
Final Program

Thirty-Fourth Annual International Neuropsychological Society Conference

February 1-4, 2006
Boston, Massachusetts, USA

WEDNESDAY, FEBRUARY 1, 2006

4:45–6:15 PM

Symposium 1

Experience-dependent Learning and Neural Plasticity: Implications for Rehabilitation Theory and Practice

Room: Grand Ballroom Salon G (4th floor)

Host: Bryan Kolb

1. MATEER, C Constraint Induced Motor Therapy: Results of contextualized constraint-based treatment for children with developmental hemiplegia.
2. LILLIE, RA Constraint in Cognitive Rehabilitation: A Useful Endeavor?
3. GONZALEZ ROTH, LJ Principles of experience-dependent learning and neural plasticity.
4. GONZALEZ ROTH, LJ Experience-dependent Learning and Neural Plasticity: Implications for Rehabilitation Theory and Practice.
5. LYNN, M Constraint Induced Language Therapy: A Preliminary Study of the Contributions of Practice Schedule and Constraint.

4:45–6:15 PM

Symposium 2

ADHD: Beyond Executive Dysfunction

Room: Grand Ballroom Salon F (4th floor)

1. RUMSEY, JM ADHD: Beyond Executive Dysfunction.
2. CASTELLANOS, F Dissecting Rewards in Attention-Deficit/Hyperactivity Disorder (ADHD): A Preliminary fMRI Study of Salience.
3. EPSTEIN, JN Response Variability in Children with ADHD.
4. NIGG, JT Temperament and Executive Functioning: Joint Clues About Multiple Inputs to ADHD.
5. SONUGA-BARKE, EJ Toward a New Paradigm for the Neuropsychology of ADHD.

4:45–6:15 PM

Symposium 3

Rethinking Post-Concussion Syndrome: Lessons Learned from Sports Concussion Research

Room: Grand Ballroom Salon E (4th floor)

1. MCCREA, M Rethinking Post-Concussion Syndrome: Lessons Learned from Sports Concussion Research.
2. BARR, W The Sports Concussion Model: Methodological Advantages for the Study of MTBI.
3. MCCREA, M Objective Measurement of Acute Effects and Early Recovery After MTBI.
4. RANDOLPH, C Methodological Issues in Measuring MTBI Recovery on Neuropsychological Testing.
5. HAMMEKE, T Functional Magnetic Resonance Imaging in Sports-Related Concussion.
6. POREH, AM The Quantified Process Approach - New Directions in Neuropsychological Assessment.

4:45–6:15 PM

Poster Session 1

Attention

1. FOSTER, PS The Effects of Movement Direction and Hemispace on Estimates of Distance Traveled.
2. FOSTER, PS Lateral and vertical attentional biases in normal individuals.
3. DRAGO, V Spatial Attentional Bias in Normal People: Object or Viewer-Centered.
4. TAYLOR-COOKE, PA Attentional Asymmetries may have Roots in the Visual Processing Pathways.
5. LISS, M Exploring the two factors of sensory processing sensitivity: Are there physiological or attentional differences?
6. COMEZ-PEREZ, E The Development of Attention and Memory. A Cross-Sectional Life-Span Study.

Electrophysiology/EEG/ERP

7. KIM, M ERP study of response inhibition in patients with obsessive-compulsive disorder.
8. SALMINEN, H Event-Related Potentials Reveal Differences in Pitch Change Processing Between Newborns With and Without Familial Risk for Dyslexia.
9. PRATT, NL Short Term Training Impacts the Adult Brain.
10. FERGUSON, MC Differences in Early Speech Processing in Breast-fed and Bottle-fed Infants.
11. EVERHART, DE The influence of hostility on electroencephalographic activity and memory functioning during an affective memory task.
12. ESTERLIS, I The Relationship of the P300 to Cognition in Male Adolescent Sons of Substance Dependent Fathers.
13. MOLFESE, DL Zygoty-Related Memory Differences For Complex Tone Sounds In 18 Month-Old Infants.
14. MOLFESE, DL ERP Differences Detect Changes In Executive Functioning of Children When Sleep Is Reduced By Only One-Hour.
15. MOLFESE, DL Investigating The Relationship Between Early Reading Skills And Phonological Processing.
16. KEY, AP Converging ERP And fMRI Evidence Of Multiple Brain Networks For Math Processing.

