*

L.H. RUBIN & P.M. MAKI. Cognitive Processes Underlying the Sex Difference on the Digit Symbol Test.

Objective: The Digit Symbol Subtest of the Wechsler Adult Intelligence Scale (DSST; Wechsler, 1981) is a cognitively complex neuropsychological task that requires

at least four cognitive processes for successful performance—visual scanning, memory, incidental learning, and graphomotor speed. Sex differences are well documented on the DSST (McCurry et al. 2001; Schmidt et al., 2000). However, little is known about the cognitive processes contributing to the female advantage on this test. The present study investigated sex differences in four cognitive processes underlying the DSST.

Participants and Methods: Fifty males and fifty-three females equivalent on age ($M = 22.15$, $SD = 3.82$) and education ($M = 15.15$, $SD = 2.46$) completed the DSST, the digit symbol copy test, the digit symbol incidental learning test, and a version of the DSST created to assess visual scanning. Independent t -tests were conducted to assess sex differences in the cognitive determinants of the DSST.

Results: Consistent with previous studies, females ($M = 89.98$, $SD = 15.46$) outperformed males ($M = 84.04$, $SD = 14.11$) on the DSST, $t(101) = 2.03$, $p < .05$. The only process showing a sex difference was visual scanning, such that females ($M = 28.19$, $SD = 10.77$) performed better than males ($M = 21.84$, $SD = 6.24$), $t(101) = 3.63$, $p < .05$. Moreover, the sex difference in DSST was no longer evident in an analysis that covaried for visual scanning scores.

Conclusions: These findings indicate that visual scanning contributed to the sex difference on the DSST.

Correspondence: *Leah H. Rubin, M.A., Psychiatry and Psychology, University of Illinois at Chicago, 912 S. Wood St., M/C 913, Chicago, IL 60605. E-mail: lrubin@psych.uic.edu*

J.L. WOODARD, K.L. MORDECAI, D.R. RUDY, K.D. BEAMAN & F.R. KALMAR. Effects of a Six-Week Trial of Hormone Replacement Therapy on Cerebral Glucose Metabolism, Cognitive Functioning and Mood.

Objective: Hormone Replacement Therapy (HRT) has been proposed to account for several beneficial cognitive changes in postmenopausal women, although its underlying mechanisms are not well-understood. Using a pretest-posttest study, we investigated the effects of HRT after six weeks on regional cerebral glucose metabolic rate (rCMRglc), mood, and cognition in postmenopausal women.

Participants and Methods: Six healthy postmenopausal women between 58 and 63 years of age ($M = 61$, $SD = 2.1$) participated in this study. Participants had not used HRT for at least 2 years prior to enrollment. Participants underwent cognitive and mood evaluation and fluorodeoxyglucose positron emission tomography (FDG-PET) at baseline and after 6 weeks of HRT.

Results: After six weeks of receiving either 0.625 mg conjugated equine estrogen (CEE; $n=2$) or CEE plus 2.5 mg medroxyprogesterone acetate ($n=4$), estrone levels nearly tripled and doubled, respectively. Significant increases in depressive symptoms ($p=.003$) and reductions in positive affect ($p=.048$) were observed. Increased verbal fluency ($p=.05$) and Wechsler Memory Scale-Revised Logical Memory II ($p=.011$) and Verbal Paired Associates I performance ($p=.003$), and decreased susceptibility to interference on the Stroop test ($p=.037$) were also observed. Significant reductions in rCMRglc in dorsolateral prefrontal cortex, left occipital gyrus, left medial and middle frontal gyrus, and left dorsomedial nucleus of the thalamus were identified.

Conclusions: After only six weeks, HRT appeared to have a mild negative impact on mood, despite having a positive influence on verbal memory and executive functioning skills. The significant HRT-associated regional rCMRglc reductions may correspond to more efficient glucose utilization that may underlie the observed enhanced cognitive performance.

Correspondence: *John L. Woodard, Ph.D., Psychology, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Rd., North Chicago, IL 60064. E-mail: john.woodard@rosalindfranklin.edu*

J. WU, A. MOLNAR, M. WAGNER, R. WAFORD, C. WARREN & D.L. MOLFESE. Sex Differences In Attention Across ERP And Near-Infrared Procedures On The Same Participants.

Objective: Event related potentials (ERPs) measure neural electrophysiological activity and optical near infrared (NIR) measures brain hemoglobin levels. Sex differences in language processing and cognitive activities have been studied for some time. However, few studies use more than one imaging procedure to study the relation between brain processing and sex differences during attention.

Participants and Methods: Both ERP and NIR were recorded from 5 males and 5 females (mean age 23.2 yrs, standard deviation 1.55 yrs) on an auditory oddball paradigm. Words containing coarticulated speech cues (back, pack, gap, cab) and nonwords (bap, pab, gak, kak) served as either frequent (88%) or target (12%) stimuli and were counterbalanced across subjects. The order of the ERP and NIR test was also counterbalanced. ERPs were recorded from 256-electrode hydro-cell nets and NIR was recorded with 30 fibers covered the left inferior frontal area.

Results: Factor analysis (PCA followed by varimax rotation) and repeated measure ANOVA were applied to the averaged data from each subject using Greenhouse-Geisser correction. Both ERP and NIR data showed significant difference between target and frequent stimuli: responses to targets had larger positive brainwaves and less hemoglobin concentrations. Gender effect was also found across methods. Compared with females, males generated more positive slow wave ERPs at 484 ms following stimulus onset, $F(1,8) = 13.872$, $p=.006$, $obs.power=.902$; and produced a lower deoxygen-hemoglobin level in NIR, $F(1,8)= 5.838$, $p=.042$, $obs.power=.565$.

Conclusions: The results indicated parallel findings using ERP and NIR measures and are discussed in relation to language processing difference between males and females.

Correspondence: *Dennis L. Molfese, Ph.D., Birth Defects Center, University of Louisville, Health Sciences Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

Visuospatial Abilities

B.J. CHERRY, J. ZHANG, G. SCOTT, R. ROMERO, R. BABAGAY, B.C. HENDERSON, A.A. RIZZO, J. BUCKWALTER & V.W. HENDERSON. Normative Data on a Modified Mental Rotation Task in Younger and Older Adults.

Objective: This study was designed to provide normative data for a modified mental rotation task. The mental rotation task used was a sim-

plified version of a test originally developed by Vandenberg and Kuse in 1978. As originally devised, this test of spatial processing may be difficult even for young adults, and it is often even more challenging for healthy older adults. In the original, each drawing (20 targets) depicted 11 blocks stacked one after the other but containing four right-angle turns, followed by four choices. A modified version of the test, developed by Rizzo, Buckwalter & Henderson, consists of 20 targets depicting six blocks with two right-angle turns. Each target is followed by two choices, one of which is a rotated version of the target.

Participants and Methods: Fifty-three younger and 53 older adults performed the modified mental rotation task as well as several more established neuropsychological measures of attention (working memory) and visuospatial function: Digit Span Forward and Backward from the WAIS-R (Wechsler, 1981); a digit ordering task (Amor et al., 1999; MacDonald et al., 2000), and the Judgment of Line Orientation Task (Benton, Hannay & Varney, 1975).

Results: Typical main effects of sex and age were found for the modified mental rotation task, such that males vs. females and younger vs. older adults identified more items correctly. The Age by Sex interaction approached significance, with larger sex differences in the older adults.

Conclusions: Normative data and intercorrelations between tasks are reported and discussed for all participants, and for younger and older adults separately.

Correspondence: *Barbara J. Cherry, PhD, Department of Psychology, California State University, Fullerton, Po Box 6846, Fullerton, CA 92834-6846. E-mail: bcherry@fullerton.edu*

N. KHETRAPAL, B. KAR & N. SRINIVASAN. Development of Visuo-Spatial Working Memory.

Objective: It has been hypothesized that Visuo-Spatial Working Memory (VSWM) is composed of two processes, namely maintenance and manipulation. In this study, we explore the development of VSWM especially the process of manipulation. We use the spatial n-back task that has been employed to study 'monitoring type' of manipulation.

Participants and Methods: In the spatial n-back task, participants are required to remember the most recent 1 and 2 stimulus positions and respond to whether the current target position matched the position (in which the target was presented) n items previously. The study was performed with 25 healthy children aged 5-13 years, divided into 3 age groups. d' was used as the measure of accuracy that has not been widely used for n-back tasks with children.

Results: On the 1-back task, accuracy was the same among older children (8-10 and 11-13 years) and was better than the younger children (5-7 years) signifying changes in perceptual response strategies as children mature on a task requiring VSWM. This is in agreement with other studies on working memory showing age-dependent changes during middle childhood and early adolescence. However, when the working memory load is increased all the three groups showed poor and similar level of performance on the 2-back task reflecting that the VSWM may not be fully developed enough to handle complex perceptual processing by age 13.

Conclusions: Our study shows that while there is development of VSWM through childhood, the processes have not reached full maturity by age 13. The study also has implications for children with ADHD as they show poor perceptual sensitivity on measures of working memory.

Correspondence: *Neha Khetrpal, D.Phil, Centre for Behavioural and Cognitive Sciences, University of Allahabad, Psychology Building, Allahabad 211 002, India. E-mail: sumitneha@rediffmail.com*

M. MARIANI. The Effects of Gender and Type of Instruction on Route Performance.

Objective: Males and females use different strategies to find their way in the environment (MacFadden et al., 2003). The present study sought to determine whether gender or type of instruction could predict performance on a task of route performance.

Participants and Methods: The sample consisted of 29 male and 30 female students ($M = 20.80$; $SD = 1.55$). Each participant was tested individually on their ability to traverse a route through a 9-point floor grid (adapted from Weinstein et al., 1959), while either viewing a map without rotating it or listening to verbal instructions. Performance was assessed by time taken to complete the task and accuracy of route reproduction.

Results: A 2 (gender) by 2 (instruction type) between-subjects ANOVA revealed a main effect for instruction type [$F(1, 55) = 233.22$, $p < .001$], whereby the use of a map yielded faster route completion. No gender effects were observed and no interactions were present. A chi-square test was performed to assess the relationship between instruction type and accuracy. The results indicated that 63.3% of participants using a map traversed the route correctly, compared to 27.6% of participants who followed verbal instructions. This difference was statistically significant [$\chi^2(1) = 6.22$; $p = .013$]. No gender differences were observed in accuracy.

Conclusions: The results of this study did not show any gender differences in the ability to traverse a route, as measured by time to completion and accuracy. However, the findings indicated that map use assists in route performance. This study has implications for wayfinding in naturalistic environments.

Correspondence: *Matias Mariani, M.A., Psychology, University of Windsor, 173 CHS, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: marian7@uwindsor.ca*

A. RAMIRO & T. MONTIEL. Visuospatial Processing in Spanish-Speaking Children with Dyscalculia.

Objective: This work intends to determine if the children with dyscalculia have problems with spatial abilities and, if any, which one of the types of spatial knowledge is mainly altered: egocentric space, corporal space or allocentric space.

Participants and Methods: 25 children with dyscalculia and 25 children without dyscalculia (9 to 12 years old) of 4th elementary school grade in Guadalajara, México. Since the mathematical abilities could be affected by intelligence level, attention abilities and reading level we compared this factors in both groups. Significant difference was shown in the intelligence level. We evaluated the groups with the spatial abilities tasks from the Evaluación Neuropsicológica Infantil-ENI (Child Neuropsychological Assessment, Matute, Rosselli, Ardila & Ostrosky, in press) and with the Drawing of a map task.

Results: The MANOVA analysis with the IQ participant's scores like covariate variable revealed a non significant interaction effect over the spatial measurements. The group effect was not observed while the analysis demonstrated a significant IQ effect for the spatial test scores.

Conclusions: Our results did not show that children with dyscalculia have difficulties in the spatial activities performance. The IQ level was an important factor in the achievement of the participants in the spatial tasks. Studies with IQ level control are necessary to determine the relation between dyscalculia and presence of spatial problems in children. Correspondence: *Alicia Ramiro, Master in Sciences, Psicología Infantil, Hospital Civil de Guadalajara, Luis Farah 1373, Villas Belenes, Zapopan 45150, Mexico. E-mail: alicia_ramiro@yahoo.com.mx*

E.M. MULLER-OEHRING, T. SCHULTE, A. PFEFFERBAUM & E.V. SULLIVAN. Effects of Age and Alcohol on the Relation between Visual Conjunction Search and Regional Corpus Callosum Size.

Objective: Components of visuospatial processing are commonly impaired in alcoholism, and those requiring visual search may be further compromised with advancing age. In controls, we have observed that older age and smaller anterior corpus callosum (CC) contribute to greater visual load differences in reaction time (RT) when serial but not parallel processing is required. Here we asked whether alcohol- and age-related structural alterations of the CC affect parallel or serial processing.

Participants and Methods: Alcoholics (ALC, $n=32$) and age-matched controls (CTL, $n=32$) performed a computerized RT task, involving 3 complexity factors: single feature color search (target=red tomato; foils=yellow tomatoes); color-form conjunction search (target=red tomato; foils=yellow tomatoes and red or yellow strawberries); and two visual display types (organized or disorganized) for conjunction stimuli. Each task contained 4 or 8 stimuli (load component). Callosal genu, body, and splenium were measured on midsagittal MRIs.

Results: ALC had disproportionately longer RTs in conjunction than feature search relative to controls. In ALC, longer RTs in feature and conjunction search correlated with greater lifetime alcohol consumption. In each group, RT was prolonged with larger stimulus load in conjunction but not feature search; older age correlated with these load differences in conjunction but not feature search, especially in the dispersed conjunction condition. However, ALC and CTL showed significantly different relations between genu area and load effects in dispersed conjunction search.

Conclusions: Our results suggest that parallel processing mechanisms are not affected by age or alcoholism, whereas serial processing in conjunction search is affected by age and alcoholism. Alcohol-related degradation of callosal fibers in addition to age effects may attenuate inter-hemispheric information transfer and diminish the opportunity for compensatory recruitment of bilateral neural systems. Support: AA12388, AA10723, AA05965

Correspondence: *Eva M. Muller-Oehring, Ph.D., Dep. of Psychiatry and Beh. Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 94305. E-mail: evamce@stanford.edu*

M. NASS, Q.R. MANO, M. MILLER & D.C. OSMON. Subitization: Insights from Canonical Inspection Time, Semantic and Negative Priming.

Objective: The purpose of the study was to explore the notion of subitizing as a perceptually obligatory process by using three paradigms: (1) Inspection Time, (2) Semantic Priming, and (3) Negative Priming.

Participants and Methods: All three paradigms involved presenting dot patterns ranging from one to nine dots to undergraduate students ($n=40$). In the Inspection Time paradigm, participants were shown briefly presented canonical and non-canonical dot patterns followed by a backward mask. For Semantic Priming, participants were presented with word primes that were consistent, inconsistent, or neutral with the target dot pattern. For the Negative Priming, participants were presented with a number or neutral prime directly to the left of each dot pattern that was congruent, incongruent, or neutral to the subsequent target dot pattern. Their task here was to ignore the distracter that shared properties with the subsequent target.

Results: Three repeated-measures analysis of variance (ANOVA) were conducted separately for each experimental condition. Regarding inspection time, analyses revealed that canonicity did not affect accuracy in the subitizing range, however, accuracy significantly improved accuracy for dot patterns four-nine ($p < .05$), suggesting that enumeration is only facilitated by canonicity when the quantity of stimuli exceeds the range of subitizing. As measured by reaction time, semantic priming had no significant affect on subitizing canonical dot patterns one-three ($p < .05$), however, findings suggested a linguistic affect on subitization. And, negative priming disrupted the automatic process of subitizing canonical dot patterns one-three ($p < .05$).

Conclusions: Altogether, results suggest the following about subitization: (1) as stated in previous literature, it is not dependent on canonicity, (2) semantic primes affect the obligatory, perceptual assessment of numerosity, and (3) the automatic properties of subitizing dot patterns one-three are vulnerable to cognitive interference/inhibition.

Correspondence: *Quintino R. Mano, M.S., Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford Ave., Garland Hall 224, Milwaukee, WI 53221. E-mail: qrmano@uwm.edu*

M. SINDEN, N. BOGOD & R. STEENHUIS. Possible Congenital Topographic Heading Disorientation.

Objective: Topographic heading disorder is a posited form of spatial disorientation. Rarely reported in the literature, it is usually described as transient and in patients with acquired focal brain damage. We describe the neuropsychological profile of a woman with a lifelong inability to orient herself within the environment.

Participants and Methods: A 42 year old left handed female who reported lifelong inability to spatially navigate, visualize directions or visually learn environmental layouts and routes. She was assessed using a comprehensive neuropsychological battery of standardized tests as well as informal tests of topographic orientation. A collateral interview and MRI of the brain were obtained.

Results: Most cognitive abilities were within normal limits, including many visuospatial and visuo-perceptual abilities. She had variable non-verbal memory abilities, difficulty planning and executing routes through mazes, and piecemeal copying of a complex figure. She was unable to identify common map locations, had difficulty recreating her route from work, and produced directional errors on simple navigation tasks. MRI suggested subtle cortical mantle abnormalities in both fronto-parietal vertices thought to represent a migrational disorder.

Conclusions: Neuropsychological tests, her self report and collateral information suggest a congenital form of topographic disorientation. She has features consistent with heading disorientation. This condition is characterized by selective impairment of exocentric spatial representations with preserved ability to remember landmarks and to demonstrate basic visuo-perceptual skills but with loss of all sense of exocentric direction and an inability to form a link between landmarks and directional information. No congenital forms and only a few cases of acquired heading disorientation are reported in the literature.

Correspondence: *Marci Sinden, BA, Neurosciences, Vancouver General Hospital, 855 West 12th Ave., Vancouver, BC V5V 1X4, Canada. E-mail: marci.sinden@vch.ca*

E.J. VAN DER HULST, B. GORDON, G.D. PEARLSON & D.J. SCHRETLEN. Cognitive and Neuroanatomic Determinants of Visual-Motor Integration.

Objective: The Beery Developmental Test of Visual-Motor Integration (VMI; Beery, 1989) is widely used to assess the integration of visual-perceptual and fine motor skills. This integration has been conceptualized as consisting of four components: visual perception, fine motor coordination, motor inhibition, and sustained attention. While impairments of visual-motor integration are common in various developmental and neuropsychiatric disorders, we are unaware of previous attempts to test the four-component model in healthy adults.

Participants and Methods: We administered a short form of the VMI and other neuropsychological tests to 237 reasonably healthy adults aged 18-93 years. Each participant also received a brain MRI from which we estimated total gray and white matter volumes using an automated segmentation algorithm.

Results: Based on linear multiple regression analyses, we found that measures of visual perception and fine motor coordination, but not motor inhibition or sustained attention, made significant unique contributions to a model that explained 33.7% of the variance in VMI performance. Thereafter, adding terms for gray and white matter volume improved the model, increased the explained variance to 38.5%, and markedly attenuated the beta weight for fine motor coordination. In fact, only visual perception and gray matter volume contributed significantly to the final model.

Conclusions: In a broadly representative community sample, individual differences in visual-motor integration were found to depend on visual perception, fine motor coordination, and cerebral gray matter volume, but not on motor inhibition or sustained attention. The contribution of gray matter volume is intriguing and suggests the involvement of some other cognitive determinant of visual-motor integration.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University, 600 N. Wolfe Street, Meyer 21S, Baltimore, MD 21287-721S. E-mail: dschret@jhmi.edu*

Paper Session 8**11:00 a.m.–12:30 p.m.****Adult Rehabilitation****R.H. BENEDICT, F. MUNSCHAUER, P. ZAREVICS & R. CARPENTER. Improved Processing Speed in MS Patients Treated with L-Amphetamine.**

Objective: Processing speed and working memory defects are common in multiple sclerosis (MS). Psychostimulant drugs may improve abilities in this area although there is no medication specifically approved by the FDA for treating this problem in MS patients. While d-amphetamine has a propensity to increase extracellular dopamine, it is highly addictive. L-amphetamine is less potent for dopamine but has similar efficacy for increasing extracellular norepinephrine in hippocampus and cortex. We tested the hypothesis that this medication will improve cognitive processing in MS.

Participants and Methods: The neuropsychological effects of l-amphetamine were evaluated in 19 MS patients, using a within-subjects, counter-balanced design. All patients underwent each of four single-dose conditions: placebo, 15 mg, 30 mg, 45 mg. Tests included the Rey Auditory Verbal Learning Test, Brief Visuospatial Memory Test - Revised, Paced Auditory Serial Addition Test, and the Symbol Digit Modalities Test (SDMT). Patients also completed self ratings using a Global Cognitive Functioning Scale.

Results: Single doses of 45 mg improved scores (in many cases with statistical significance) on tests of attention and processing speed. Largest effects were observed on the SDMT. Dose response relationships were apparent on several measures. While episodic memory test effects were in the expected direction, the findings were not statistically significant. Self-ratings of cognitive capacity also improved with treatment. L-amphetamine was well-tolerated and no subject was discontinued from the study due to an adverse event.

Conclusions: The preliminary findings show promise for the use of l-amphetamine for the symptomatic treatment of slowed processing speed in MS. Further phase II investigation is underway.

Correspondence: *Ralph H. Benedict, PhD, Neurology, University at Buffalo, Buffalo General Hospital, 100 High Street, Buffalo, NY 14203. E-mail: benedict@buffalo.edu*

L.J. ALTMANN, B. CROSSON, E. MIKELL, C.M. DEL TORO, S. LEON, L.X. BLONDER & L.J. GONZALEZ ROTH. Change in discourse Quality Following an Attentional Treatment for Anomia.

Objective: The current work reports the effects on discourse production of a treatment designed to encourage RH contributions to noun access. Also, it introduces an extremely simple measure of content in impaired discourse called Utterance with New Information (UNI) that signifies the proportion of utterances providing information new to the listener.

Participants and Methods: Participants: Individuals (N = 17) with aphasia due to left CVA were video taped in conversations before and after treatment for anomia. The treatment was designed to encourage RH contributions to object naming by directing attention to the left visual field. Conversations were transcribed and scored by an independent team of researchers.

Scoring: Conversations were segmented into utterances using Systematic Analysis of Language Transcripts (SALT) protocols and coded for number of nouns, verbs, sentence types, and UNIs. Measures were corrected to number per utterance to control for sample length. Comparisons used Wilcoxon signed rank tests.

Results: Comparisons of pre- and post-treatment conversation revealed that, post-treatment, participants produced significantly more nouns ($p < .005$) and appropriate responses ($p < .05$), and marginally more appropriate grammatical sentences ($p < .06$), UNIs ($p < .08$) and total content words ($p < .08$). The use of verbs increased in 13 of 17 participants, but this was not significant ($p < .12$). Mean length of utterance (MLU) and Type-Token Ratio (TTR) did not change.

Conclusions: These findings illustrate that facilitating access to RH lexical representations can have pervasive effects on discourse quality, i.e. the amount of information communicated, without affecting traditional quantity measures (MLU and TTR). We suggest that the UNI can be used to track functional gains in conversational speech, even in non-propositional speech, of individuals with aphasia or other language impairment. Correspondence: *Lori J. Altmann, PhD, Communication Sciences and Disorders, University of Florida, 336 Dauer Hall, Box 117420, Gainesville, FL 32611-7420. E-mail: laltmann@ufl.edu*

M. VAN HOUT, E.M. WEKKING, I.J. BERG & B.G. DEELMAN. Psychosocial and Cognitive Rehabilitation of Patients with Chronic Toxic Encephalopathy. A Randomized-Controlled Study.

Objective: There is little experience with (neuro)psychological treatment of patients with chronic toxic encephalopathy (CTE). We compared cognitive behavior group therapy with cognitive strategy training and a waiting list control condition in a randomized controlled clinical trial (RCT) in two centres.

Participants and Methods: Hundred and twenty-seven patients with diagnosed CTE were invited for treatment. Ninety-five patients started treatment, 84 patients had complete data. Research design was a RCT with follow-up, comparing the effects of the two interventions allocated in random order with each other and with a waiting-list control group. The first treatment consisted of eight group sessions of cognitive behavior therapy (CBT). The second treatment consisted of eight sessions of cognitive strategy training to compensate memory problems. Outcome measures were treatment satisfaction, self-ratings of psychosocial and cognitive functioning, and neuropsychological tests. Multiple linear regression analyses were performed with baseline scores, treatment condition, effort status, and litigation or financial compensation status as predictors.

Results: Treatment satisfaction was high. The PST group was more satisfied than the CST group. Insufficient effort and litigation were negatively associated with treatment outcome. After controlling for these variables, treatment condition was a significant predictor of memory scores after treatment. The CST group benefited the most. These effects diminished at follow-up. There were no significant differences between the groups on the psychosocial outcome measures.

Conclusions: Although patients in the CBT group were more satisfied with the treatment, the CST group benefited the most. Unfortunately, treatment effects were not stable over time. In future studies it might be relevant to evaluate the effect of regular sessions to update practiced cognitive strategies. Effort tests might be used as a predictor of treatment outcome in this patient group.

Correspondence: *Moniek van Hout, MSc, Clinical Psychology, Medical Spectrum Twente, P.O. Box 50.000, Enschede 7500 KA, Netherlands. E-mail: m.vanhout@ziekenhuis-mst.nl*

M. KURTZ, J.C. SELTZER, D.S. SHAGAN, W.R. THIME & B.E. WEXLER. Computer-Assisted Cognitive Remediation in Schizophrenia: What is the Active Ingredient?

Objective: An emerging body of research has shown that computer-assisted cognitive remediation for patients with schizophrenia, con-

sisting of training in attention, memory, language and/or problem-solving, produces improvement in neurocognitive function that generalizes to untrained neurocognitive tests and may also impact symptoms and work functioning. The active ingredient of these interventions, however, remains unknown as control groups in these studies have typically included few, if any, of the elements of these complex behavioral treatments.

Participants and Methods: This study compared the effects of an extended (12-month), standardized, computer-assisted cognitive remediation intervention with those of a computer-skills training control condition that consisted of many of the elements of the experimental intervention, including hours spent on a computer, interaction with a clinician and non-specific cognitive stimulation. Forty-two patients with schizophrenia were randomly assigned to one of two conditions and were assessed with a comprehensive neuropsychological test battery before and after treatment.

Results: Results of two-way, mixed ANOVAs revealed that cognitive-remediation training produced a significant improvement in working memory, relative to the computers-skills training control condition, but that there was overall improvement in both groups on measures of working memory, reasoning/executive-function, verbal and spatial episodic memory, and processing speed.

Conclusions: Taken together, these findings suggest that specific practice in neurocognitive exercises targeted at attention, memory and language, produce improvements in neurocognitive function in patients with schizophrenia that are not solely attributable to non-specific stimulation associated with working with a computer, interacting with a clinician or cognitive challenge, but that non-specific stimulation has a salutary effect on neurocognition as well.

Correspondence: *Matthew Kurtz, PhD, Schizophrenia Rehabilitation Program, Institute of Living, 200 Retreat Avenue, Hartford, CT 06106. E-mail: mkurtz@harthosp.org*

Paper Session 9

11:00 a.m.–12:30 p.m.

Assessment Issues

G.E. SMITH, V. PANKRATZ, S. NEGASH & M. MACHULDA. A plateau in pre-Alzheimer memory decline: Evidence for compensatory mechanisms?

Objective: Past studies suggest two potential models for memory decline in the pre-clinical period before Alzheimers Disease (AD). Conventional wisdom argues that slow cognitive aging is overtaken by disease, producing a monotonic acceleration in the decline to AD. An alternative model includes a period of plateau after initial decline that reflects a process of physiological or psychological compensation which ultimately yields in the final decline to dementia diagnosis.

Participants and Methods: We conducted mixed effects modeling of Mayo Cognitive Factors Scores to determine the longitudinal pattern of cognitive decline in the period 10 years prior to and 5 years following

a clinical diagnosis of Alzheimer's disease. Our analysis included 199 people that eventually received a diagnosis of clinically probable Alzheimer's disease. Participants had at least two neuropsychological evaluations including one before the evaluation at which they received the AD diagnosis.

Results: A bi-logistic model, including parameters for a plateau in the course of cognitive decline, better fit longitudinal memory than a simple logistic model. On average the plateau began about 4 years prior to the clinical diagnosis of AD and ended with a decline that probably contributed to the clinical diagnosis of AD. A similar plateau was not evident in four other cognitive domains.

Conclusions: The present findings may support proposed compensatory hypotheses involving redundant memory systems, upregulation of neurotransmitters, or recruitment of other neural networks. These findings also have important implications for the clinical practice of longitudinal memory assessment.

Correspondence: *Glenn E. Smith, PhD, Neuropsychology, Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: smith.glenn@mayo.edu*

D.W. LORING, E. STRAUSS, B.P. HERMANN, W. BARR, P. KENNETH, M.R. TRENNERY, G. CHELUNE, M. WESTERVELD, G.P. LEE & K.J. MEADOR. Differential Sensitivity of the Rey Auditory Verbal Learning Test and California Verbal Learning Test to Lateralized Temporal Lobe Epilepsy.

Objective: Despite the many available approaches to testing verbal learning, the relative sensitivity of these tests as measures of material-specific memory impairment has not been adequately addressed in a large representative sample of anterior temporal lobectomy candidates. In this report, we compare the sensitivity of two common verbal learning tests (Rey Auditory Verbal Learning Test, AVLT; California Verbal Learning Test, CVLT) to lateralized temporal seizure onset in patients with confirmed left cerebral language dominance in two patient cohorts.

Participants and Methods: There were 189 patients (L=91; R=98) who were administered the Rey AVLT and 212 patients were administered the CVLT (left n=113, right n=99). Of this sample, there were 135 patients who were administered the Boston Naming Test (L=69; R=66). Seizure onset laterality was determined according to clinical criteria in place at each participating institution. All patients have subsequently undergone anterior temporal lobectomy.

Results: Significant seizure onset laterality effects were present for the AVLT, with left TLE patients performing more poorly than patients with right TLE [L TLE=42.9 (10.6), R TLE=47.7 (9.9); ($p < .002$; Cohen's $d=.47$)]. Although statistically significant, the group differences for the CVLT was of a smaller magnitude [L LTE=40.7 (11.1), R TLE=43.8 (9.9); ($p < .03$, Cohen's $d=.30$). Group differences, however, were even greater on the Boston Naming Test [L LTE=43.1 (8.9), R TLE=48.1 (8.9); ($p < .001$, Cohen's $d=.57$).

Conclusions: Since both the AVLT and CVLT are similar in structure differing primarily in whether their stimulus words are semantically related or not, our findings suggest that the use of semantically related words in the CVLT stimulus list provides a strategy for encoding and recall that may compensate for verbal associative memory deficits associated with left temporal lobe dysfunction.

Correspondence: *David W. Loring, Department of Neurology, University of Florida, 100 S. Newell Drive, PO Box 100236, Gainesville, FL 32610-0236. E-mail: david.loring@neurology.ufl.edu*

M.F. GREIFFENSTEIN, W. BAKER & T.J. GOLLA. Dimorphism, Somatization, and Noncredible Cognitive Deficits.

Objective: A proven association exists between somatization disorder (SD) in females and interfamily psychopathy; but the association re-

mains enigmatic. We examined the hypothesis that female SD represents a sex-limited expression of psychopathy: Qualitatively different social cheating techniques. We examined dimorphic Test of Memory Malinger Trial 2 (TOMM-2) failure rates in persistent postconcussive presentations.

Participants and Methods: We collected biosocial, MMPI-2, and TOMM data on 189 persons (105 men; 84 women) asserting disability > 6 months after mild head-neck trauma. MMPI-2 profiles were classified a priori into three types: Conversion (high 1 & 3, low 2 & 7); Somatization Disorder (SD; 1-2-3-7 high points), and Negative Affect Only (NAO; 2-7 profiles). Social cheating was defined as TOMM-2 scores < 45/50, a customary cutting score.

Results: Female TOMM-2 failure rates were 63% with SD profiles ($N = 45$), 29% with Conversion ($N = 30$) and 7.3% in with NAO ($N = 9$). Male failure rates were 42.6% in the Conversion group ($N = 43$), 51% in SD ($N = 53$), and 6.4% with NAO ($N = 9$).

Conclusions: Noncredible cognitive defects showed strong association with female SD presentations ("Briquet's Hysteria") relative to other female or any male presentation. Psychopathy in 1st degree male family members is a known correlate of female SD status, but our study is the first to show intraindividual social cheating in affected females. The study design does not allow distinctions between secondary and primary psychopathy; it remains unclear whether noncredible performance represents manipulative test-taking behavior triggered by situational exigencies versus a stable style.

Correspondence: *Manfred F. Greiffenstein, Ph.D., Psychological Systems Inc., 26862 Woodward, Suite 103, Royal Oak, MI 48076. E-mail: mfgreiff@comcast.net*

J.L. STRICKER, G.G. BROWN, S.S. MARSHALL & J.L. ELMAN. Lessons for neuropsychologists from a connectionist architecture that can constructively solve multiple problems without interference.

Objective: Despite the increasing use of functional connectivity analyses and increasing sophistication and accuracy in imaging and testing methods, researchers still often conceptualize and discuss cognitive processes in terms of an assembly line of isolated systems. Artificial neural networks (ANNs) provide a simplified way to explore the properties of an interactive, dynamic system, and thus develop more realistic theories of brain function and dysfunction. However, the shortcomings of ANNs, most notably catastrophic interference, have prevented them from being utilized to develop more realistic theories of brain functioning. Here, we develop a network architecture and training methods to examine the extent to which ANNs are capable of constructively solving multiple problems.

Participants and Methods: Through a series of simulations, feed-forward and recurrent network architectures are developed and trained to solve multiple overlapping logic and delayed matching to sample problems.

Results: By increasing the efficiency of learning in ANNs, they are capable of constructively learning new problems without suffering from catastrophic interference.

Conclusions: The architecture developed in this work provides a process account of how different types of executive function and dysfunction occurs within the brain without requiring the existence of a large number of isolated, complex processes. When developing a process theory of neuropsychological phenomena it is important to distinguish between the limitations of abstractions used to develop theories (e.g. verbal, mathematical, or simulations) and broad statements about brain capabilities. At the same time, these results also highlight the value of connectionist simulations by illustrating how it is difficult for researchers to intuitively generate theories about how cognition could be implemented in simple interactive simulations, let alone in the human brain.

Correspondence: *John L. Stricker, Ph.D., San Diego Veteran's Healthcare System, 3350 La Jolla Village Drive, M/C 151B, San Diego, CA 92161. E-mail: jlstricker@ucsd.edu*

Paper Session 10

11:00 a.m.–12:30 p.m.

Pediatric Imaging

L. EWING-COBBS, M. PRASAD, M. BRANDT, J. BACHEVALIER, J. ALLOWAY, P. UPADRASHTA, P. SWANK, D. MENDEZ, J. FLETCHER & L. KRAMER. Regional Brain Volumes in Young Children with Traumatic Brain Injury: Relations with Neuropsychological Outcomes.

Objective: The purpose of this study was to characterize the relation of regional white and gray matter and corpus callosum subdivisions to IQ and executive process scores in children who sustained traumatic brain injury (TBI) prior to six years of age.

Participants and Methods: Regional white and gray matter volumes from conventional MRI were examined in 42 children with mild, moderate, or severe TBI who were scanned and tested at a mean age of 34.6 months. Partial correlation coefficients controlled for age at scanning and testing.