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

17. CASTNER, JE Timed Object and Action Picture Naming as a Function of Stimulation of the Subthalamic Nucleus in a Patient with Parkinson's Disease.
18. ALTMANN, LJ Understanding Complex Sentences: Answer Position Interacts with Relative Clause Location and Type.
19. CLEMENTS, A Developmental differences in the neural circuitry associated with sentence comprehension.
20. SANTOS, SN Processing Sentences With a Temporary Structural Ambiguity Recruits Dissociable Neural Executive Resources: An fMRI Study.
21. ANTONUCCI, SM The Role of the Left Temporal Lobe in Naming and Semantic Knowledge.
22. ASBJORNSEN, AE Word Chain-Performance in Norwegian High School Students: Could It Be Explained by Phonological Skills?
23. FERNANDEZ GUINEA, S Study of the Influence of Syntactic Complexity on Sentence Comprehension and on Working Memory Resources in the Elderly.
24. TALLBERG, I Swedish Responses on Boston Naming Test.
25. DOYLE, R The Role of Eye Movements in the Relationship between Rapid Automatized Naming and Reading Ability.
26. RUBIN, LH Changes in the Contribution of Verbal Fluency Tasks as a Function of Practice.
27. KILLGORE, WD Sustained Verbal Fluency Following Sleep Deprivation and Recovery Sleep: The Effects of Caffeine, Modafinil, and Dextroamphetamine.
28. CIAMPA, EC The Connection Between IQ and Verbal Fluency.

Memory

29. LY, JJ Retrograde Amnesia Following Treatment with ECT.
30. KESSELS, R Feature Binding in Human Memory: A Comparison of What, Where and When in Young and Older Adults.
31. ALTMANN, LJ The Relationship between Verbal Working Memory and Vocabulary Tasks: A Factor Analysis.
32. NG, L Factors Influencing the Superior Performance of Physical Enactment Relative to Verbal Recall during the Retrieval of Novel Naturalistic Actions.
33. KRAMER, ME Episodic Memory in Children: an fMRI Region of Interest Analysis of Hippocampal Activation.
34. LEVICK, WR Implicit and Explicit Memory in Extremely Low Birthweight (ELBW) Children.
35. BROWNDYKE, JN Neural Correlates of Malingered Memory Errors.
36. FOSTER, PS Verbal Learning Ability and Posterior Temporal Lobe Slow Wave Activity.
37. MARTIN, E Impaired Priming for Novel Conceptual Associations in Amnesia.
38. CLASON, CL Do Subjective Material-Specific Memory Complaints Predict Objective Material-Specific Memory Performance in Epilepsy Surgery Patients?
39. BARBUTO, E The Effects of Dual-Task at Retrieval on Memory for Serial Order.
40. LAWRENCE, MR After Controlling For Effort & Mood, Does Pain Severity Impact Cognitive Status in a Mixed Chronic Pain Treatment Seeking Sample?
41. LUBINSKY, TR Combining Errorless Learning and the Generation Effect: A Benefit to Cued Recall Performance.
42. RICH, JB Enactment and Categorization Effects on Free Recall, Temporal Order, and Recognition Memory.
43. BOEGEHOLD, L Relationships Between Delirium and Memory Performance in Older Adults.
44. GOLD, DA The Effects of Dividing Attention at Study and Test on the Encoding and Enactment of Novel Naturalistic Actions (NNAs).
45. PARE, N Differential Sensitivity and Specificity of Memory Measures for Classification of MCI.
46. LOGALBO, A Validation of a DMST Task with Persons with Dementia of the Alzheimer's Type.
47. GOLD, DA The Effects of Response Type and Divided Attention on the Retrieval of Novel Naturalistic Actions (NNAs).
48. GRANT, DE Interaction between Age, Gender, and APOE Status on Verbal Learning and Memory in Cognitively Normal Individuals At Risk for Alzheimer's Disease.
49. KANG, Y Inconsistency Between the Logical Memory Test and the California Verbal Learning Test in the Left Temporal Lobe Epilepsy.
50. ADDIS, D Hippocampal Atrophy and Autobiographical Memory in Temporal Lobe Epilepsy: Preliminary Findings.
51. MARIANI, M Working Memory, Map Learning, and Spatial Orientation: The Effects of Gender and Encoding Interference on the Acquisition of Survey Knowledge.
52. NUTTER-UPHAM, KE Verbal Fluency Performance in Probable AD, Amnesic MCI, and Older Adults with Cognitive Complaints.
53. LIPSZYC, M Cognitive Processes Underlying False Memory in Older and Young Adults.