Results: Midcallosal and retrocallosal gray and white matter volumes showed a significant positive correlation with IQ subtest scores. Spatial self-ordered pointing test scores correlated positively with right and left precallosal gray matter volumes; perseverative error scores correlated with right and left precallosal white matter volumes. Morphometric analysis of 7 corpus callosum (CC) subdivisions was completed in 24 children. Scores were adjusted for brain size. Executive process scores correlated significantly with volumes as follows: rostrum, phonological working memory and delayed gratification ($p < .05$); genu, spatial self-ordered pointing, visuomotor precision, and joint gaze during a social interchange ($p < .05$); and anterior midbody, spatial reversal ($p < .02$).

Conclusions: The working memory, motor, and social communication scores were correlated primarily with volumes of the rostrum and genu, which carry prefrontal fibers, and with precallosal white and gray matter volumes. The strength of the brain-behavior relationships is striking given the young age of the children at the time of testing and the varied dependent measures. Supported by NIH R01-NS029462.

Correspondence: *Linda Ewing-Cobbs, PhD, Pediatrics, University of Texas Health Science Center, 7000 Fannin, Suite 2401, Houston, TX 77030. E-mail: linda.ewing-cobbs@uth.tmc.edu*

J.R. WOZNIAK, S. SCHNOEBELEN, L. KRACH, B. MUELLER, E. WARD, R. MUETZEL & K. LIM. Diffusion Tensor Imaging in Mild to Moderate Pediatric Traumatic Brain Injury.

Objective: The current study evaluated the sensitivity of Diffusion Tensor Imaging (DTI) in detecting white matter damage in children with mild to moderate TBI. We hypothesized that white matter microstructural integrity may be compromised and that changes at this level may be associated with neurocognitive and behavioral impairments.

Participants and Methods: Participants were 26 children, ages 11 to 18. Thirteen had TBI and 13 were control participants. Mean initial Glasgow Coma Scale (GCS) score was 12.5; mean lowest GCS score was 9.3. Participants had an MRI scan and neurocognitive battery. Parents completed the BASC and BRIEF. Testing occurred 8 months post-injury on average (range 6 to 12 months).

Results: Overall, no significant group differences emerged on any of the neurocognitive measures, but there was a trend toward slower processing speed in the TBI group ($p = .057$). In contrast, parents reported significant executive functioning problems on the BRIEF and behavioral abnormalities on the BASC for the TBI group. DTI data revealed evi-

dence of microstructural abnormalities in several regions (elevated mean diffusivity), including the corpus callosum, inferior frontal white matter, and centrum semiovale (CS). Abnormalities in CS mean diffusivity were associated with slow processing speed. No relationships between white matter integrity and the behavioral measures were found.

Conclusions: These results suggest that mild to moderate TBI in children may be associated with long-term white matter microstructural changes. The only structure-function relationship observed thus far was with processing speed. Additional analyses may reveal more localized areas of damage that correlate with specific aspects of functioning and behavior.

Correspondence: *Jeffrey R. Wozniak, Ph.D., Psychiatry, Univ. of Minnesota, F256/2B West, 2450 Riverside Ave., Minneapolis, MN 55454. E-mail: jwozniak@umn.edu*

O. ELKANA, D. SCHMIDT, U. KREMER, D. BEN-BASHAT, T. HENDLER & A. SCHWEIGER. Neuroanatomical Representation of Language Recovery Following Unilateral Brain Damage in Children: Preliminary Data from fMRI and Neuropsychological Testing.

Objective: Left hemisphere (LH) focal lesions acquired early in life can induce language re-organization in the undamaged right hemisphere (RH) and/or in the perilesional, undamaged tissue in the LH. Recently it has been suggested that in the chronic stage, language functions return to the LH in adults. The present study investigates the neuroanatomical re-organization of language processing in children, following unilateral aphasiogenic lesions.

Participants and Methods: We present preliminary data of six children with a history of single left hemisphere lesions, who were diagnosed with non-fluent aphasia at onset (ages 5-17) and subsequently recovered. All underwent fMRI using three linguistic activating tasks in the chronic stage (at least 4 years post onset). Thirteen age & sex matched healthy right handers served as controls.

Results: The patterns of activations in the RH in patients showed a striking similarity with the homologous LH patterns of the normal controls. On a non-linguistic control task of mental rotation, patients exhibited similar bilateral activation pattern to that of normal controls.

Conclusions: These data demonstrate that patients with childhood LH focal damage, who exhibited good linguistic recovery, the RH is activated during linguistic functions in brain areas homologous to LH regions involved in language processing (e.g., Broca & Wernicke), at least under normal circumstances.

Correspondence: *Avraham Schweiger, Ph.D., Behavioral Sciences, Academic College of Tel Aviv, 14 Rabeinu Yerucham, Tel Aviv 6168, Israel. E-mail: schweige@mta.ac.il*

B.A. CORBETT, V. CARMEAN, S. RAVIZZA & C. CARTER. Exploring the Amygdala in Children with Autism Using Structural and Functional MRI.

Objective: Autism is a severe neurodevelopmental disorder characterized by qualitative impairment before the age of three in verbal and non-verbal communication, reciprocal social interaction, and a markedly restricted repertoire of activities and interests. Social knowledge depends on our ability to recognize, identify, assimilate, plan, and respond appropriately to social and emotional stimuli, such as facial expressions. The human amygdala plays an essential role in the processing of affect, especially fear. Previous research using pathological, animal and neuroimaging methods suggest a primary role of the amygdala in the neuropathology of autism. To extend these findings, structural and functional MRI were collected using established probes of amygdalar function.

Participants and Methods: Participants included 33 children between 7 to 12 years of age with high functioning autism ($N=16$) and typical development ($N=17$). The first experiment consisted of a block design with alternating blocks of rapidly presented (200 ms) fearful faces, neutral faces, and fixation trials. The second experiment involved explicit matching of facial expressions, people and objects.

Results: The results of the fMRI studies showed relative deactivation of the anterior medial temporal lobe in the region of the amygdala in children with autism. In contrast, typically developing children showed activation of the amygdala during both the passive (implicit) and active (explicit) processing tasks.

Conclusions: These findings support previous research showing abnormalities in the amygdala function in individuals with autism. Analyses involving implicit and explicit processing of affective stimuli and other regions of interest will be presented and discussed.

Correspondence: *Blythe A. Corbett, Ph.D., Psychiatry and Behavioral Sciences, University of California, Davis, M.I.N.D. Institute, 2S25 50th Street, Sacramento, CA 95817. E-mail: blythe.corbett@ucdmc.ucdavis.edu*

Poster Session 11: Executive and Emotional Functions

11:15 a.m.–12:45 p.m.

Executive Abilities/Frontal System

C.E. BARBER, E. LERITZ, L. EL-MESSIDI, W. MILBERG & R. MCGLINCHEY. Clustering and Switching as Underlying Components of Verbal Fluency.

Objective: Controlled Oral Word Association (COWA), a standardized measure of verbal fluency, often correlates with executive functioning. Two implicit processes, clustering and switching, have been investigated as underlying processes of fluency and have been ascribed to temporal and frontal lobe functioning, respectively. The interplay of clustering and switching in relation to COWA performance, as well as the relationships of these processes to memory and executive function performance, was examined.

Participants and Methods: Sixty healthy, elderly African-Americans completed a battery of standardized neuropsychological tests, including phonemic and semantic fluency tasks.

Results: Two separate stepwise regression models were run with overall phonemic and semantic fluency scores as dependent variables. Switching and clustering emerged as significant predictors of overall fluency in each model (phonemic: switching, $\beta = .926$, and clustering, $\beta = .642$; semantic: switching, $\beta = .533$, and clustering, $\beta = .393$). Three factors resulted from a factor analysis conducted on the neuropsychological tests (1: “executive function,” 2: “memory,” 3: “attention”). Additional regression analyses indicated that phonemic switching and clustering predicted performance on the executive function Factor, but neither phonemic index was a predictor of the memory Factor. Semantic switching was predictive of the attention Factor.

Conclusions: These data suggest that switching may be the most critical component in COWA, as switching is a self-monitoring behavior related to higher order executive functions. Clinically meaningful information can be garnered by investigating the more subtle cognitive processes contributing to fluency.

Correspondence: *Colleen E. Barber, B.A., Geriatric Research, Education and Clinical Center, VA Boston Healthcare System/Harvard Medical School, 150 South Huntington Avenue, 1S2 JP, Boston, MA 02130. E-mail: cbarber@heartbrain.com*

L.D. BERKELHAMMER, C.H. BASSIN, A.M. MELTON, S.D. SANFORD, M.P. SMELTZER, C. LI, W.C. WANG, M.B. FREEMAN & K.J. HELTON. Attention and Executive Deficits in Children with Sickle Cell Disease without CNS Infarct.

Objective: The neuropsychological sequelae of pediatric sickle cell disease (SCD) are characterized by IQ, attentional, and executive dys-

function. This study examined performance of children with cMRI-confirmed absence of infarct (NI) compared to the normative sample. Ecological validity, as defined by the relationships between participant performance and observer ratings, was also explored. We hypothesized that children with NI would demonstrate neurocognitive weakness on standardized measures and via parent and teacher report. Participants in special education were expected to perform more poorly than those in general education.

Participants and Methods: Conventional brain MRI was unremarkable in fourteen African-American children with Hb SS. Three participants evidenced silent infarct (SI). Eight of the fourteen NI participants were receiving special education. Appropriate analyses were employed to compare the clinical to the normative sample, special versus general education groups, and the NI and SI groups.

Results: NI participants demonstrated lower IQ and deficits in sustained attention and response consistency (median standard scores; WASI: FSIQ=88.5, $p=.01$; VIQ=85.5, $p=.01$; PIQ=92.5, $p=.02$; T.O.V.A.: Omission Errors=40, $p=.01$ and Variability=79, $p=.02$). IQ scores were significantly lower for children receiving special education services compared to those who were not. Teachers reported cognitive and executive weaknesses, although parents denied attention, cognitive, and executive problems (median T-scores; CTRS-R:S Cognitive Problems=56, $p=.06$; BRIEF: MI=53.5, $p=.03$ and GEC=55, $p=.05$).

Conclusions: Increased specificity of the effect of pediatric SCD on attention and executive functions may facilitate development of cognitive rehabilitation and special educational interventions targeted to the needs of these often underserved students.

Correspondence: *Leslie Berkelhammer, Ph.D., Behavioral Medicine, St. Jude Children's Research Hospital, 332 N. Lauderdale Street, MS 740, Memphis, TN 38105-2794. E-mail: leslie.berkelhammer@stjude.org*

A. BIRD, J.H. KRAMER, L. QUITANIA, V. BECKMAN, D. DEAN & B.L. MILLER. Neuroanatomical Correlates of Verbal Abstract Reasoning.

Objective: Verbal abstract reasoning has long been described as a test of frontal-lobe functioning despite poorly understood neuroanatomical underpinnings. Our goal was to identify MRI predictors of similarity judgments and proverb interpretation.

Participants and Methods: We studied a heterogeneous sample of 161 subjects (mean age = 63.05) with an MMSE of at least 15 and diagnoses including normals ($n = 34$), AD ($n = 30$), FTD ($n = 26$), semantic dementia ($n = 16$), PPA ($n = 5$), PSP ($n = 10$), CBD ($n = 11$), LBD ($n = 1$), MCI ($n = 3$), and ALS ($n = 4$) from the UCSF Memory and Aging Center. MRI brain image analyses were obtained using BRAINS2 software. Subjects were administered two abstract reasoning tasks: similarities between word pairs and proverb interpretation. Hierarchical multiple regressions were performed with age, MMSE, and left- and right-frontal, temporal, and parietal lobar volumes as predictors of scores on the two abstraction tasks separately and combined into a general abstraction variable.

Results: Left-frontal ($p < .01$) and left-temporal ($p < .05$) lobar volumes made significant contributions to the variance on general abstraction beyond that accounted for by age and MMSE (R^2 change = 0.201, $F = 21.648$, $p < .01$). However, further analyses indicated only left temporal volume significantly contributed to the variance on similarities above and beyond MMSE and age (R^2 change = 0.173, $F = 11.361$, $p < .01$), and only left frontal volume significantly contributed to the variance on proverb interpretation (R^2 change = .146, $F = 15.395$, $p < .01$).

Conclusions: Our results indicate left frontal- and temporal-lobe volumes contribute significantly to variance in abstraction scores after accounting for age and MMSE score. These findings are consistent with evidence indicating a connection between frontal regions and executive functioning, but suggest possible anatomic specificity, with the left temporal lobe more important for apperception of semantic categories, and the frontal lobes more involved in novel abstract reasoning.

Correspondence: *Anne Bird, M.S., UCSF, 11780 San Pablo Ave, Apt 209, El Cerrito, CA 94530. E-mail: abird@memory.ucsf.edu*

A. BOEKA & K. LOKKEN. Neuropsychological Performance of Obese Individuals Seeking Bariatric Surgery.

Objective: The prevalence of morbid obesity is increasing at an alarming rate. It is one of the leading causes of preventable death in America, and is associated with a number of medical conditions, including hypertension, type II diabetes, and obstructive sleep apnea. Recent research has demonstrated that individuals with many of these obesity-related illnesses perform poorly on neuropsychological (NP) tasks, especially those measuring executive functioning. In addition, neuroanatomical studies implicate abnormal function of the prefrontal cortex in obese and post-obese individuals. However, little research exists examining the performance of obese individuals (OI) on NP tasks.

Participants and Methods: Fifty-four OI (36 females, 18 males) were recruited as part of a standard of care pre-surgical NP evaluation for bariatric surgery (Mean age = 40.56 years; Mean body mass index = 50.1 kg/m²; Mean education level = 14 years). Performance of these OI on NP tasks was compared to normative data.

Results: Overall, OI performed poorly on Trails B, Wisconsin Card Sorting Task, and Rey Complex Figure Test. As was predicted, OI took significantly more time to complete Trails B ($p < .001$), scored significantly lower on Rey Complex Figure Test Copy ($p < .001$), and made significantly more perseverative errors on the Wisconsin Card Sorting Task ($p < .001$) as compared to normative data. Further, OI performed below normative levels on California Verbal Learning Test-II Long Delay Cued Recall score ($p < .01$) and Controlled Oral Word Association test total score ($p < .01$).

Conclusions: Such preliminary results provide further evidence of cognitive dysfunction in OI.

Correspondence: *Abbe Boeka, MA, University of Alabama, 1034 26th St S, Birmingham, AL 35205. E-mail: boeka001@bama.ua.edu*

F.W. BYLSMA & A. BAGLEY. Does the Frontal Systems Behavior Scale (FrSBe) Assess Frontal System Behaviors.

Objective: The Frontal Systems Behaviors Scale (FrSBe) is an increasingly popular assessment tool purported to objectively measure a patient's and/or family member's appreciation of changes in the patient's apathy, disinhibition, and executive dysfunction after a brain injury. The FrSBe is said to measure the functional manifestations of frontal lobe dysfunction — and is unlikely to be related to performance on standard neuropsychological executive function measures.

Participants and Methods: To assess the relationships between standard measures and FrSBe-based assessments of frontal system dysfunction, 20 patients with acquired brain injuries were administered the FrSBe Family Rating form and standard clinical measures of frontal/executive function. To assess the ecological validity of the FrSBe, the Independent Living Scale (ILS) Health & Safety subscale was also completed with the patients.

Results: Results indicate no significant correlations ($p < .01$) between performance on standard neuropsychological measures of executive function (Trail Making Test, WCST) and the difference between family ratings of behaviors pre & post injury using the FrSBe. However, a significant correlation was observed between Pre-Post injury difference scores on the FrSBe Executive Dysfunction (ED) subscale and false positive errors on a verbal recognition memory measure ($r = 0.65$) suggests some evidence of construct validity. Additionally, the change in ED scores and the ILS Health & Safety subscale scores were significantly correlated ($r = 0.75$), suggesting ecological validity of the FrSBe.

Conclusions: These findings suggest that the FrSBe is most predictive of the functional manifestations of acquired brain injury, and not that of performance on most objective executive tasks.

Correspondence: *Frederick W. Bylsma, Ph.D., Neuropsychological Services, PC, 180 North Michigan Avenue, Suite 2210, Chicago, IL 60601. E-mail: nps_pc@sbglobal.net*

J. CHESTNUT, M. WELSH, S. LOGAN & C. VAN ROMER. Associations between Executive Functions and Self-reported Risk Taking Behavior in College Students.

Objective: Recent studies have suggested that certain neuropsychological impairments can be identified in groups of delinquent adolescents, including poor performance on cognitive tasks of spatial working memory and self-control. The present study examined the correlations between self-reported impulsive, nonplanful, and fearless behavior and scores on executive function (EF) tests in normal college students.

Participants and Methods: Sixty male and female college students, enrolled in an introductory psychology course, were administered four tests to assess specific EF skills: Tower of London-Revised (TOL-R)—planning skills, Iowa Gambling Task (IGT)—risky decision making, Contingency Naming Task (CNT)—mental flexibility, and Matrix Reasoning (MR)—inductive reasoning. In addition, participants were given a 187-item Personality Styles Inventory to assess possible antisocial personality traits.

Results: As expected, the three personality traits were significantly and positively intercorrelated. In addition, scores on three of the EF tasks (TOL-R, MR, and CNT) correlated in the predicted direction. Unexpectedly, more risky choices on the IGT related to better performance on the TOL and MR, and higher scores on the latter two measures were related to greater self-reported nonplanfulness and impulsivity.

Conclusions: These preliminary and surprising results suggest that such antisocial personality characteristics may have a different meaning in a “normal” population than they do in a delinquent population. Our findings indicate that students with better executive functions are reporting greater tendencies towards more risky behaviors, which are also reflected in their performance on the IGT.

Correspondence: *Jenny Chestnut, BA, University of Northern Colorado, Box 94, School of Psychological Sciences, Greeley, CO 80639. E-mail: jennychestnut@msn.com*

J. DAMON, C.L. CAREY, D. DEAN, V. BECKMAN, B. MILLER & J. KRAMER. Neuroanatomical Correlates of Planning Ability and Rule Monitoring.

Objective: Planning is a complex construct, one component of which is monitoring rules. Global planning has been linked to frontal lobe functioning, but the neuroanatomical underpinnings of rule monitoring have been less well studied. This study examines the relative contribution of different brain regions to planning and rule monitoring.

Participants and Methods: The D-KEFS Tower Test was administered to 19 patients with Alzheimer's disease, 25 with Frontotemporal Dementia, 12 with Semantic Dementia, and 6 normal controls. Overall achievement and number of rule violations were correlated with structural MRI scans yielding volumes for right and left frontal, temporal, and parietal lobes corrected for total intracranial volume. Multiple regression analyses controlling for age and MMSE were performed, with variable selection for analyses based on significant bivariate correlations.

Results: Higher overall achievement significantly correlated with smaller brain volumes in several regions, including bilateral frontal and parietal lobes, and the right temporal lobe. These regions combined to account for 31% of the variance, with no single region remaining significant on its own. In contrast, rule violations were specifically correlated with bilateral frontal regions, with only right frontal volume remaining as significant in the regression analysis.

Conclusions: Planning ability is a complex construct that is associated with the integrity of several brain regions. Rule monitoring, a component of planning ability, demonstrates greater anatomical specificity for right frontal lobe volume. This finding is consistent with other research that has found the right frontal lobe to be important for monitoring externally ordered events (Milner & Petrides, 1984; Goldberg et al., 1994). Correspondence: *Jill Damon, M.A., UCSF Memory & Aging Center, 350 Parnassus Avenue, Suite 706, San Francisco, CA 94117. E-mail: jill.damon.99@alumni.dartmouth.org*

M.F. DULAY, R.M. BUSCH, J.M. SMERZ, J.S. HAUT, R.I. NAUGLE, W. BINGAMAN & I.M. NAJM. Depression and Executive Functioning After Unilateral Frontal Lobectomy.

Objective: Previous studies indicate that extent of executive dysfunction in individuals with frontal lobe epilepsy is associated with factors such as depressed mood, earlier age at onset of seizures, and side of seizure focus. We extend this line of research by examining the relationship among these factors with seizure freedom after unilateral frontal lobectomy (FL) for the treatment of intractable epileptic seizures.

Participants and Methods: A total of 67 adults received measures of executive functioning (Trail B, WCST perseverative errors, Ruff Figural Fluency, and Letter Fluency) and mood state (Beck Depression Inventory-II) an average of 8½ months before and 8 months after unilateral FL (33 left, 34 right).

Results: Patients who were seizure free after surgery exhibited better performance across all executive tasks compared to patients who were not seizure free (F values ranging from 3.10 to 11.10, p 's < 0.05). Depressed patients with a poor seizure outcome produced significantly more WCST perseverative errors after surgery compared to depressed patients with a good seizure outcome or non-depressed patients with a good/poor seizure outcome, regardless of side of surgery. Repeated measures ANOVA showed a significant 3-way interaction such that individuals who were depressed and had an early age at seizure onset (6 years or less versus greater than 6 years) had a large and significant improvement in letter fluency performance from before to after surgery compared to all other groups, regardless of side of surgery or seizure outcome.

Conclusions: Results demonstrate that depressed mood state, age at seizure onset, and seizure outcome are important factors to consider when predicting the possibility of executive function improvements or impairments after frontal lobectomy.

Correspondence: *Mario F. Dulay, Ph.D., Baylor College of Medicine, 1709 Dryden Road, Suite 750, Houston, TX 77030. E-mail: mariodulay@aol.com*

C.C. DUMITRESCU, R.E. HANLON & N. JASINSKI. Executive Dysfunction in Acute Medical Inpatients: Implications for Functional Outcome.

Objective: Executive dysfunction commonly interferes with the ability to formulate and execute plans, grasp abstract concepts, and maintain motivation. Such impairments have implications in medical settings where patients must consent to treatment and adhere to a treatment plan. This study involved the retrospective review of the medical records and neuropsychological test data of 123 inpatients. We examined relationships between executive dysfunction and utilization of hospital services by inpatients with no history of dementia or psychiatric disorders.

Participants and Methods: Medical records of 123 inpatients were retrospectively reviewed. Statistical analysis of the association among demographic variables, neuropsychological test results, length of hospital stay and number of hospitalizations were analyzed using one-way ANOVAs and measures of association.

Results: We found that 42.3% of medical inpatients manifested executive dysfunction and attentional disturbance. These deficits were related to a history of multiple hospitalizations for similar medical prob-

lems. There were significant negative correlations between length of stay and verbal reasoning, number of hospitalizations and verbal reasoning, verbal fluency and number of hospitalizations, and basic attentional functions and length of stay. Verbal reasoning and attentional capacity were predictors of length of stay and number of admissions.

Conclusions: We found that approximately half of this inpatient sample manifested executive deficits that were statistically significant predictors of multiple hospitalizations and length of stay.

Correspondence: *Claudiu C. Dumitrescu, Northwestern Memorial Hospital/Northwestern Medical School, 1120 Game Trail South, Bourbonnais, IL 60914. E-mail: dumitrescu@comcast.net*

A. EASTVOLD, Y. SUCHY, M. KRAYBILL, K. KUSS & E. FRANCHOW. Inverse relationship between inhibition and switching: Evidence from the BDS-EV and the DKEFS Color-Word Interference.

Objective: A moderate relationship between the original Behavioral Dyscontrol Scale (BDS-O) and the Stroop has been previously demonstrated. The current study examined the relationship between the electronic version of the Behavioral Dyscontrol Scale (BDS-EV) and two versions of the Stroop, the Color-Word Inhibition and the Inhibition/Switch tasks from the Delis Kaplan Executive Function System (DKEFS). The Inhibition/Switch task requires that participants switch from color naming to word reading when a word is inside a box.

Participants and Methods: College students, ages 18-25 ($n = 16$) completed the BDS-EV and the DKEFS.

Results: Analyses revealed that the BDS-EV positively correlated with performance speed on the Color-Word Inhibition ($r = .601, p < .05$) and Inhibition/Switch ($r = .469, p = .06$) tasks. However, examination of Inhibition/Switch error data revealed an unexpected negative correlation ($r = -.529, p < .05$) with the BDS-EV.

Conclusions: The BDS-EV demonstrated a positive correlation with the speed of performance on both the Color-Word Inhibition and Inhibition/Switch subtests of the DKEFS, replicating prior results and further validating the BDS-EV. The unexpected inverse relationship between the BDS-EV and the Inhibition/Switch errors suggests a curvilinear relationship between task complexity and inhibition abilities. Specifically, a high ability to inhibit environmental distractors appears to be beneficial when a task is relatively simple; however, exceptional inhibition capabilities may be detrimental if a task requires attending to extraneous task characteristics and switching between inhibition and release of a particular response. Correspondence: *Angela Eastvold, MA, Psychology, University of Utah, 350 S 1530 E, Salt Lake City, UT 84102. E-mail: angela.eastvold@psych.utah.edu*

M.A. GARCIA-BARRERA, R.W. KAMPHAUS & G.W. HYND. Development of a Screener for the Behavioral Assessment of Executive Functions in Children -Pilot Study.

Objective: Our goal was to develop a screener for executive functioning of children, by performing a confirmatory factor analysis of 28 items from the BASC (Reynolds & Kamphaus, 1992) teacher-form for children aged 6-11, believed to measure executive behaviors.

Participants and Methods: The sample included 641 children with balanced gender distribution and multiracial representation. 28 items from the BASC were distributed into a theoretically-driven 4-factor structure (Problem Solving, Emotional Control, Behavioral Control, and Attentional Control) for validity analysis.

Results: LISREL 8.54 was used to perform the CFA, with the Maximum Likelihood method of estimation and Satorra-Bentler correction for nonnormality. Although a significant Chi-square was obtained ($\chi^2 = 3904.42, p < 0.00$), type 2 (NFI = .94, NNFI = .94, IFI = .95) and type 3 indexes (CFI = .95) demonstrated moderate goodness of fit. Factor loadings were significant and some factors correlated (r range = -0.53 to -0.83). Alpha coefficients were high, ranging from .85 to .93.

Conclusions: Significant correlations among the factors serve as evidence of “unity” of EF. Moreover, these correlations were not so high as to rule out the “diversity” of the construct components. The high loadings and high proportions of shared variance, the relative goodness of fit, and the multiple modification indexes (e.g., addition of error covariances) suggest the possibility of constructing a shorter scale, with fewer items that can count for the shared variance, and that may be more independent of one another. Prior to adopting or rejecting this CFA model for a clinical trial, cross validation, split half analysis of reliability, and content validity analysis are necessary. We believe that development of behavioral screeners for the assessment of EF is of great relevance to the field of pediatric neuropsychology, offering more “ecologically valid” ways of measuring this complex construct. Future investigations should focus on the behavioral indicators of executive functioning.

Correspondence: *Mauricio A. Garcia-Barrera, M.Ed., Educational Psychology and Instructional Technology, The University of Georgia, 345 Research Drive, Apt 57, Athens, GA 30605. E-mail: mgarcia@uga.edu*

C. GIBBS, M. POWELL, L.M. NOLL & S.E. CAUDLE. **Neurocognition and Parent Reported Sleep Problems in Children with Autism.**

Objective: Sleep problems in children result in daytime sleepiness and inattention and may impact neurocognition (Fallone et al., 2001). Parents of children with autism frequently report sleep problems in their children (Allik et al., 2006). In this study we hypothesized that specific aspects of neurocognition dependent on executive control would be more sensitive to parent reported sleep problems than other aspects of neurocognition.

Participants and Methods: Children ($n=23$; mean age = 5.3 ± 1.69 ; 20 male; Full Scale IQ = 95 ± 16.2) diagnosed with autism completed a battery of tests including the Leiter International Performance Scale-Revised. Parents completed a child sleep habits questionnaire. Items from the sleep habits questionnaire were rated on a 3-point Likert scale with high scores indicating sleep problems. Selected sleep items were used in linear regression analyses to predict performance on the Leiter Fluid Reasoning scale and Figure Ground and Form Completion subtests.

Results: The overall model for predicting Fluid Reasoning was significant ($F=5.1$, $p=.03$, $R\text{-square}=.20$). The model was not significant for predicting performance on the Figure Ground ($F=.66$, $p=n.s.$, $R\text{-square}=.09$) or Form Completion ($F=.52$, $p=n.s.$, $R\text{-square}=.12$) subtests.

Conclusions: Executive control is known to be vulnerable in children with autism and may be exacerbated by disturbed sleep. In this sample of children with autism, parent reported sleep problems predicted children’s performance on the Fluid Reasoning scale, where executive control demands are high due to requirements on active novel problem solving. Parent reported sleep problems were not associated with performance on the Figure Ground or Form Completion subtests, which place less demand on executive control.

Correspondence: *Cullen Gibbs, PhD, Learning Support Center for Child Psychology, Texas Childrens Hospital, 6621 Fannin Street, CC 1630.30, Houston, TX 77030. E-mail: mcgibbs@texaschildrenshospital.org*

C. GRAVER, L. BIELIAUSKAS, B. HAYES & S. PLEIN. **Perceived Need for Treatment and its Relationship to Neuropsychological Performance.**

Objective: A limited number of studies have suggested that executive functions (e.g., reasoning) are related to individuals’ insight in regards to their need for psychiatric treatment. A recent study by Whitney et al. (2005) indicated that lower social reasoning abilities, as measured by the NCSE judgment subtest, also may limit patients’ ability to judge their need for medical treatment. Perceived need for treatment, however, did not relate to performance on other cognitive tasks, such as the PPVT-III, FAB, and HVLTR. This study aimed to replicate those findings in a larger sample and further investigate this relationship.

Participants and Methods: Participants were 342 medical inpatients with a mean age of 64.93 years ($SD = 12.59$) and mean education of 12.89 years ($SD = 7.92$). All participants completed a brief neuropsychological screen within 48 hours of admission.

Results: There were small, statistically significant relationships between perceived need for treatment and the PPVT-III, FAB, and HVLTR ($r = .12$ to $.18$), though of limited clinical value. The relationship between the NCSE judgment subtest and perceived need for treatment just failed to reach statistical significance ($r = -.06$).

Conclusions: The predicted relationship between social reasoning and perceived need for treatment was not replicated. The implications of these findings are discussed.

Correspondence: *Christopher Graver, Ph.D., Western State Hospital, Neuropsychology S2-223, 9601 Steilacoom Blvd SW, Tacoma, WA 98498. E-mail: gravecj@dshs.wa.gov*

G. HERNANDEZ & T. MONTIEL. **Executive Functioning and Categorical Classification in Spanish-Speaking Children with Attention-Deficit/Hyperactivity Disorder.**

Objective: We intended to determine if the Attention-Deficit/Hyperactivity Disorder have an impact on the children’s achievement of executive function and categorical classification tasks.

Participants and Methods: 11 children from 2nd school grade, 14 children from 4th school grade and 10 children from 6th school grade diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) and 35 children without ADHD paired by gender and age.

We evaluated both groups with the executive functioning tasks from the Evaluación Neuropsicológica Infantil-ENI (Child Neuropsychological Assessment, Matute, Rosselli, Ardila & Ostrosky, in press) and with one Free Classification task.

Results: We found differences between ADHD group and control group in 2nd school grade in the number of movements used and the number of correct designs done with the minimum number of movements of the pyramid of Mexico and in perseverative responses of the card sorting test; both subtest from the ENI. In 4th school grade the differences were in the number of correct classifications and the use of perceptual criterion in the free classification task. Finally, in 6th school grade the ADHD group shown more frequency of total number of errors and a higher percent of errors than the control group in the card sorting test of ENI.

Conclusions: Our results show problems in the executive functioning and categorical classification in the ADHD children and the manifestation of these difficulties is different through the school grades.

Correspondence: *German Hernandez, Master in Sciences, Psicología Infantil, Hospital Civil de Guadalajara, Luis Farah 1373, Villas Belenes, Zapopan 45150, Mexico. E-mail: hernandez_german_clm@yahoo.com.mx*

J.D. HOLLAND & M. WELSH. **A Comparison of Manual and Computerized Versions of the Tower of Hanoi and the Contribution of Inhibition to Performance.**

Objective: The Tower of Hanoi has become a popular assessment for measuring executive functions such as planning, working memory, and inhibition; however, this task is administered in a wide variety of formats, including the use of physical models and computerized versions. This study was conducted to examine the performance difference between computerized and manual versions of the Tower of Hanoi, and to explore the degree to which inhibition of responses contribute to the quality of performance on each version.

Participants and Methods: Seventy-five male and female college students were randomly assigned to one of four groups that represented a computerized or manual version of the Tower of Hanoi-Revised, and assignment to a control condition, in which they solved problems at their

own pace, or to a timing delay group, requiring participants to wait a predetermined amount of time before every move within a problem to prevent impulsive responding. Performance was measured across two dependent variables: total number of problems solved correctly and number of 1st move errors.

Results: The study found that participants in the manual version groups achieved a higher total score and made fewer first move errors. Participants in the timing delay groups performed at a higher level than the no-delay control groups, irrespective of task type. No interaction effect was found for the two factors.

Conclusions: These findings demonstrate that the computer version is more difficult for participants than the manual version; inhibition of maladaptive responses is related in scores on both tasks, and does not explain the overall performance differences between the tasks.

Correspondence: *James D. Holland, M.A. Psychology; Psychology; University of Northern Colorado, McKee 14, Campus Box 94, Greeley, CO 80631. E-mail: jimdholland@yahoo.com*

A. ISOMURA, T. TAKAHASHI, B. YAMAGATA, H. TOMIOKA, H. KOBAYASHI, M. YANO, Y. MIYAMA & M. MIMURA. Anterior Medical Prefrontal Cortex and Self-Generated Information Processing: A Near-Infrared Spectroscopy Study.

Objective: Recent studies have suggested that the prefrontal cortex, specifically the anterior medial prefrontal cortex (amPFC) is crucially involved in self-generated information processing (Christoff et al, 2003). From the viewpoint of memory rehabilitation, generating self devised cues is believed to improve new learning of amnesic individuals. The present study aimed to examine whether individuals with frontal damage may show impaired utilization of self-generated cues in the setting of new association learning.

Participants and Methods: An experimental task was created to evaluate generation of self-devised cues. A list of 20 unrelated pair of words was presented to 10 individuals with a focal frontal lesion including the amPFC and 10 healthy controls to learn and memorize. A half of the pairs were immediately followed by the externally given cues, which the examiner had created beforehand. For a remaining half of the pairs, participants were expected to generate cues to encode the words. During the encoding/ cue generation phase and the target retrieval phase, oxygenated hemoglobin (oxy-Hb) values in the medial and lateral prefrontal cortex were measured by using near-infrared spectroscopy (NIRS). **Results:** The healthy controls recalled more target words prompted by internally generated cues than by externally given cues. This advantage of internal cues was less striking for individuals with frontal damage. In addition, NIRS demonstrated that healthy controls showed a reliable oxy-Hb increase in the amPFC while they were internally generating cues. This oxy-Hb response during internal generation of cues was reduced in individuals with frontal damage.

Conclusions: amPFC is associated with self-generated cues during memory activities.

Correspondence: *Angelica J. Isomura, Ph.D., Department of Neuropsychiatry, Showa University, 2-1-35-1302 Ikenohata Taito-ku, Tokyo 110-0008, Japan. E-mail: angelica4932@hotmail.com*

A.R. JOHNSON, A.A. BRINDLE, S.A. WIEBE & K.A. ESPY. Squirmy Snackers vs. Still Snowmen: Assessing Preschool Self-Regulation in a Snack Delay task.