54. SITZER, TE The Impact of Psychiatric History on Memory Performance in Adults with Mild TBI: Interpreting Change in the Miserable Minority.
55. ROULEAU, I Improvement of prospective memory with episodic priming.
56. KRAMER, M Neural Correlates of Verbal Encoding Strategies.
57. RANE, S Are Verbal and Nonverbal Stimuli Registered in Separate Short-Term Memory Systems? An Examination of Serial-Position Curves.
58. HOPE, CW Effects of a motor distraction task on the categorization of living and non-living things.
59. MORRONE-STRUPINSKY, JV Differential Hippocampal Activation in Response to Novel Happy and Sad Baby Faces.

Psychopathology: Schizophrenia

60. KESSLER, RK Naturalistic Action Impairment in Chronic Schizophrenia/Schizoaffective Disorder.

Visuospatial Abilities

61. SULLIVAN, KD Visuoconstruction in Two Frontostriatal Disorders: HIV and Parkinson's Disease.
62. LEVINE, TM Interrelationships Between Behavioral Performance and Neural Mechanisms Associated with Different Visuospatial Tasks.
63. BARRETT, AM "Not What You See, But How You Say It." Spatial Bias in Young and Aged Subjects.

THURSDAY, FEBRUARY 2, 2006**9:00–10:30 AM**

Symposium 4
The Complementary Impact of Functional Imaging and Lesion Analysis in Neuropsychology
Room:Grand Ballroom Salon G (4th floor)

1. RAO, S The Relative Sensitivity of Neuropsychological and fMRI Measures for Identifying Early Impairment in Frontostriatal Circuits.
2. TRANEL, D Neural Correlates of Lexical Retrieval as Revealed by PET and Lesion Approaches.
3. FELLOWS, L Using Literature Citations to Assess the Impact of Functional Neuroimaging and Lesion Studies on Cognitive Neuroscience.
4. CHATTERJEE, A The Inferential Logic of Lesion and Functional Neuroimaging Methods.
5. HAALAND, KY The Complementary Impact of Functional Imaging and Lesion Analysis in Neuropsychology.

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

1. RICE, S Incremental Validity Associated with Administration of the Full Interference Trial of Golden's Stroop Color-Word Test.
2. GIGGEY, PP Linear and Nonlinear Practice Effects in Observed on Timed Measures in Healthy Men: Findings from The Depleted Uranium Study.
3. CHAN, RC Psychometric properties and discriminative validity of the Chinese version of the Test of Everyday Attention for Children: An exploratory study in children with ADHD and healthy controls.
4. CRAWFORD, JR Regression Equations in Neuropsychology: Methods for Comparing Predicted and Obtained Scores.
5. SUHR, J Diagnosis Threat and Neuropsychological Performance in Pregnancy.
6. ATCHISON, TB Effects of Altering Instructions and Administration of the Matrix Reasoning Task on the Wechsler Adult Intelligence Scale- Third Edition.
7. SUHR, J Exploration of the Diagnosis Threat Effect in a Chronic Pain Population.
8. HISCOCK, M Why Do University Students Perform Poorly on the Iowa Gambling Task?
9. CARLOZZI, N Factor Analysis of the Repeatable Battery for the Assessment of Neuropsychological Status.
10. SHERIDAN, L Symbol Digit Modalities Test: Normative Data in non-clinical adults.
11. IRANI SIVASEGARAN, F Assessing the Self through the Self/Other Word Association Test (S/O WAT).
12. DEVENEY, CM Neuropsychological Predictors of On-Road Driving Performance.
13. JEFFERSON, AL Performance on the 30-item even version of the Boston Naming Test (BNT): Comparing normal control participants (NC) to those with mild cognitive impairment (MCI) and Alzheimer's disease (AD).
14. MCLACHLAN, JF Development of a Culture Fair Cognitive Screening Test Battery.
15. DILANDRO, C California Older Adult Stroop Test (COAST): Additional Psychometric Properties.
16. MORENO-MARTINEZ, F Presentation and preliminary results of Semantic Battery Nombela. A new instrument to evaluate semantic categorial impairment.
17. WILLIAMSON, D How do the NAB Decision Rules work in a Clinical Sample?
18. BYLSMA, FW The Clinical Utility of the 15/30-item Boston Naming Test Shortform in a TBI Sample.
19. BARRY, D In Search of an Efficient and Accurate Measure of Organic Brain Dysfunction: A Modified Average Impairment Rating.
20. DANIEL, M Ecological Validity of Neuropsychological Tests For Predicting Navigational Ability.
21. CARTER, SL CVLT-II Performance in a Neurovascular Sample: Relationship to Other Neuropsychological Domains.
22. MCLACHLAN, JF A Culture Fair Cognitive Screening Test Battery: Effects of Emotional Status and Symptom Magnification.
23. IVERSON, GL Frequency of Abnormal Scores on the Neuropsychological Assessment Battery (NAB) Screening Module in a Mixed Neurological Sample.
24. ATKINSON, TM Construct Validity and Order Effects in Variants of Sequencing-Shifting Tests.
25. DICKINSON, M The Flynn Effect in Neuropsychological Assessment.
26. DENMAN, J Efficacy of a Telecommunications Memory Clinic.
27. VANNORSODALL, TD Demographic and Neuropsychological Correlates of Iowa Gambling Task Performance in Healthy Adults.
28. RYAN, E Assessing Premorbid Intellectual Performance Among HIV+ Participants with Low Literacy.
29. SISCO, S Stability of Proxy Ratings on the Frontal Systems Behavior Scale.
30. LANGE, R Clinical Validation of the Estimate of Premorbid Ability for Canadians (EPAC).
31. MCHUGH, T Sensitivity and Specificity of the Memory Subtests of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).
32. BORGOS, MJ Practices and Perspectives Regarding the Assessment of Judgment Skills: A Survey of Clinical Neuropsychologists.
33. MCDONALD, S Assessing Social Perception Can Be A Reliable And Valid Exercise: A Psychometric Study Of The Awareness of Social Inference Test (TASIT).
34. DAVIS, A Standardized Sensory Acuity and Subcortical Motor Differences between Individuals with ADHD and TBI.
35. PASTOREK, N Change in Raw Score Performance across Age Ranges of Community-Dwelling Older Adults on Longitudinally-Administered Memory Subtests of the RBANS.