Objective: Behavior regulation, specifically the ability to follow direction and delay a prohibited reward, develops across preschool age and culminates in behavioral control by school entry. Regulatory deficits can be described by two types of behaviors: off-task behaviors and those related to reward sensitivity. Using a new, modified version of Snack Delay task (Espy et al., 2001), interrelations among these components of performance were examined in preschoolers.

Participants and Methods: The revised Snack Delay task incorporates a "Do" command that required children to sustain an unpleasant behavior (stay still: measured by frequency of movement) and a "Don't" command that demanded children to delay gratification of reward (eat snack; latency before eating snack, frequency of rule breaking, and latency to first rule break). Forty, typically developing, 3-year-old children from a rural Midwestern community participated as part of a larger longitudinal study.

Results: Decreased latency before snack eating, increased frequency of rule breaking, and decreased latencies to break rules were inter-related. The latter two were associated with increased movement frequency ($p < .05$). No sex differences in variables were observed, nor did observed relations among dependent variables differ by sex ($p > .35$). Children who ate the snack were significantly more likely to break rules earlier (M-Delayers = 130 (108)s, M-Snack Eaters = 40 (50)s), but did not show greater frequency of movements ($p > .75$).

Conclusions: These findings suggest that although off-task behaviors and reward sensitivity dimensions of self-regulation are related, meaningful differences can be detected, consistent with recent theories of multiple pathways to externalizing symptomatology in early childhood (Nigg & Casey, 2005).

Correspondence: *Abigail R. Johnson, B.S., Psychology, Southern Illinois University, mailcode 6503, Carbondale, IL 62901. E-mail: abbyrj@siu.edu*

C.P. JOHNSON, G.A. GIOIA, R.M. ROTH, P.K. ISQUITH, B. HARRISON & G. CRAIG. Children's Response Accuracy, Speed and Consistency on a Computerized Test of Executive Control.

Objective: Measuring inhibitory control (IC) and working memory (WM) in children remains challenging. We report on effects of parametrically increasing IC and WM demands via computer administered battery.

Participants and Methods: 242 children (197 boys) aged 9-17 years completed six sub-tests that varied IC demand (no inhibit, inhibit) within three levels of WM demand (0, 1, 2-back). Participants pressed either a non-target or target button, or no button (inhibit) for simple pictures presented for 400 milliseconds each with an interstimulus interval jittered around 1600 msec over 100 trials per condition.

Results: Target response accuracy (RA), response time (RT), and response time variability (ICV) were submitted to MANOVA with age as the between subjects variable and WM and IC conditions as within subjects variables. RA improved with age, $p < .001$, $\eta^2 = .19$, and decreased with increments in WM demand. The effect was exacerbated with additional IC demand, $p < .001$, $\eta^2 = .27$. Increased IC demand also slowed RT, $p < .001$, $\eta^2 = .20$. ICV linearly decreased with each level of WM demand, $p < .001$, $\eta^2 = .25$, but was not related to IC condition.

Conclusions: Children's accuracy on a novel test of executive control declined and slowed increasingly with the addition of working memory and/or inhibitory demand, and response times became more variable with greater working memory demand. Parametrically increasing working memory and inhibitory demand may provide an efficient and sensitive means of measuring fundamental aspects of executive function in children.

Correspondence: *Peter K. Isquith, Ph.D., Department of Psychiatry, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001. E-mail: isquith@dartmouth.edu*

C.P. JOHNSON, B.M. ELLIOTT & G.P. CRAIG. Development of a Computer-Administered Working Memory and Inhibitory Control Battery for Adolescents.

Objective: Working memory and inhibitory control are fundamental executive processes that contribute to a host of clinical disorders, yet are difficult to assess reliably via performance measures. We report on the initial psychometric properties of a computer-based battery of tasks tapping working memory and inhibition in children.

Participants and Methods: 212 boys and 53 girls aged 9 to 17 years completed a six-subtest computerized test with three levels of working memory demand (0, 1, 2-back) crossed with 2 levels of inhibitory demand (absence versus presence of inhibitory signal). Participants pressed a non-target or target button, or no button with inhibitory cues, for 13 simple pictures presented for 400 milliseconds each with a mean inter-stimulus interval of 1600 msec over 100 trials per subtest. Target response accuracy (RA), response time (RT), and response time variability (VAR) were calculated for all subtests.

Results: An age MANOVA revealed significant main effects for age but not sex on each subtest for RA, RT, and VAR. Developmental trends indicated consistent linear improvement in performance on all tasks with increasing age.

Conclusions: Examination of children's performance on a novel computerized measure of working memory and inhibitory control suggests appropriate psychometric properties including strong internal reliability and absence of gender differences. The six subtests were individually and collectively sensitive to developmental trends, with increasing accuracy, speed and consistency across the 9 to 17 year age spectrum. Correspondence: *Chad P. Johnson, BA, Neuropsychology; Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: cpjohnso@cnmc.org*

J. YEOM & Y. KANG. Cognitive Changes in the Frontal Lobes Across the Lifespan.

Objective: The frontal lobes begin to develop after birth until the late teens. With aging, however, it is the first to degenerate among all the cortical areas. This study was conducted to examine how cognitive functions in the frontal lobes change across the lifespan.

Participants and Methods: The subjects were 30 aged 6 and 30 aged 9 children, 30 college students, 27 middle-aged adults, and 30 older adults. They were given very diverse neuropsychological tests to evaluate the frontal lobe functions which were divided into 3 groups according to the subareas assessed; dorsolateral prefrontal tests (Controlled Oral Word Association Test, Trail Making Test, Tower Test, Sorting Test, Spatial Reasoning Test, and Digit Span Test), medial frontal test (Color-Word Stroop Test), and ventral prefrontal tests (Go-No Go and Iowa Gambling Test).

Results: The results showed that cognitive functions in dorsolateral prefrontal area had two types of developmental trend. Verbal fluency, working memory, visuospatial reasoning, and concept formation abilities improved from childhood until early adulthood, and henceforth gradually declined with aging, whereas visuoconstructive function, deducing rules, planning, and self-monitoring abilities showed a rapid growth during the childhood and maintained until middle adulthood before they began to deteriorate. Performance of the CWST that assessed the medial frontal area (Miham et al., 2002) improved from childhood to early adulthood and then declined gradually with the age. Impulse control and the emotion-based decision making abilities in ventral prefrontal area enhanced starting early adulthood but declined after middle adulthood.

Conclusions: These results showed that the cognitive functions in the frontal lobes have different developmental trends. It suggests that new subdivision of the prefrontal dorsolateral area is needed so that two types of developmental trend can be explained.

Correspondence: *Yeonwook Kang, Ph.D., Psychology; Hallym University; Okhondong, Chuncheon 200-702, South Korea. E-mail: ykang@hallym.ac.kr*

J. KELDERMAN & F. ANDERSON. Right Frontal Lobe Impairment In a 10-year-old with a History of Medullablastoma.

Objective: This case study illustrates neuropsychological functions of the right frontal lobe (RFL).

Participants and Methods: "G.S." is a 10-year-old boy 5-years post-treatment for medullablastoma. He underwent craniotomy, shunt placement, and a rigorous course of chemotherapy and radiation. Formal testing and behavioral observations identified numerous classic symptoms of RFL impairment rarely seen in a pediatric population.

Results: Test results indicated below average verbal intelligence and working memory, as well as impaired nonverbal intelligence and processing speed. RFL has been found to mediate prosody, organize and form cohesive discourse, and interpret abstract aspects of language. Consistent with this, G.S.'s language was characterized by loose associations, confabulations, echolalia, and clanging. Attention was excellent throughout testing, and parents did not endorse difficulties with inattentiveness. On formal testing, auditory attention was intact; however, he performed poorly on all attention tests with a visual component. This is consistent with research identifying reduced visual attention in patients with RFL injury. Attentional abilities of RFL have also been implicated in visuo-spatial cognition. G.S. was unable to complete the Benton Judgment of Line Orientation test, and his Rey-Osterrieth Complex Figure copy was remarkably disjointed and distorted. G.S. was very calm and serene, and did not seem affected by his obviously poor performance on several tasks. Parents described him as surprisingly unaffected by his long illness and subsequent limitations, which substantiated our perception of him as "blissfully unaware." Right-sided lesions have long been associated with indifferent or euphoric reactions. Imaging studies substantiated suspicion of right frontal involvement.

Conclusions: We found G.S.'s profile to be a relatively rare observation in pediatrics, and an excellent exemplar of right executive dysfunction. Correspondence: *Jill Kelderman, PhD, Pediatrics, University of Minnesota, 420 Delaware St. SE, Minneapolis, MN 55455. E-mail: kelde003@umn.edu*

J. LI & K.A. KERNS. Investigation of Performance Monitoring: The Effect of External Feedback on Error Correction in Children & Adults.

Objective: Error and performance monitoring refers to online detection of errors and subsequent adjustment of performance. These play an important role in dynamic decision making processes and are crucial for self-regulation. Humans evaluate and alter their performance using both internal and external information, hypothesized as being supported by different brain systems. We hypothesized that in comparison to adults, children would be more influenced by external information in evaluating and modifying their responses.

Participants and Methods: We examined error correction as a measure of error and performance monitoring in children (N=22) and adults (N=27) under no-feedback and feedback conditions (including true and false feedback) using a modified flanker and a pattern judgment task. Participants were asked to correct their errors immediately following their response in a no-feedback condition, and in a condition in which the computer indicated if their response had been correct or incorrect.

Results: Results showed that overall adults outperformed children in error correction, and that they were less influenced by external feedback than were children. Within the child group, results of both the flanker and the pattern judgment task revealed stronger influence of false feedback on error correction, though within the pattern judgment task true feedback also affected performance.

Conclusions: Different demands of internal and external monitoring in the two tasks are discussed. Conflict monitoring theory is applied to account for error correction performance demonstrated by children in the study.

Correspondence: *Jun Li, BSc, Psychology, University of Victoria, PO Box 3050 Stn "CSC", Victoria, BC V8W 3P5, Canada. E-mail: kkerns@uvic.ca*

M. KRAYBILL, A. EASTVOLD & Y. SUCHY. Trail Making and Simple Choice Reaction Time: Double Dissociation of Motor Speed and Executive Abilities.

Objective: Many tests of executive abilities require that a patient engage in speeded motor output. The Delis-Kaplan Executive Function System (DKEFS) Trail Making subtest attempts to parse apart motor speed from executive control by including a condition that requires that patients simply trace a previously drawn trail. The purpose of this study was to evaluate the validity of this procedure using a computerized finger tapping and simple choice reaction paradigms.

Participants and Methods: 26 participants (age 18-25) were administered the Simple Choice (SC) and Finger Tapping (FT) tasks from the Behavioral Dyscontrol Scale – electronic version (BDS-ev) as well as the DKEFS Trail Making test. In the SC task participants are required to respond to visual stimuli using a specialized response consol. Decision Time (i.e., the time between stimulus presentation and response initiation) and Movement Time (i.e., the speed of finger movement) are measured with a high degree of accuracy.

Results: Data were analyzed using bivariate correlation analysis. The results showed (1) SC Decision Time correlated significantly with DKEFS number-letter switching ($r=.502$, $p=.011$), but not with DKEFS motor speed; and (2) SC Movement Time and FT correlated significantly with DKEFS motor speed ($r=.427$, $p=.033$), but not DKEFS number-letter switching.

Conclusions: These results provide support for the DKEFS effort to differentiate motor speed from executive abilities and further validate the BDS-ev SC task. SC decision time appears to capture the executive abilities assessed by the DKEFS number-letter switching task and SC movement time appears to capture the motor abilities assessed by the DKEFS motor speed task.

Correspondence: *Matt Kraybill, BA, Psychology, University of Utah, 350 S. 1530 E., Room 502, Salt Lake City, UT 84112. E-mail: mkraybill@gmail.com*

J. LENGENFELDER, A. SMITH, N.B. MOORE & J. DELUCA. Using the Frontal Systems Behavior Scale to Assess Behavior in Individuals with TBI.

Objective: To examine the utility of the Frontal Systems Behavior Scale (FrSBe) to assess behavioral changes in individuals with traumatic brain injury (TBI).

Participants and Methods: Participants were 10 individuals with moderate to severe TBI (9 males). Individuals with TBI and a family member were asked to complete the FrSBe rating frontal behaviors for two points in time, before the individual's injury and after the injury.

Results: Two-way (time: before & after injury; rater: self & family rating) repeated measures ANOVAs were performed for each of the three scales; apathy, disinhibition, and executive dysfunction. Results indicated a significant overall change in apathy from before to after injury ($p<.01$). This change was observed by both the individual with TBI and their family member, with no difference noted in apathy ratings between the self-report and family ratings (ns). The same pattern was found for behavioral ratings of executive dysfunction with a significant overall change in ratings from before to after injury ($p<.01$) observed by both the individual with TBI and their family member (ns). A different pattern of results was noted for disinhibition. Specifically, disinhibition was not significantly different from before to after injury (ns), however, there was a significant difference between the self and family ratings ($p<.05$).

Conclusions: The FrSBe was found to be a sensitive measure to assess behavioral change in individuals with TBI. Findings will be discussed in the context of advancing the understanding of assessing frontal functions in TBI and the relationship to neuropsychological measures of executive abilities.

Correspondence: *Jean Lengenfelter, Neuroscience, Kessler Medical Rehabilitation Research & Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: jlengenfelter@kmrrec.org*

D. LIEBERMANN & U. MÜLLER. The Relation Between Preschoolers' Executive Functioning and Their Everyday Behaviors.

Objective: Executive Functioning (EF), a critical component of children's cognitive development, is often assessed via measures adapted from neuropsychology which impose limitations on relating EF abilities to children's everyday behaviors. The major goal of the present study was to examine the relation between preschoolers' performance on EF tasks and their rating on a behavior rating scale of EF (Behavior Rating Inventory of Executive Function – Preschool Version; Gioia, Espy, & Isquith, 2003).

Participants and Methods: A battery of EF tasks emphasizing specific components of 5 subscales of the BRIEF-P was administered to 60 preschool-aged children, while data from both parents and teachers were collected for the BRIEF-P.

Results: Results for the EF tasks are consistent with previous findings of age related changes and relations among EF tasks (e.g., Carlson, 2005). Factor analysis of the BRIEF-P ratings largely reproduced the factor structure reported by the authors of the questionnaire (Isquith et al., 2004). However, hardly any age-related changes were observed on the BRIEF-P. Finally, only few significant correlations were observed between EF tasks and BRIEF-P.

Conclusions: The results of the study suggest that the questionnaire and the EF tasks are measuring the primary components of EF in distinct manners: the behavior rating scales on the BRIEF-P may provide a more global or general view of EF skills in children than the EF tasks. The BRIEF-P, therefore, should be considered as a complementary tool in EF assessment alongside neuropsychological based tests that are more developmentally sensitive.

Correspondence: *Dana Liebermann, Masters, Psychology, University of Victoria, Department of Psychology, University of Victoria, P.O. Box 3050 Stn CSC, Victoria, BC V8W 3P5, Canada. E-mail: dl@wic.ca*

K. LOKKEN & A. BOEKA. Executive Dysfunction in Obese Binge Eaters.

Objective: Recent fMRI studies implicate abnormal function of the prefrontal cortex (PFC) in obese individuals (OI). The PFC is involved in the mediation of executive functions (EF), and executive dysfunction in individuals with syndromal and subsyndromal maladaptive eating behaviors has been reported. Of interest is the relationship between obesity, specifically as it relates to binge eating behaviors, and measures of EF. It was predicted that 1) severity of maladaptive eating behavior would be associated with EF performance and 2) group differences would exist between binge eating prone (BEP) OI and non-binge eating (NBE) OI on measures of EF.

Participants and Methods: Fifty-four OI were recruited as part of a pre-surgical neuropsychological evaluation for bariatric surgery. Participants were divided into two groups (BEP OI and NBE OI) based on data from questionnaires and clinical diagnostic interview. The groups did not differ on the basis of education, body mass index, or FSIQ, and were similar in terms of racial and gender distributions.

Results: Scores on a measure of maladaptive eating (the Binge Eating Scale) were significantly inversely correlated with EF scores. MANOVA indicated a significant overall effect ($F(1,51)=5.24$, $p<.05$), indicating that BEP OI were significantly impaired on measures of EF in comparison to NBE OI. Univariate results showed BEP OI were slower to complete Trails B ($p<.05$), made more perseverative errors ($p<.05$), and completed fewer categories ($p<.05$) on the WCST in comparison to NBE OI.

Conclusions: Results provide further evidence for frontal neural system involvement in maladaptive eating behaviors.

Correspondence: *Kristine Lokken, Ph.D., Psychiatry, UAB, CPM 253 1530 3rd Ave S, Birmingham, AL 35294. E-mail: klokken@uabmc.edu*

R.C. MARSHALL, S.R. MCGURK & C.M. KAROW. Problem Solving by Subjects with and without Diffuse Neurologic Involvement on the Rapid Assessment of Problem Solving Test (RAPS).

Objective: The objective of this study was to compare problem solving by subjects with and without diffuse neurologic involvement on the Rapid Assessment of Problem Solving test (RAPS), a clinical test resembling the 20 questions task.

Participants and Methods: Five groups of 20 adults participated in this cross-group study, two groups of normal (NI) subjects (older and younger), and three groups of individuals with diffuse neurological involvement (DNI). Problems of the RAPS require the patient to ask yes/no questions to identify a target picture in a 32-item array. It was predicted that the DNI groups would perform less well on the RAPS than the NI groups as reflected in lower scores and in the asking of different types of questions to solve problems.

Results: Findings revealed no differences between the younger and older NI groups, but significant differences between the NI groups and the DNI groups in scores for (a) number of questions (b) constraints, (c) planning, and (d) efficiency. NI and DNI groups also differed significantly in the types of questions and with respect to the strategies they used to solve the problems.