36. NEAL, T Pathognomic Gender Differences in Sensory and Motor Performance in Children.
 37. SPENCER, RJ Psychometric Limitations of the Mini Mental State Examination in Older, Non-Demented Adults.
 38. FEARING, MA The Cabinet Memory Test: "What is it?" and "Where did you put it?".
 39. RANE, S Development of a Non-Manual Trail Making Test: Construct and Discriminant Validity.
 40. DAWES, S Examination of Cognitive Profiles in an HIV positive sample.
 41. DAWES, SE Preliminary Normative Data for the Patient's Assessment of Own Functioning Inventory.
 42. CHOI, J The Psychometric Development of the Memory for Everyday Tasks (MET): A Functional Performance-based Memory Test for use in Neurocognitive Research.
 43. AINSWORTH, CR Prediction of Health and Safety Functioning from Neuropsychological Measures.
 44. DUX, MC Differentiating Cognitive Components of Processing Speed: A Strategy for Enhancing Detection of Concussion Related Deficits.
 45. PEDRAZA, O Reliable Change on the Dementia Rating Scale-2.
 46. MEYER, SM Combining Word-Reading and Demographics to Predict Neuropsychological Test Performance.
 47. VICTOR, TL Using Multiple Measures of Effort.
 48. VICTOR, TL The Validity of Using Effort Tests in a Mentally Retarded or Learning Disabled Population: A Case Example.

Child - Assessment

49. LOPEZ, WL Design Copy Trial for the Wide Range Assessment of Memory and Learning.
 50. HAUKENES, SS Behavior Rating Inventory of Executive function: Profiles among children with ADHD.
 51. GUAY, JL Utility of the CPT-II in Differentiating ADHD and Dyslexia.
 52. SORENSEN, L Attention Network Test reveals characteristic patterns of dysfunction among children with ADHD.
 53. EVERHART, DE Cognitive dissimulation strategies in children: Examination of forced choice recognition memory and verbal learning and memory.
 54. DAVIS, A The Canonical Relationship between Sensory-Motor Skills and Academic Achievement in Children with ADHD.
 55. TRASK, CL Late Onset of Cognitive Regression in an Eight-Year-Old Girl.
 56. MATSON, MA Behavioral and Neuroanatomic Correlates of Parent Ratings of Working Memory in Typically Developing Children.
 57. BEEBE, D Children's Sleep is Associated with Aspects of Attention, Executive, and Scholastic Functioning.
 58. RADCLIFFE, J Developmental Changes in Attention Performance and Their Relationship to Behavior and School Problems.
 59. MAERLENDER, A An Exploratory Study of the Relationship of Parenting Behaviors to Children's Executive Functioning.
 60. NELSON, E Language Functioning Differentially Associated with Parent and Teacher Reports of Behavior Problems in Preschool Children.
 61. WODKA, EL Discriminant Value of Executive Function Measures in Children with ADHD.
 62. JANUSZ, J Frequency of Post-Concussion Symptom Report in a Pediatric Sample.
 63. GIOIA, GA Initial Development of the Pediatric version of the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) Battery.
 64. DIVER, T Initial Evidence of Differentiated Memory Based on Exploratory Factor Analysis of the Pediatric Version of ImPACT.
 65. GIOIA, GA Initial Development of a Computer-Administered Working Memory and Inhibitory Control Battery for Children.
 66. DI PINTO, M Performance on Working Memory Versus Episodic Memory Tasks in a New Computerized Pediatric Assessment Tool: A Developmental Study.