Conclusions: NI subjects used an organized, reductionistic approach to solving problems. The DNI subjects tended to break down and guess when certain types of questions were needed to meet the goal of solving problems with "as few questions as possible." Differences in problem solving on the RAPS are readily explained using the decision to plan, strategy choice, strategy execution, and self-monitoring components of Scholnick and Friedman's (1993) developmental theory of planning.

Correspondence: *Robert C. Marshall, Ph.D., Rehabilitation Sciences, University of Kentucky, 120 CTW Bldg., 900 S. Limestone, Lexington, KY 40536-0200. E-mail: rcmarsh@uky.edu*

B.M. MERKER, J.G. SCOTT, G.R. JEWELL, R. ADAMS, K.J. BHARUCHA & P. FRANCELE. Neuropsychological Functioning in Essential Tremor Patients Following Deep Brain Stimulator Surgery.

Objective: The purpose of this study is to further examine the short-term neuropsychological functioning among Essential Tremor (ET) patients following deep brain stimulator (DBS) surgery.

Participants and Methods: Participants (ET = 22) completed a neuropsychological battery designed to assess the major cognitive domains approximately one month prior to surgery and three months following surgery. Additional emphasis was placed on measuring cognitive abilities commonly associated with the dorsolateral pre-frontal, anterior cingulate, and orbital-frontal regions of the frontal lobes due to previous research suggesting cerebellar-thalamo-cortical pathway dysfunction.

Results: Statistical analysis was carried out using t-tests for paired observations. Post-surgically, ET patient's performance on the RBANS, STAI, GDS, FRSBE, California Card Sorting Test and Iowa Gambling Task was consistent with their pre-surgical levels of performance. In addition, there were no significant pre-post surgical differences in patient and family reported independent activities of daily living.

Conclusions: DBS for essential tremor is cognitively safe in the absence of operative complications. However, in contrast to previous research which found subtle declines in verbal fluency possibly due to electrical disruption of the cerebellar-thalamic-cortical circuitry, our subjects failed to show significant cognitive changes on various measures associated with frontal lobe functioning.

Correspondence: *Brad M. Merker, Ph. D, Psychiatry and Behavioral Sciences, University of Oklahoma Health Sciences Center, 920 Stanton Young Blvd WP 3771, Oklahoma City, OK 73104. E-mail: Brad-Merker@ouhsc.edu*

M.B. MITCHELL & L. MILLER. Deconstructing The D-Kefs Trail Making Test: Prediction Of Functional Status In Older Adults.

Objective: The purpose of this study was to investigate the predictive abilities of each of the five conditions of the D-KEFS Trail Making Test on observed daily functioning in older adults (i.e., Condition 1: Visual Scanning, Condition 2: Number Sequencing, Condition 3: Letter Sequencing, Condition 4: Number-Letter Switching, Condition

5: Motor Speed). We hypothesized that Condition 4: Number-Letter Switching would be the only significant predictor of functional status when controlling for the variance accounted for by age, education, income, and the four other conditions of the D-KEFS Trail Making Test.

Participants and Methods: 45 community-dwelling older adults from retirement centers in Northeast Georgia were recruited (mean age = 81, s.d. = 6.1). Participants were administered the D-KEFS Trail Making Test, along with three other D-KEFS Tests as part of a larger study (Tower, Verbal Fluency, and Design Fluency). To obtain a measure of daily functioning, participants were administered the Direct Assessment of Functional Status, Revised edition (DAFS-R).

Results: A multiple regression analysis was performed to determine if the D-KEFS Trail Making Test Condition 4 was predictive of functional status beyond the variance accounted for by age, education, income, and the four other conditions of the D-KEFS Trail Making Test. Condition 4: Letter-Number Switching was the only significant predictor of functional status, $t(8,44) = 2.05, p < .05$. Age, education, income, and all other conditions of the D-KEFS Trail Making Test were nonsignificant ($p > .05$).

Conclusions: Results of this study suggest that the D-KEFS Trail Making Test Condition 4: Number-Letter Switching is a useful clinical tool to detect decrements in daily functioning in older adults, even when controlling for more basic deficits in visual scanning, sequencing ability, and psychomotor speed.

Correspondence: *Meghan B. Mitchell, B.A., Psychology, University of Georgia, 12901 N. MacArthur Blvd., Oklahoma City, OK 73142. E-mail: mbmitch@uga.edu*

S.M. PATEL & S.A. ROPACKI. The Impact of Coronary Artery Bypass Grafting on Neuropsychological Functions Mediated by the Frontal Lobes.

Objective: Research suggests that individuals who undergo coronary artery bypass grafting (CABG) experience declines in neuropsychological functioning post-operatively. This decline has been observed in up to 80% of patients early after surgery, and in up to 30% of patients after 6

months. While many studies have examined the potential effects of CABG on the temporal lobe and memory functioning, none have focused specifically on the effects of CABG on the frontal lobe. Previous research on the neurobiological consequences of CABG suggests that the frontal lobes may be particularly vulnerable to damage subsequent to heart disease and CABG surgery. This study investigated the impact of CABG on neuropsychological functions mediated by the frontal lobes. It was hypothesized that there would be a significant decline on neuropsychological tests of frontal lobe functioning after CABG surgery.

Participants and Methods: Archival data was used. The sample consisted of 43 patients undergoing on-pump, normothermic CABG surgery. A battery of neuropsychological tests was administered 1-3 days before surgery and again 1-2 days before discharge.

Paired sample t-tests were conducted. The Bonferroni correction was applied to control for Type I error.

Results: Results revealed that there was a significant decline on tests of visual perception, long term visual memory, and verbal working memory. There was a significant increase in self-reports of anger and mental control after surgery. There were no significant declines on tests of verbal fluency, judgment and problem solving.

Conclusions: The results of this study suggest that CABG may compromise certain regions of the frontal lobe, particularly the prefrontal cortex.

Correspondence: *Sapna M. Patel, M.A., Psychology, Loma Linda University, 495 Richey St. Apt 101, Corona, CA 92879. E-mail: smpatel@llu.edu*

C.R. PILARSKI & R.L. SKEEL. An Investigation into the Influence of Personality and the Short-Term Physiological Effects of Nicotine on Decision-Making.

Objective: Individuals who smoke also engage in other risky behaviors such as selecting high risk occupations, abusing substances, and gambling (Hersch & Viscusi, 1998; Petry & Oncken, 2002). The mechanisms influencing the decision-making of smokers are unclear. The current study investigated the influence of personality and nicotine on the decision-making of smokers. It was hypothesized that both smoking status and personality would impact decision-making.

Participants and Methods: The sample consisted of three groups (non-smokers, deprived smokers, and non-deprived smokers) each consisting of twenty-one subjects. The role of personality was studied by comparing the profiles of smokers and non-smokers on the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ; Zuckerman et al., 1993). By manipulating the amount of nicotine in the system of a smoker prior to their participation on two behavioral measures of decision-making, the Bechara Gambling Task (BGT; Bechara et al., 1994) and Balloon Analogue Risk Task (BART; Lejuez et al., 2002), the effects of nicotine were investigated.

Results: Smokers had significantly elevated scores on impulsive sensation seeking ($t(61) = 2.623, p = .011$) and sociability ($t(61) = 1.994, p = .051$). Performance on the BART ($F(2, 60) = .059, p = .942$) and BGT ($F(2, 60) = .905, p = .410$) were not significantly impacted by group. Regression models evaluating the contribution of personality and smoking status on decision-making were not significant; however, personality variables were found to have higher effect sizes than smoking status.

Conclusions: Some support was found suggesting that personality/trait variables may impact decision-making more than state variables (nicotine usage).

Correspondence: *Carrie R. Pilarski, M.A., Psychology, Central Michigan University, 10346 E. Remus Rd., Mt. Pleasant, MI 48858. E-mail: crtaratuta@hotmail.com*

M.T. RANSOM & K.B. WETTERSTEN. Executive Function Differences in Medicated Depressed, Non-Medicated Depressed, and Non-Medicated Non-Depressed Individuals.

Objective: The purpose of the current study was to assess the performance of depressed young adults on tests of executive function, while controlling for the variables of age and medication status, which have been inconsistently measured in previous research. It was hypothesized that statistically significant group differences would occur on tests of executive functions in three distinct groups: psychotropically medicated depressed, non-psychotropically medicated depressed, and non-psychotropically medicated non-depressed individuals.

Participants and Methods: Participants included 53 adults who were psychotropically medicated depressed (15), non-psychotropically medicated depressed (16), and non-psychotropically medicated non-depressed (22) and were between the ages of 19 and 40 years. Participants completed measures assessing depression, psychological well-being (including anxiety), intelligence, and executive functions.

Results: Between group comparisons revealed several statistically significant differences on executive function measures including the Wisconsin Card Sorting Test (WCST) Trials Administered, WCST Failure to Maintain Set, Trail Making Test (TMT) B, Stroop Word, Stroop Color, Stroop Color-Word, and Stroop Interference. The non-psychotropically medicated non-depressed group performed better overall than those in the non-psychotropically medicated depressed and psychotropically medicated depressed groups. Post-hoc stepwise regression analyses indicated that anxiety predicted performance on a number of executive function measures to a greater degree than did depression.

Conclusions: Findings suggest that executive functions of young adults are affected by depression, psychotropic medication status, and anxiety. Results of the present study contradict the assumption that psychotropic medications do not affect cognitive abilities. These findings also suggest that future research investigating the interaction between anxiety and executive functions are necessary.

Correspondence: *Michael Ransom, M.A., University of North Dakota, 1008 Wildwood Ave, Mobile, AL 36609. E-mail: michael.ransom@und.edu*

S.K. SHIVAPOUR, T.H. YAMADA, A.R. KAUP, A. LALOGGIA, M.D. MCCOY, A. BECHARA, D. TRANEL & N.L. DENBURG. The Importance of Numeracy to Complex Decision-Making.

Objective: The Iowa Gambling Task (IGT; Bechara et al., 1994) is a sensitive, reliable measure of laboratory decision-making. It shows high external validity, with poor performances corresponding to real-world faulty decision-making in patients with prefrontal ventromedial lesions, as well as poor consumer decision-making among older adults. An obvious aspect of decision-making, particularly when considering medical and financial options, is the ability to understand mathematical concepts. Therefore, the present study examines the role of numeric ability (probabilities, proportions, percentiles, hereafter termed "numeracy") in decision-making.

Participants and Methods: One hundred community-dwelling, healthy adults ($M = 65.6$ years; $SD = 14.3$; range 27-88) completed the computerized version of the IGT and Lipkus et al.'s (2001) Numeracy Scale. Participants also completed a 2-subtest verbal intellectual measure (WASI; Wechsler, 1999).

Results: We regressed IGT performance on numeracy in a linear model and found numeracy was a significant predictor ($r = .25, p = .01$). Examining IGT performance over the 100 deck choices, a 2 (Numeracy: Low vs. High) x 5 (IGT: Block 1, 2...5) repeated measures ANOVA with verbal intellect as a covariate revealed a Numeracy x Block interaction ($F(4,292)=3.41, p < .05$), indicating that the highly numerate displayed improvement and learning during Blocks 3-5 that was not observed among the low numerate. A main effect for Numeracy ($F(1,73)=5.18, p < .05$) was also significant.

Conclusions: In conclusion, numeracy appears to contribute significantly to high-quality decision-making throughout adulthood, and is an important cognitive domain to consider when assessing an individual's ability to make well-reasoned medical and financial decisions.

Correspondence: *Sara K. Shivapour, Neurology, The University of Iowa, 435 Ridgeland Ave. Apt. #1, Iowa City, IA 52246. E-mail: sara-shivapour@uiowa.edu*

D.J. SIMMONDS, S.G. FOTEDAR, S.J. SUSKAUER, J.J. PEKAR, M.B. DENCKLA & S.H. MOSTOFISKY. Correlation between functional brain activation and response time variability in children performing a Go/No-go task.

Objective: During tasks of response inhibition, intra-individual response time (RT) variability, a measure of motor response preparation, has been found to correlate with errors of commission, such that individuals with higher variability show increased commission errors. This study used fMRI to examine neural correlates of RT variability in children performing a Go/No-go task. We hypothesized that lower RT variability would be associated with No-go activation in premotor regions important for motor response preparation.

Participants and Methods: Thirty healthy children, ages 8-12, completed a simple Go/No-go task. Stimuli were presented rapidly (ITI = 1800ms) with a 3:1 ratio of Go:No-go stimuli. fMRI data were analyzed using SPM99. Individual contrast maps were created for Go and No-go conditions and correlations of Go and No-go activation with RT variability were examined using intra-individual coefficient of variability (ICV) [(standard deviation of RT) / (mean RT)].

Results: ICV was significantly correlated with commission errors ($r = .46, p = .006$). Lower ICV was associated with Go activation in the

right anterior cerebellum and with No-go activation in the left rostral supplementary motor area (pre-SMA; BA6), right postcentral gyrus (BA3/4), left anterior cerebellum and the left inferior parietal lobule (BA40). For both Go and No-go events, higher ICV was associated with activation in right prefrontal cortex (BA9/10) and the right caudate.

Conclusions: The results suggest that children with better motor response preparation (lower ICV) rely on more automatic motor control systems within premotor circuits to guide response selection/inhibition. Those with poorer motor response preparation (higher ICV) utilize less automatic prefrontal circuits involved in higher-order cognitive control. The findings have implications for disorders such as ADHD, in which both response inhibition and selection are impaired.

Correspondence: *Daniel J. Simmonds, Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway Ave., Baltimore, MD 21205. E-mail: simmonds@kennedykrieger.org*

D.J. SIMMONDS, J.J. PEKAR & S.H. MOSTOFSKY. Activation Likelihood Estimate (ALE) meta-analysis across event-related fMRI studies of healthy adults performing a Go/No-go task.

Objective: fMRI studies of response inhibition consistently reveal frontal lobe activation, but localization within the frontal cortex varies across studies and appears task-dependent. Activation likelihood estimate (ALE) meta-analysis is a powerful way of establishing concurrence of activation across fMRI studies. Reported foci are plotted as the center of a three-dimensional Gaussian distribution and pooled to create a whole-brain image of concurrence across studies. This study used ALE to investigate the neural correlates of response inhibition across studies of healthy adults performing a Go/No-go task.

Participants and Methods: Studies were selected by searching the Pubmed database; selection criteria were applied such that all studies used event-related fMRI and reported activation for correctly rejected No-go trials against a general task baseline in healthy adults. Sixty-eight foci across six studies were processed using the Brainmap Search&View program (www.brainmap.org) using a FWHM of 10mm, and 5000 permutations using the same FWHM and number of foci were generated to assess significance.

Results: Concurrence was mainly right-lateralized with the highest concurrence was seen in the rostral supplementary motor area (pre-SMA; BA6). Activation was additionally seen in the bilateral inferior parietal lobules (BA40), left premotor cortex (BA6), right middle frontal gyrus (BA9/46), right inferior occipital gyrus (BA19) and the left posterior cerebellum (declive).

Conclusions: The ALE analysis indicates that a primarily right-lateralized neural network is involved in inhibition of a motor response. The high concurrence of activation within the pre-SMA highlights the region's importance in response selection, including selecting to not to respond (inhibition). Concurrence in posterior parietal and occipital regions is likely due to their involvement in stimulus recognition and processing of stimulus-response associations necessary to guide motor response selection/inhibition. Correspondence: *Daniel J. Simmonds, Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway Ave., Baltimore, MD 21205. E-mail: simmonds@kennedykrieger.org*

M. HATFIELD ELDRED, K. PYTLAK, J. NEUDECKER, C. PILARSKI & R. SKEEL. Relationship between Risk-Taking, Personality, and Violation of Self-Imposed Drinking Limits.

Objective: Studies have demonstrated emotional factors play a role in violations of self-imposed alcohol limits (Muraven et al., 2005). However, risk-taking and impulsivity have not been studied as predictors of limit violation. This study examined the relationship between neuropsychological measures of risk-taking, personality, and alcohol consumption limits. Both personality and risk-taking were hypothesized to predict unique variance in alcohol limit violation.

Participants and Methods: Seventy-nine undergraduate students participated. Risk-taking was measured using the Bechara Gambling Task (BGT; Bechara et al., 1994) and the Balloon Analogue Risk Task (BART; Lejuez et al., 2002). The Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) was used to assess personality. Daily electronic journals completed over 3 weeks provided alcohol use and limit information.

Results: Several hypothesized correlations approached significance. Number of drinks consumed per day (DPD) correlated with BGT risky deck selections ($r = 0.21, p = .06$) and ZKPQ anxiety and neuroticism ($r = -0.30, p = .007$). The number of limit violations days (LVD) correlated with BGT risky deck selections ($r = 0.22, p = .07$), and drinks consumed per drinking episode (DPE) correlated with average pumps on the BART ($r = 0.21, p = .06$). Regression models indicated personality measures explained significant variance for DPE (9.4%, $p = .024$) and DPD (9.3%, $p = .025$), but not in LVD. Behavioral measures did not explain additional significant variance.

Conclusions: Results suggest personality tends to have stronger relationships with alcohol consumption pattern than neuropsychological risk-taking measures. Neither showed strong evidence of relationships with self-imposed consumption limit violations.

Correspondence: *Reid Skeel, Ph.D., Central Michigan University, 136 Sloan Hall, Mt. Pleasant, MI 48859. E-mail: reid.skeel@cmich.edu*

E. TAMEZ, J. MYERSON, L.T. CONNOR, L. MORRIS, D.A. WHITE & C. BAUM. Sensitivity of Tests of Executive Function in a Stroke Population: Are Backward Digit Span and Trails B Really More Sensitive to Brain Damage?

Objective: Our goal was to determine whether Digit Span Forward and Trails A are less sensitive to brain damage than Digit Span Backward and Trails B, which are assumed to be more dependent on executive functions subserved by the frontal lobes.

Participants and Methods: Data from the stroke registry maintained by the Washington University Cognitive Rehabilitation Research Group were analyzed to assess the effect of brain damage as measured by the NIH Stroke Severity Scale.