10:45 AM-12:15 PM

Poster Session 3

Cognitive Neuroscience

1. LILLIE, RA "You Look Familiar": Impact of Face Familiarity on the N250 ERP Component.
 2. LARSON, MJ Task-Irrelevant Facial Fear Distractors Impair Working Memory.
 3. GIOVANELLO, KS Conceptual Priming in Semantic Dementia: A Window into the Cognitive and Neural Basis of Conceptual Implicit Memory.
 4. KUMAR, MA The Neural Correlates of Self-deception.
 5. TROIANI, V From Nonword to Verb: an fMRI Investigation of Verb Acquisition in Healthy Young Adults.
 6. NEGASH, S Implicit Learning of Sequential Regularities and Spatial Contexts in Corticobasal Syndrome Patients.
 7. BRAESE, R CSS and Cognition: An Examination of 5 Neurocognitive Profiles.
 8. ABEL, JR Magnetic Resonance Spectroscopic Imaging and NF-1: Correlates to Cognitive Function.
 9. SUCHY, Y Bad, Ugly, or Just Different: The Meaning of Outliers.
 10. BROWN, GG Latent Working Memory Dissociations in Lateralized Brain Disease.
 11. MILOVAN, D Cognitive Profiles of Patients with Unilateral Migraines.
 12. LEWYCKY, ST Effects of Music Training on Verbal and Visual Memory.
 13. SHELBY, CR Self-enhancement Modulated via Transcranial Magnetic Stimulation (TMS).
 14. STOESZ, BM Evidence For a Local Processing Advantage in Musicians.
 15. HERNANDEZ, M Development of parallel versions of the Iowa Gambling Task for repeat testing.
 16. MURRAY, EM Mapping the Cortical Pathways Involved in Perspective Taking: A Perturbation Approach Using Transcranial Magnetic Stimulation.
 17. KING, KE Word Learning in Late and Novice Learners of German.
 18. MOLFESE, DL Impact of Minor Sleep Reduction on Speech Processing in Children.

19. RICHTMYER, C ERPs Index The Relation Between Prereading Skills And Math Abilities.
20. SPADONI, AD Adolescent Neuropsychological Performance Predicts Callosal Microstructure San Diego State University, University of California San Diego, VA San Diego Healthcare System Supported by DA15228 to Tapert.
21. ENGLAND, RL The relationship between psychopathic traits and emotional processing using fMRI.
- Dementia Alzheimer's Disease**
22. RENTZ, DM Highly Intelligent Older Individuals with IQ-adjusted Memory Impairment Have Abnormal SPECT Perfusion.
23. LINEWEAVER, TT Differential Patterns of Visuospatial Impairment in Alzheimer's Disease and Huntington's Disease.
24. MATTEAU, E Clinical Utility of the Mattis Dementia Rating Scale for the Diagnosis of Mild Cognitive Impairment and Alzheimer's Disease.
25. ZIEGLER, R Methylmalonic Acid, Vitamin B12, and Functional Abilities in Cognitively Impaired Older Adults: Is MMA an early predictor of functional decline?
26. ACHARYA, D Neuropsychological and Demographic Correlates of Apraxia in a Large Cohort of Alzheimer's Patients.
27. LANGE, KL Preserved Appreciation of Hedonic Value in Alzheimer's Disease.
28. TENG, E Facial Affect Processing Deficits in Mild Cognitive Impairment.
29. MCDONALD, NK Neuropsychological Correlates of Leukoaraiosis and Atrophy in Alzheimer's Disease, Mild Cognitive Impairment, and Nondemented Elderly.
30. HOPKINS, MW Comprehension Deficits in Dementia.
31. CARLOZZI, N Dual Therapy (Donepezil/Memantine) for Alzheimer Disease in Mild Cognitive Impairment.
32. JUNCADELLA, M Addenbrooke's Cognitive Exploration: spanish normative data and validity.
33. GIOVANNETTI, T Strategic Object Placement improves Naturalistic Action in Dementia.
34. FOSTER, PS Learning in Alzheimer's and Parkinson's disease.
35. COON, WC Odor Identification Deficits in MCI subtypes.
36. CAHN-WEINER, DA Cognitive Predictors of Daily Functioning in Mild Cognitive Impairment.
37. BRADFORD, L Exploring Promising New Behavioural Assessment Tools for Dementia: Validation of the Kingston Standardized Behavioural Assessment (KSBA).
38. ARANGO, JC Are Lexical-Semantic Deficits Part of the Preclinical Phase of Alzheimer's Disease?
39. KRISHNAN, M Clustering and Switching in Verbal Fluency Tasks in Older Individuals with Mild Cognitive Impairment and Normal Controls.
40. HOKKANEN, L CERAD Neuropsychological Battery in Finnish Primary Health Care.
41. JENKINS, RA Naming Improvement with Phonemic Cues: Which Alzheimer's Patients Benefit Most?
42. ROGERS, SA Preclinical Neuropsychological Markers of Alzheimer's Disease.
43. SPITZNAGEL, MB Impaired Awareness in Dementia Patients Predicts Caregiver Burden.
44. SMERZ, JM Relationship Between Cognitive Factors and Behavior Symptoms in Moderate to Severe Dementia.
45. PETERS, KR Apolipoprotein E Genotype in Cognitively-Impaired-Not-Demented Individuals.
46. MURPHY, C The Effect of Gender and the Apolipoprotein E e4 Allele on Rate of Decline in Recognition Memory for Olfactory Stimuli in Patients Diagnosed with Alzheimers Disease.
47. DEMERTZIS, K Emotional and Neuropsychological Functioning in Individuals At-Risk for Alzheimer's Disease.
48. SAVAGE, G Unirhinal Olfactory Identification Impairment and Neuropsychological Correlates in Mild Cognitive Impairment.
49. WESTERVELT, H Clinical Presentation of Alzheimer's Disease in Patients With and Without Odor Identification Deficits.
50. RHODES, RD Short-Term Verbal Learning in Alzheimer's Disease: Statistical Versus Clinical Significance.
51. NORDLUND, A Neuropsychological Differences Between MCI Subjects with Normal and High Concentrations of CSF tau.
52. COSENTINO, SA Anosognosia Assessment in Alzheimer's Disease: New Metacognitive Methodology.
53. KONKA, S The Discrimination Index of the Hopkins Verbal Learning Test is Lower in Patients with Alzheimer's Disease than Patients with Frontal-subcortical Dementias.
54. GREEN, J Neuropsychological Changes Related to Extrapyramidal Motor Symptoms (EPS) in Mild Cognitive Impairment (MCI).
55. NADKARNI, NK Functional Impairment Correlates Differentially with Executive Function Deficits in Alzheimer's Disease and Frontotemporal Dementia.
56. MAPSTONE, M Visual Motion Perceptual Deficits and the Window of Spatial Attention in Alzheimer's Disease.
57. BENGE, J Phonemic Cued Performance on the Boston Naming Test: Longitudinal Change and its Correlates in Alzheimer's Disease.
58. SAYKIN, AJ Pharmacogenetic Imaging in Preclinical Alzheimer's Disease: Candidate Genes and Response to Cholinergic Enhancement in Amnesic MCI.
59. WARREN, LH Prediction of Dementia: A Comparison of Multiple Preclinical Dementia Algorithms.
60. MCCAWLEY, G Category Specific Naming Difficulty in Alzheimer's Disease and Frontotemporal Dementia.
61. ROGERS, SA Premorbid Intelligence and Age-Associated Memory Impairment.
62. VAN GAAL, S Validation of Simple Measures for Progression of Brain Atrophy and Cognitive Decline in Alzheimer's Disease.

11:00 AM–12:30 PM**Paper Session 1****Cognitive Dysfunction in HIV/AIDS****Room:Grand Ballroom Salon G (4th floor)**

1. CHERNER, M Relationship Between Cognitive Deficits and Performance on Tests of Everyday Functioning in HIV+ Spanish Speakers: Preliminary Results.
2. BECKER, JT Patterns of Neuropsychological Impairment in HIV/AIDS Differ as a Function of Immune System Competence and Age.

3. BYRD, D HIV-Related Cognitive Disorders in U.S. Ethnic Minorities: Influence of Confounds and Classification Systems.
4. MARTIN, E Neurocognitive Function and Hepatitis C Disease: The Women's Interagency HIV Study.
5. SCHWEINSBURG, BC Neural Substrates of Response Inhibition in HIV-1 Infection.