Results: In 499 patients, forward spans were only weakly correlated with stroke severity ($r = -.142$), whereas a stronger correlation ($r = -.304$) was observed for backward spans. Controlling for forward span decreased the correlation between backward span and stroke severity only slightly ($r = -.273$). Similar patterns were observed in both patients with ($N = 238$) and without ($N = 261$) frontal damage. Stroke severity was slightly more correlated with Trails A than with Trails B ($r_s = -.355$ and $-.304, N = 348$). When patients were divided into those with ($N = 171$) and without ($N = 177$) frontal damage, similar patterns (stronger correlations for Trails A than Trails B) were observed in both groups.

Conclusions: Backward Digit Span, but not Trails B, was more sensitive to brain damage than the corresponding non-executive task. Notably, the similarity of the results for both frontal and nonfrontal groups provides no support for the hypothesis that backward span and Trails B are more affected by frontal lobe damage, at least in stroke patients.

Correspondence: *Elaine Tamez, Washington University, One Brookings Drive, Saint Louis, MO 63130. E-mail: emtamez@artsci.wustl.edu*

A.J. VERDEJO, M. PÉREZ-GARCÍA & A.E. PUENTE. Effects Of Polysubstance Abuse And Drug Of Choice On Inhibition Measures Taxing Orbitofrontal Dysfunction.

Objective: Substance use disorders are associated with executive function impairment that includes response inhibition deficits. The lateral and medial orbitofrontal cortices are argued to be primarily involved on the response inhibition deficits revealed on substance abusers. Recent neuropsychological evidence suggests that the "fourth" condition of the Stroop test, consisting on flexibly alter-

nating between reading words and naming the (incongruent) colors of these words, may be particularly sensitive to orbitofrontal cortex involvement. Specific aims are: (1) To examine response inhibition skills associated with orbitofrontal functioning in a mixed sample of polysubstance abusers (PSA) of cocaine, heroin and alcohol; (2) to examine possible effects of main drug of choice on response inhibition performance.

Participants and Methods: Fifteen PSA and 37 healthy controls (HC) volunteered for this study. Drug of choice was cocaine in 7, heroin in 4, and alcohol in 4 of the PSA. We used performance time and number of errors on the fourth condition of the Stroop test as dependent variables. We conducted independent-samples *t* tests to examine group differences (PSA vs. HC), and one-way ANOVAs to examine specific effects of drug of choice (cocaine vs. heroin vs. alcohol), on the Stroop performance indices.

Results: PSA had lower performance time [$t(50)=-2.58, p=.01$] but higher number of errors [$t(50)=2.41, p=.02$] than HC on the Stroop. Analyses of drug of choice showed that for performance time only alcohol PSA were significantly quicker than HC ($p=.02$), and that only cocaine PSA committed significantly more errors than HC ($p=.01$).

Conclusions: These findings indicate that PSA executive deficits are evident in accuracy rather than speed measures of response inhibition sensitive to orbitofrontal cortex functioning.

Correspondence: Antonio J. Verdejo, *Personalidad, Evaluación y Tratamiento Psicológico, Universidad de Granada, Campus de Cartuja S/N, Granada 18071, Spain. E-mail: averdejo@ugr.es*

S.P. VERNEY, S.M. SCHNEIDER, C. STELLAVATO, J. RODRIGUEZ & C. LEE. Executive Functioning in a Combined Heat and Exercise Stress Environment.

Objective: Military and civilian personnel are increasingly placed in hot, dry environments that may have profound effect on their cognitive functioning. Such effects could have an impact on their ability to efficiently process information and make informed decisions. We investigated executive functioning in participants during vigorous exercise in a heat stress environment.

Participants and Methods: Ten healthy students completed the Delis Kaplan Executive Functioning System (D-KEFS) Trail Making Test (TMT) at baseline and following heat stress conditions evaluating four body cooling techniques: cooling by a water-cooled vest, hand-water immersion, and a rapid thermal exchange device, along with a no-cool condition. Subjects walked on a treadmill (50% maximal aerobic capacity) until core body temperature reached 38.5°C or until their HR reached 95% of maximal HR. Subjects then begin cognitive testing, still in the hot, dry environment (42°C, 27% RH).

Results: Consistent with our hypotheses, impaired performance was associated with increased cognitive load. No differences were found between baseline and heat stress conditions during low cognitive load, TMT visual scanning and motor speed. As cognitive load increased during the TMT number sequencing, letter sequencing, and number-letter switching tests, significantly lower performance was found in the heat stress conditions compared to baseline.

Conclusions: These findings suggest that combined heat and exercise stress impairs executive functioning ability when cognitive load is increased. Additional studies are needed to understand cognitive functioning in extreme environments and to identify a body cooling technique that spares executive functioning. This study was funded by the Defense Advanced Research Projects Agency (DARPA), U.S. Department of Defense.

Correspondence: Steven P. Verney, *Ph.D., Psychology, University of New Mexico, MSC03-2220, Albuquerque, NM 87131-0001. E-mail: sverney@unm.edu*

M. WELSH, P. GORMAN BARRY, N. SPERAKAS & J. HOLLAND. Executive Function Performance in Low-Income Hispanic 2nd-grade Children and their Parents.

Objective: Although research examining executive functions in young children has burgeoned in recent years, there has been relatively little study of these cognitive processes in specific ethnic and economic groups.

Participants and Methods: The present study measured executive skills in 93 male and female 2nd-graders who were all low-income, Hispanic (99%), and either primarily English-speaking (54%) or Spanish-speaking (46%). In addition, a small sample of the children's parents ($N=23$; 91% mothers; 74% Spanish-speaking) were tested on parallel measures. The executive function measures (administered in the participants' preferred language) included age-appropriate Tower of London (TOL) and Stroop tests.

Results: For the children, no language-group or gender-group differences were found for the TOL. The Spanish-speaking children exhibited significantly better inhibition on the Stroop than their English-speaking peers. Conversely, the data from the parents indicated no language-group differences on Stroop variables, but a difference on the TOL, with Spanish-speaking parents exhibiting more errors. The scores of the children and their parents were not significantly correlated for either executive function measure. The TOL and Stroop scores were uncorrelated for the children, whereas the parents' data exhibited stronger (marginally significant) correlations.

Conclusions: These results suggest that preferred language is not related to executive function performance in children; the relatively better inhibition in the Spanish-speaking children may be a "real" cognitive difference or an artifact of the testing procedures. In contrast, Spanish-speaking parents demonstrated relative difficulty with the TOL-R, a complex test of planning. The lack of correlation between children's and parents' scores may indicate a greater environmental influence on the executive function skills measured in this study.

Correspondence: Marilyn Welsh, *Ph.D., School of Psychological Sciences, University of Northern Colorado, McKee Hall 14, Campus Box 94, Greeley, CO 80639-0121. E-mail: marilyn.welsh@unco.edu*

S.A. WIEBE, M. CHANG, A. JOHNSON, J.I. HUGGENVIK, T. JAMESON & K. ANDREWS ESPY. Genes and Behavior in Preschool Children: The Relation Between Dopamine Genotype and Latent Executive Control.

Objective: Dopaminergic neurotransmission is implicated in the executive control of cognition and behavior (Braver & Cohen, 2000). Presence or absence of particular dopamine gene alleles relates to executive control performance (Casey, 2002; Roesch-Ely, 2005) and to attention problems and ADHD (Durstun, 2005; Schmidt, 2001). The present study examined the relation between dopamine genotype and executive control in normally-developing preschool children.

Participants and Methods: The sample included 133 children (66 girls; mean age 4 years, range 2;2-6 years). Children completed a battery of executive control tasks, and were genotyped for 4 dopamine genes: the dopamine receptors DRD2 and DRD4, the dopamine transporter DAT, and the enzyme COMT. Based on a literature review, for each gene, children were classified as carrying the high- or low-risk allele, and a risk score was constructed by summing the number of high-risk alleles (range 0-4). In Mplus, structure equation modeling was used to examine the relation between the genetic risk score and a latent factor representing the executive control battery, controlling for age.

Results: The SEM model evidenced good fit to the data ($\chi^2(43)=43.15, p=.46$). Age had a strong positive relationship with executive control, and higher risk scores for dopamine genotype were associated with lower executive control performance (standardized regression coefficients=.76 and -.10, respectively).

Conclusions: Dopamine genotype is correlated with executive control performance, perhaps reflecting differences in dopamine availability and efficiency of neurotransmission related to different dopamine alleles. Given that executive control problems are implicated in ADHD (Nigg, 2005), these findings may shed light on how genetic risk contributes to behavioral problems.

Correspondence: *Sandra A. Wiebe, Ph.D., Psychology/Office of Research, University of Nebraska-Lincoln, Room 102, 501 Building, P.O. Box 880206, Lincoln, NE 68588-0206. E-mail: swiebe2@unl.edu*

B. YOCHIM, J. BALDO, A. NELSON & D. DELIS. Set-Shifting on the D-KEFS Trail Making and Color Word Interference Tests in Patients with Lateral Prefrontal Cortex Lesions.

Objective: The Trail Making and Color-Word Interference subtests of the Delis-Kaplan Executive Function System (D-KEFS) provide two measures of cognitive set-shifting while controlling for other variables such as letter sequencing and word reading. To date there has been no direct test of the effects of focal frontal lobe lesions on these two tests. This study evaluated cognitive set-shifting on the D-KEFS Trail Making and Color Word Interference tests in patients with lesions in the lateral prefrontal cortex (LPC).

Participants and Methods: Eleven patients with focal lesions in the LPC were identified through review of CT and/or MRI scans obtained at least five weeks post-lesion. They were administered the D-KEFS Trail Making and Color-Word Interference tests and compared to 11 age- and education-matched control participants.

Results: Patients with LPC lesions performed significantly worse on the Letter Sequencing, Motor Speed, and Number-Letter Switching conditions of the D-KEFS Trail Making test. Performance on the Number-Letter Switching condition was significantly slower even after controlling for performance on the other Trail Making conditions. On the D-KEFS Color Word Interference test, patients with LPC lesions performed significantly worse on all conditions. However, there was no significant difference on the Interference or Interference/Switching (set-shifting) conditions after controlling for performance on the Color Naming and Word Reading conditions.

Conclusions: These results suggest that damage to the LPC may lead to deficits in cognitive set-shifting under certain conditions. Findings suggest that the D-KEFS Trail Making Test may be more sensitive to LPC lesions than the Color Word Interference test.

Correspondence: *Brian Yochim, Ph.D., Psychology (COH5), University of Colorado at Colorado Springs, 1420 Austin Bluffs Pkwy., P.O. Box 7150, Colorado Springs, CO 80933-7150. E-mail: brainyochim@yahoo.com*

SATURDAY AFTERNOON, FEBRUARY 10, 2007

Paper Session 11

1:30–3:00 p.m.

Developmental Imaging

S.J. SUSKAUER, S. FOTEDAR, J.G. BLANKER, A. VENKATADRI, J.J. PEKAR, M.B. DENCKLA & S.H. MOSTOFSKY. fMRI Evidence that Children with ADHD Recruit Different Brain Structures in a Simple Task of Motor Inhibition.

Objective: Deficient response inhibition is characteristic of Attention Deficit Hyperactivity Disorder (ADHD). There are few prior fMRI studies of motor inhibition in children with ADHD; many are complicated by paradigms taxing working memory. We used a simplified Go/No-go task to identify ADHD-associated differences in neural activation associated with response inhibition under conditions in which cognitive demands are otherwise minimized.

Participants and Methods: 21 children with ADHD and 21 typically developing (TD) controls, aged 8-12 years, completed a simple Go/No-go task using a well ingrained stimulus-response association (Green=Go, Red=No-go) to minimize working memory demands. Groups were matched for commission errors. Voxel-wise contrast maps were created for Go and No-go conditions for each individual. At a second level, random effects comparisons within and between groups were completed, followed by region of interest (ROI) analyses using clusters of activation from group No-go maps.

Results: For both groups, No-go activation was seen in left rostral supplementary motor area (pre-SMA, BA6). For TD group, areas of activation included right inferior parietal cortex (BA 40); for ADHD, activation was also seen in right dorsolateral prefrontal cortex. In No-go group contrast map, TD group showed greater activation in right inferior parietal cortex (BA40). In ROI analyses TD children showed greater activation in pre-SMA; children with ADHD showed greater activation in right dorsolateral prefrontal cortex.

Conclusions: Findings suggest children with ADHD and TD children rely on different neural mechanisms to successfully inhibit a motor re-

sponse. Motor response inhibition in TD children appears to largely depend on premotor circuits important for response selection (including selecting to inhibit) and posterior association cortices important for processing stimulus-response associations. In contrast, children with ADHD recruit higher order cognitive control systems to successfully inhibit a motor response.

Correspondence: *Stacy J. Suskauer, M.D., Pediatric Rehabilitation, Kennedy Krieger Institute, 707 North Broadway, Baltimore, MD 21205. E-mail: suskauer@kennedykrieger.org*

B.A. RICH, S. FROMM, D. PINE & E. LEIBENLUFT. fMRI Studies of Face Emotion Processing and Pediatric Bipolar Disorder: Behavioral Deficits and the Role of the Amygdala.

Objective: Pediatric bipolar disorder (PBD) is a debilitating childhood psychiatric illness marked by severe social impairments and deficient face emotion identification. Clarifying the behavioral manifestations and neural correlates of aberrant face processing in PBD youth may elucidate the disorder's core impairments and neural mechanisms.

Participants and Methods: We conducted two fMRI studies in which bipolar and control subjects, ages 7-17, rated the emotions depicted in emotional and non-emotional facial expressions. In the first study, we compared 22 PBD to 21 healthy control subjects when rating the hostility and fearfulness of neutral face expressions. In a follow-up study, we examined the strength of neural connectivity in 33 PBD subjects and 24 controls when processing varied face emotions.

Results: PBD subjects rated neutral faces as significantly more hostile and fear-producing than did controls. During these negative misinterpretations, PBD subjects displayed significantly greater activation of the amygdala, striatum, and prefrontal cortex than controls. In the second study, compared to controls, PBD subjects had significantly weaker neural connectivity between the amygdala and the superior temporal gyrus, fusiform gyrus, and posterior cingulate when processing face emotions.

Conclusions: PBD youth negatively misinterpret facial expressions. This behavioral deficit is secondary to hyperactivation of limbic neural regions responsible for processing emotional stimuli, in particular the

amygdala. Impaired face emotion identification in PBD youth may also reflect impaired connectivity between the amygdala and temporal association cortex regions responsible for processing faces and social stimuli. These data begin to clarify possible neural correlates of social deficits in PBD youth while also elucidating the pathophysiology of the illness. Correspondence: *Brendan A. Rich, Ph.D., NIMH, NIH, 9000 Rockville Pike, Bldg 15K, MSC 2670, Bethesda, MD 20892. E-mail: brendanrich@mail.nih.gov*

L.H. LU, M. DAPRETTO, E.D. O'HARE, E. KAN, S.T. MCCOURT, J. JOLLEY, P.M. THOMPSON, A.W. TOGA & E.R. SOWELL. Right hemisphere involvement in language development observed with magnetic resonance imaging and neuropsychological measures.

Objective: There have been limited attempts to examine how functional activation relates to morphological brain maturation. Additionally, little is known about how developmental improvement on cognitive tasks relates to changes in functional activation. We combined functional MRI, structural MRI, and neuropsychological data to reveal new insights into language development.

Participants and Methods: BOLD signals during the implicit reading paradigm described by Turkeltaub and colleagues (2003) were obtained from 15 healthy children (age 6-15). Functional data from a Siemens 3T scanner were registered to high-resolution structural data from a Siemens 1.5T scanner. Cortical pattern matching techniques were used to match anatomy across subjects, and permutation testing was used to correct for multiple comparisons. Single word reading and naming speed tasks were administered.

Results: Expected activation during implicit reading was seen in the left inferior frontal gyrus. Greater implicit reading activation was associated with greater gray matter thickness in right hemisphere dorsal frontal and medial frontal regions (permutation p-values, 0.03-0.045). Greater activation was also associated with worse reading and naming speed in the right superior temporal and inferior frontal gyri.

Conclusions: Gray matter in the dorsal frontal and parietal regions thins with maturation (Sowell et al., 2003, 2004). The functional-structural correlations show that activation during implicit reading does relate to cortical thickness maturation in regions contralateral to peak activation. This, together with functional-performance correlations may indicate that younger children (i.e., poorer readers) activate the right hemisphere more during implicit reading than older children. These findings support a role for the right hemisphere during language development from age 6-15.

Correspondence: *Lisa H. Lu, Ph.D., Neurology, Univ of California, Los Angeles, Laboratory of Neuro Imaging, 635 Charles Young Drive South, Rm 225, Los Angeles, CA 90095. E-mail: lisa.lu@loni.ucla.edu*

S.M. WOLOSIN, M.E. RICHARDSON, M.B. DENCKLA & S.H. MOSTOFASKY. Abnormal Cerebral Cortex Structure in Children with ADHD.

Objective: Findings from previous studies suggest that ADHD is associated with reduced gray matter volume. In this study, ADHD-associated differences in cortical gray matter structure were examined in greater detail using an automated surface-based analysis technique that provides measures of cortical thickness, surface area (SA) and volume.

Participants and Methods: MPRAGE images were acquired from 27 children with ADHD (11 girls) and 38 typically developing (TD) controls (15 girls), aged 8-12 years. Full-brain thickness maps were generated for each subject and statistical difference maps were generated by conducting t-test comparisons between the two groups at every point along the surface. A gyral based template was used to divide the cortex into 32 ROIs within each hemisphere. Cortical volume, SA, and mean

thickness were measured for each ROI and summed for examination of entire hemispheres and frontal, temporal, parietal, and occipital lobes within each hemisphere. Cortical folding was also measured by calculating fractal complexity: dividing the SA by the SA of a sphere of the same volume.