11:00 AM–12:30 PM**Symposium 5****Does Age at Insult Predict Outcome From Childhood Brain Insult?****Room:Grand Ballroom Salon F (4th floor)**

1. TAYLOR, GH Age-related Influences on Outcome of Childhood Brain Injury: Review of the Evidence.
2. HOWARD, K Early White Matter Injury in Very Preterm Children is Associated With Executive Difficulties at 2 Years Corrected Age.
3. ANDERSON, V Outcome Following TBI Sustained at Different Stages of Childhood.
4. DE LUCA, CR The Cognitive and Behavioural Legacy of Congenital Anomalies.
5. RANKINS, D Processing Speed in Young Adults with a 12-14 Year History of Type I Diabetes: The Impact of Age of Disease Onset.
6. DA COSTA, AC Neurodevelopmental Functioning in Infants with a Craniofacial Disorder: Single-suture Craniostyostosis.
7. DA COSTA, AC Does Age at Insult Predict Outcome From Childhood Brain Insult?

11:00 AM–12:30 PM**Paper Session 2****Psychopathology and the Brain****Room:Grand Ballroom Salon E (4th floor)**

1. GOLD, JM Intact attentional control of working memory encoding in schizophrenia.
2. MEDINA, KL White Matter & Depressive Symptoms in Adolescent Marijuana Users.
3. KALMAR, JH Emotional Regulation and Cingulum Integrity in Bipolar Disorder.
4. STORY, TJ Neurocognitive Correlates of Depression Improvement and Remission in Late-Life Depression.

12:30–2:00 PM**Poster Session 4****Behavioral Neurology**

1. WILLIAMSON, AL Soft Signs, Neuropsychological Deficits, and Neuroimaging Abnormalities in Children with Sickle Cell Disease.

Child - Assessment

2. FISHER, BC Use of lamotrigine in Autism Spectrum Disorder (ASD) B. C. Fisher, G. Avci-Wolf, & B. Couvadelli.

Child - Developmental Disorders

3. BLOOM, JS Planum Temporale and Planum Parietale Morphology in Children with Developmental Dyslexia.
4. SMITH, SK Investigation of Visual Skills in Preschool-Aged Children Diagnosed with Severe to Profound Sensorineural Hearing Loss.
5. KUSHALNAGAR, P Effects of Intelligence and Parental Depression on Behavior Adaptability in Pre-Cochlear Implant Candidates.
6. KEY, AP Atypical Auditory Attention In Young Adults With Williams Syndrome.
7. POLLAK, Y Deficient Prospective Time Estimation in Adult ADHD: Lack of Effect for Attention to Non-Temporal Stimuli and Working Memory.
8. GRAY, R Gender Differences in Childhood Disruptive Behavior Disorders.
9. PRICE, K Irregular Movement Timing in Asperger Syndrome.
10. LAJINESS-O'NEILL, R Differentiating Autism and Developmental Language Delay with the Preschool Language Scale-3.
11. SHANAHAN, M Is Pure ADD Neuropsychologically Distinct from ADHD Combined Type?
12. BAPP NEWMAN, J Differences in Neuropsychological Development Between Preterm-Birth Twins and Singletons.
13. MCINERNEY, RJ Transfer of Learning in Children with Fetal Alcohol Spectrum Disorder (FASD).
14. WALZ, NC Discourse Abilities in Adolescents with Myelomeningocele and/or Nonverbal Learning Disabilities.
15. SIKLOS, S Differences Between Children with Fetal Alcohol Spectrum Disorder (FASD) and Attention Deficit/Hyperactivity Disorder (ADHD) on the Behavior Rating Inventory for Executive Function (BRIEF).
16. KOUSHIK, NS Subtypes of Children with Intellectual Disabilities: External Validation Using the Vineland Adaptive Behaviour Scales.
17. WODKA, EL A Prospective Examination of Neuropsychological Functioning in Preschool-Age Children with Sickle Cell Disease and its Association with Psychosocial Factors.
18. SEMRUD-CLIKEMAN, M Behavioral Functioning Differences in Children with ADHD with and without Stimulant Treatment.
19. GOMES, H Auditory and Visual Attention in Language Impaired and AD/HD Children.
20. HUNTER, SJ Neuropsychological profile differences between Aspergers Syndrome and Nonverbal Learning Disorder: Implications for diagnostic divergence.
21. WOLFSON, VM Semantic Verbal Fluency in Children with Language Impairment and ADHD.
22. TAYLOR, HB Early Information Processing among Infants with Spina Bifida.
23. SUTERA, S Factors Influencing Positive Prognosis in Toddlers Diagnosed With an Autism Spectrum Disorder.