Results: Children with ADHD had significantly reduced cortical gray matter volume compared to controls ($p < .001$); volume reduction was diffusely distributed throughout the left and right frontal, parietal, temporal and occipital lobes (all $p < 0.01$). No group differences in mean cortical thickness were detected in the statistical difference maps (threshold of corrected $p < .05$) or within ROIs. The ADHD group, however, showed an overall decrease in SA of more than 7% within each hemisphere ($p < .001$) with decreased cortical folding in both the right ($p = .002$) and left ($p = .012$) hemispheres.

Conclusions: Decreased cortical gray matter volume in ADHD appears to be due mainly to differences in SA and not cortical thickness. Decreased cortical folding may account for the reduced surface area; this could help to identify neurodevelopmental mechanisms that contribute to ADHD.

Correspondence: *Daniel J. Simmonds, Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway Ave., Baltimore, MD 21205. E-mail: simmonds@kennedykrieger.org*

Paper Session 12

1:30–3:00 p.m.

Innovative Approaches to Assessment and Treatment

S.D. ALL, W.D. SPAULDING, A.A. MENDITTO & S.M. SILVERSTEIN. Attention Shaping as a Cognitive Rehabilitation Technique for People with Schizophrenia.

Objective: Reduced attention span is a problem for many people with schizophrenia, and it interferes with the ability to learn new information in evidence-based psychosocial rehabilitation interventions. The behavioral technique of attention shaping has been used to successfully lengthen attention span, and increase learning, during skills training groups among patients who had previously been considered unable to benefit from these treatments. **Participants and Methods:** We present data from a recently completed controlled trial study on attention shaping as a method of improving attentiveness and learning within a social skills training environment (N=80).

Results: While both the shaping and control groups improved in social skills as a result of skills training, the group that received attention shaping within the context of the group demonstrated significantly and dramatically increased attentiveness and participation in the group, and increased learning of group material. These changes were unrelated to changes in medication dose. We also present a model of the manner in which the initial use of extrinsic reinforcers to promote task success can lead to increases in self-efficacy, an improved working alliance with group leaders, and greater satisfaction with treatment. These can then act as intrinsic motivators to increase behavioral momentum, and ultimately sustain new behaviors in the absence of tangible rewards.

Conclusions: Implications of this model for the continued development of cognitive rehabilitation of schizophrenia, including attention shaping techniques to improve treatment engagement and outcomes, will be discussed.

Correspondence: *Sherrie D. All, M.S., Department of Psychology, Rosalind Franklin University of Medicine & Science, 3333 Green Bay Rd., North Chicago, IL 60064. E-mail: sherrie.all@rfums.org*

R.M. BILDER, D. PARKER, R. POLDRACK, D. KALAR, N. BROWN & A. TOGA. Mapping Cognition: Cognitive Ontologies for Visualization and Modeling of Brain-Behavior Relationships.

Objective: Brain mapping has revolutionized neuropsychology, benefiting in part from concrete three-dimensional scaffolding to display and model spatial relationships. Cognitive concepts have unknown structure, making mapping more challenging. To develop “registrations” between different data types (e.g., brain images and cognitive test results) requires structuring cognitive concepts. Ontologies are being developed for other domains of biological knowledge, but cognitive ontologies are so far rudimentary. We aimed to develop cognitive ontologies and use these for literature mining and visualization.

Participants and Methods: We used text mining and natural language processing to develop controlled vocabularies representing content domains important for neuropsychology. We then developed web-based software applications that use these ontologies for visualization and modeling.

Results: This presentation emphasizes two applications: (1) PubBrain (www.pubbrain.org) enables visualization of PubMed searches on a probabilistic brain volume atlas; (2) PubGraph (www.pubgraph.org) displays concepts as nodes, with literature co-occurrence statistics as edges linking these nodes. These applications enable “mapping” of concepts like “working memory” on 3D brain images, and the display of complex, multidimensional hypotheses (e.g., how does gene DISC1 relate to proteins, cellular systems and signaling pathways, neural systems, cognitive phenotypes and ultimately syndromes like schizophrenia?).

Conclusions: These applications enable visualization of hypotheses about brain-behavior relationships and rapid retrieval of literature relevant to these associations, laying the groundwork for examining links of cognitive concepts to other biological knowledge. Applications to automated meta-analysis, gene discovery, and drug discovery will be discussed.

Supported by NIH Roadmap P20 RR020750

Correspondence: *Robert M. Bilder, Ph.D., Psychiatry & Biobehavioral Sciences, UCLA, 760 Westwood Plaza, NPI Room CS-849, Los Angeles, CA 90024. E-mail: rbilder@mednet.ucla.edu*

J.J. LOBOSCO, K. LOMBARDI, Y. POLATOFF, E. BANAKOS, J. REDFIELD & N.S. FOLDI. The Aging Of Attention: Capacity And Orienting In Visual Attention In Late Life.

Objective: This visual attention study explored age effects on attentional capacity in a simple detection task, emphasizing the psychological refractory period (PRP), and in a covert orienting task.

Participants and Methods: Healthy participants (young, 20-39yrs; mid-old, 60-79yrs; old-old, >80yrs) were tested. The simple detection task was administered both pre- and post other computer tasks to assess fatigue or practice effects (session: two levels), and presented targets at varied stimulus onset asynchronies (SOA: four levels); PRP was expected after the shortest SOA. The endogenous orienting task measured validity effects (invalid RT-valid RT), costs (invalid RT-neutral RT), and benefits (neutral RT-valid RT) using centrally presented valid, neutral, or invalid cues. Performance on cognitive domains scores of speed, standard attention, memory, visuospatial, and executive functioning were used as correlates.

Results: On detection, the PRP was significantly higher in the old-old group on repeated administration (Group X Session X SOA, $p=.01$). Correlations demonstrated that the young and mid-old groups used different strategies (Speed $R=-.66$ and Attention $R=-.69$, respectively) to respond at equivalent speeds. On orienting, the old-old group's significant validity effect, $F(3,122)=3.07$, $p=.02$, was due to greater benefits ($p=.03$) not costs ($p=.37$).

Conclusions: Load and fatigue tax late-life attentional capacity. PRP and orienting effects highlight this vulnerability. The mid-old group drew on attentional resources to match the speed of young, who did not use those resources. Covert orienting findings of the oldest group showed

that they may treat neutral like invalid cues, and/or rely preferentially on valid, predictive cues.

Correspondence: *Nancy S. Foldi, Ph.D., Department of Psychology, Queens College - CUNY, 65-30 Kissena Blvd., NSB E318, Flushing, NY 11367. E-mail: nancy.foldi@qc.cuny.edu*

S. MCDONALD, T.L. ROBYN, L. TOGHER, B. CRISTINA, E. LONG, P. GERTLER, R. BOWEN & F. MCGREGOR. Outcome Of A Randomised Controlled Trial To Remediate Social Skills After Severe Traumatic Brain Injury.

Objective: Psychosocial deficits following traumatic brain injury are common and present a major target for remediation. Such deficits reflect behavioural, cognitive and emotional impairments along with psychological adjustment issues. Efforts to improve social functioning must, therefore, address all these aspects. This study reports on the results of a randomised controlled trial to assess the effectiveness of an integrated approach aimed to address all three components.

Participants and Methods: We designed a treatment package that entailed 12 weeks of group work to improve social skills, along with perception training to improve recognition of emotions in others. This was supplemented by weekly individualised sessions to address issues of self-esteem, anxiety, depression etc. Fifty-one participants (mean age = 35 years; mean education = 13 years) each with a severe, chronic TBI (mean length of PTA = 94 days; mean time post TBI = 6 years) were assessed and randomly allocated to treatment ($N=18$), a social placebo group ($N=17$) or the waitlist condition ($N=16$). There were 12 dropouts leaving 13 in each condition. Pre-assessment measures included tests of emotion perception (TASIT), self and relative ratings regarding social function (SPSS, SPRS, KATZ) and expert ratings of social behaviour (BRIS-R) during a videotaped social encounter with a trained actor.

Results: After remediation the treatment group showed modest gains on emotion perception and in their behaviour as rated by their relative (on the KATZ). No other treatment effects were apparent.

Conclusions: These results highlight the inherent difficulties of conducting controlled trials in this population and these issues will be discussed.

Correspondence: *Skye McDonald, PhD, School of Psychology, University of NSW, UNSW, Sydney, NSW 2052, Australia. E-mail: s.mcdonald@unsw.edu.au*

Paper Session 13

1:30–3:00 p.m.

Executive Functions

P.L. KERR, P. MOULTON, T.V. PETROS, R. FERRARO & S. PYLE. Executive Functioning in Children Exposed to Pesticides.

Objective: Multiple studies (e.g., Keifer & Mahurin, 1997; Rosenstock et al., 1991) have reported that acute organophosphate pesticide poisoning is associated with cognitive and affective impairment. However, few studies have examined the impact of chronic exposure to pesticides in adults or children. The present research examined the impact of

chronic pesticide exposure on cognitive functioning in children in Eastern North Dakota.

Participants and Methods: As part of a larger neuropsychological battery, children aged 7-12 living on or near (i.e., within 200 feet of) an active farm field ($n=63$) were compared with children living at least one mile from an active farm field ($n=68$) on their performance on the California Verbal Learning Test-Child Version (CVLT-C), Wisconsin Card Sorting Test-64 CV (WCST), and Conners' Continuous Performance Test (CPT).

Results: The results of 2 (Group) \times 2 (Sex) ANOVA for the CVLT-C revealed that memory was significantly worse in children living near active farms compared to control children on total recall ($p=.026$); trial 1 free recall ($p=.028$); trial 5 free recall ($p=.03$); and correct recognitions ($p=.004$). However, no significant between-groups differences were found on any scales of the WCST or CPT. All results remained when the analyses were recomputed with Parental IQ and Socioeconomic Status as covariates.

Conclusions: This research provides preliminary evidence of memory deficits in children living near active farms, although no differences on tests of executive function and sustained attention were found. Future research must replicate and extend these results exploring multiple sources of pesticide exposure.

Correspondence: *Patrick L. Kerr, M.A., University of North Dakota, 2603 7th Ave South, #37, Grand Forks, ND 58201. E-mail: patrick.kerr@und.edu*

M. NIKOLAS, M. MARTEL & J. NIGG. Executive Functioning in Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD).

Objective: ADHD may fit with a dual-pathway conception of neuropsychological influence in which executive function problems are primarily related to the inattentive symptom domain (Sonuga-Barke, 2005). However, this concept, and the extent of executive function weakness in adolescents with ADHD, needs further evaluation (Biederman et al., 2006).

Participants and Methods: 183 adolescents (109 boys, age 13-17 years) completed a multi-stage, multi-informant clinical assessment, with final diagnosis by a multi-disciplinary team using a best-estimate procedure. They were grouped into ADHD ($n=85$; 43 Inattentive (ADHD-PI); 42 Combined type (ADHD-C)), and Control ($n=98$). Executive functions were assessed with (a) the Logan Stop task (stop signal reaction time, SSRT, a measure of response suppression), (b) Trail-Making B time, (c) Wisconsin Card Sort perseverative errors (both set shifting measures), and (d) Stroop task interference control.

Results: An omnibus MANOVA indicated ADHD weaknesses in executive function ($F=4.31, p<.01$). ADHD-C and ADHD-PI were associated with poorer response inhibition, Trailmaking, interference control, and perseverative responding (all $p<.05$). ADHD-C and ADHD-PI did not differ on any executive measure (all $p>.05$). In multivariate regression in which each symptom domain was partialled from the other, a composite executive function score ($\alpha=.79$) significantly predicted teacher and parent-rated inattentive symptoms ($\beta=.17, .21; p<.01$), but not teacher or parent-rated hyperactive/impulsive symptoms ($\beta=.08; .05; p>.05$). All results were unchanged after covarying oppositional and conduct disorder.

Conclusions: In one of the largest adolescent ADHD samples reported to date, executive function weaknesses are apparent. Results partially support a dual-process model in which symptoms of inattention but not hyperactivity-impulsivity are related to a frontodorsal-striatal circuit supporting executive dysfunction.

Correspondence: *Molly Nikolás, B.A., Psychology, Michigan State University, Department of Psychology, Michigan State University, East Lansing, MI 48824. E-mail: nikolasm@msu.edu*

W.S. MACALLISTER, M.C. MILAZZO, E.R. KAUFMAN, C. CHRISTODOULOU, R. TROXELL & L.B. KRUPP. The Ecological Validity of the Tower of London in Pediatric Multiple Sclerosis.

Objective: To assess the sensitivity of the Tower of London (TOL) to cognitive dysfunction in pediatric multiple sclerosis (MS) and the relations between TOL variables and parent-report of executive functioning.

Participants and Methods: 36 individuals with pediatric MS (mean age = 14.64, SD = 2.13) were included. The Expanded Disability Status Scale (EDSS) measured neurologic impairment. The mean disease duration was 22.78 months (SD = 26.76) and 36% reported fatigue. Participants were administered the TOL, a task of planning and problem solving. Parents completed the Behavioral Rating Inventory of Executive Functions (BRIEF), a proxy-report of executive functioning. Correlational analyses assessed the relations between TOL scores and clinical variables, as well as parent-report of executive dysfunction.

Results: EDSS related to several TOL variables, including Total Moves ($r = -.40, p = .015$), Total Correct ($r = -.38, p = .023$), Rule Violations ($r = -.43, p = .009$), and Execution Time ($p = -.36, p = .031$). TOL Total Correct scores were related to several BRIEF Metacognition Index scores, including Working Memory ($r = -.37, p = .023$), Plan/Organize ($r = -.33, p = .047$) and Monitoring ($r = -.37, p = .023$). Total Rule Violations significantly correlated with the BRIEF Inhibit Scale.

Conclusions: The TOL is a sensitive measure of executive dysfunction in pediatric MS and is related to neurologic impairment. Further, the TOL is predictive of parent report of executive problems, such as working memory, planning, and self-monitoring and behavioral inhibition. Correspondence: *William S. MacAllister, Ph.D., SUNY Stony Brook, HSC T-12-020, Stony Brook, NY 11794-8121. E-mail: wmacallister@notes.cc.sunysb.edu*

J.C. LARSON, E. MAHONE, M.B. DENCKLA, E.M. LAUFE & S.H. MOSTOFKY. Multiple Components of Executive Function Contribute to Poor Use of Strategy in Children.

Objective: Recent research has shown that children with ADHD show impaired performance on a "Strategy Task" that requires consistent use of a straightforward test-taking strategy to maximize performance when presented with otherwise minimal cognitive demands. To examine the profile of executive dysfunction associated with impaired strategic task approach, we examined the relationship between parent ratings from the Behavioral Rating Inventory of Executive Function (BRIEF) and performance on the Strategy Task.

Participants and Methods: Participants were 38 children with ADHD and 38 controls, ages 8-12 years. The Strategy Task consisted of two four-minute trials (T1 and T2), each comprised of 360 problems (180 framed and 180 unframed) in which subjects determined whether two icons were the same or different. Before T1, participants were told: 1) to earn as many points as possible, 2) "framed" problems were worth 10 points; unframed problems were worth 1 point, and 3) they could do the problems in any order. Between T1 and T2, participants were explicitly told that the best strategy is to only do the framed problems. Following initial correlational analyses, two groups were formed: "strategy users" (i.e., those whose responses were $\geq 90\%$ framed problems) "non-strategy users" (i.e., those answering at chance— $\leq 60\%$ framed problems).

Results: Regression analyses revealed that 2 of the 8 BRIEF scales predicted T1 total points ($p<.05$), whereas 7 of the 8 scales predicted T2 total points ($p<.05$). Multivariate analysis of variance revealed a significant effect of strategy use ("users" vs. "non-users") at T2 on the 8 scales of the BRIEF ($p<.002$). Follow-up univariate analyses revealed significant effects for 6 of the 8 scales (Inhibit, Shift, Initiate, Working Memory, Plan/Organize, Monitor), all at $p<.01$.

Conclusions: Multiple components of executive function contribute to impaired ability of children to consistently employ a strategic approach. Correspondence: *Jennifer C. Larson, M.A., Developmental COgnitive Neurology, Kennedy Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: larsonj@kennedykrieger.org*

S. KARANTZOULIS, A.K. TROYER, S. MURTHA & J.B. RICH. The Relation of Frontal Lobe Integrity to Source Memory in Amnesic Mild Cognitive Impairment.

Objective: Age differences in memory for contextual aspects of a learning episode, termed source memory (SM), appear to be driven by individual differences in frontal lobe (FL) integrity. Emerging evidence suggests compromised FL ability, albeit subtle, in addition to core medial temporal lobe decline in amnesic mild cognitive impairment (MCI). We examined whether group differences between healthy elderly and individuals with amnesic MCI in SM are due to differences in FL integrity.

Participants and Methods: Twenty-eight individuals with the amnesic variant of MCI (M age = 75) and 28 healthy elderly controls (M age = 73) were tested on memory for the temporal order and spatial location of nonverbal computer-displayed abstract designs.

Results: As expected, the controls outperformed the MCI group on both SM tests. However, the group difference in temporal order memory was

retained only for MCI participants classified as below-average based on their scores on a composite battery of executive function (EF) tests; those with average EF did not differ from controls on temporal order memory. On the spatial location SM test, MCI participants performed significantly worse than controls, regardless of EF ability.

Conclusions: The group difference in temporal order SM appears to be carried by a subset of individuals with amnesic MCI with relatively poorer EF abilities. In contrast, medial temporal lobe processes appear to play a larger role than do frontal-lobe processes in MCI-associated performance on in spatial location SM. Thus, group analyses may mask individual differences in cognitive ability and distort findings that are important for our understanding of MCI-related memory deficits on memory tasks with a strong FL contribution.

Correspondence: *Stella Karantzoulis, Psychology, York University, 175 East 96th Street, New York, NY 10128. E-mail: skarantz@gmail.com*