24. WILSON, LB Effects of Demographic Factors on Satisfaction with Screening and Diagnosis of Autism Spectrum Disorders.
25. BERNABEU, J Neuropsychological Profiles and Differences among NVLD, Asperger and Healthy Children.
26. PETERSON, RL Cognitive Overlap between Speech Sound Disorder and Reading Disability.
27. KENEALY, L White Matter Microstructure in Childhood ADHD: Association with Behavioral Inhibition.
28. VERBALIS, AD Sex Differences in Toddlers with Autism.
29. BROCKI, KC Novel Computerized Measures of Spatial And Verbal Working Memory: A comparison Between Children With ADHD And Normal Controls.
30. RAINES, DM The Computerized Mind in the Eyes-Revised Test: An Initial Investigation and Validation in Patients with Aspergers Syndrome.
31. MICHEL, J Monozygotic Twin Boys Discordant For Fetal Alcohol Spectrum Disorder (FASD) Diagnosis: A Case Study.
32. MOSTOFSKY, SH Children with Autism Show Differences in Cerebellar-Cerebral Circuits During fMRI of Sequential Finger Tapping.
33. KIMBERG, C A Pilot Study Comparing the Attentional Profile of Autism Spectrum Disorders and ADHD.
34. PHILLIPS, KD Differences Among Parent-Report Measures of Pervasive Developmental Problems in Very Young Children.
35. HALPERIN, JM A New Perspective on the Role of the Prefrontal Cortex in the Pathophysiology of ADHD.
36. MATTSON, SN Executive Functioning in Children with Fetal Alcohol Spectrum Disorders and ADHD.
37. PANDEY, J The Modified Checklist for Autism in Toddlers (M-CHAT) Sibling Study: An Update.
38. HINTON, VJ Autism and Duchenne Muscular Dystrophy.
39. O'CALLAGHAN, CA Use of a Handheld Computer to Facilitate the Evaluation of Treatment Approaches with an Autistic Student.
40. FEE, R Possible Evidence of Cognitive Side Effects with Steroid Treatment for Duchenne Muscular Dystrophy.
41. THEDE, L Subtle Psychosocial Differences Perceived among Autistic Groups.
42. KIEFEL, JM Evidence of a unique behavioral phenotype in Duchenne Muscular Dystrophy.
43. LOCASCIO, G Corpus Callosum Area Differences in Children with Autism, Asperger's Disorder and Bipolar Disorder.
44. GROFF, AR The Relationship Between Attachment Style and Frontal Lobe Functioning in an Adult Sample.
45. MRAZ, KD An Investigation of Head Circumference During Infancy in Autism.
46. LARSON, JC Examination of Motor Skill Learning Using Maze Tracing in Children With Autism.
47. CYRULNIK, S Preschool Children with Duchenne Muscular Dystrophy Exhibit Delays in Complex Language Skills.
48. ESSER, EL Sensory Reactivity in Young Children with Autism Spectrum Disorders and Other Developmental Disorders.
49. MCLAUGHLIN-BELTZ, SE EEG Neurofeedback Brain Activity in Children with ADHD - Inattentive Type.
50. GALLO, FJ Observations of Heightened Anxiety in Young Children with Williams Syndrome.
51. PUNDLIK, J Executive Functions and Perceived Self-Efficacy in African American Boys with Attention Deficit Hyperactivity Disorder.
52. RODAK, KL Impact of autistic spectrum pathology on self-face recognition: A pilot study of children with Aspergers Syndrome.
53. ROULEAU, N Is ADHD Associated With an Homogeneous Neuropsychological Profile?
54. BOORSTEIN, HC Stability of DSM-IV-TR Symptoms in Young Children With Autism Spectrum Disorders.
55. LEVIN, S Social Functioning and maladaptive behavior scores predict performance on theory of mind tasks in children.
56. SUTTON, A Variable Executive Function and Cognitive Performance in Apert Syndrome.
57. KONDO, T Noise Sensitivity and Prefrontal Activations in Asperger's Syndrome: a NIRS Imaging Study.
58. HALE, J Quantifying Medication Response in ADHD: Does Neuropsychological Impairment Matter?

Cross-Cultural Issues

59. MALLERY, ST Performance Advantage on the Tower of London-DX for Monolingual vs. Bilingual Young Adults.
60. KAZANDJIAN, S Effects of Bilingualism and Acculturation on the Neuropsychological Test Performance of Armenian-Americans.
61. MADORE, M The Relationship Between Specific Aspects of Acculturation and the WCST.
62. THAKUR, AS Immigration, Cognition, and Aging among Hispanic New York City Residents.
63. RENTERIA, L Validation of the Spanish Language Wechsler Adult Intelligence Scale - Third Edition (WAIS-III, TEA Version) in a Sample of Urban Mexican Americans.
64. RENTERIA, L The Influence of Acculturation, Education, and Language Proficiency on the Neuropsychological Test Performance of Urban Mexican Americans.
65. VERNEY, SP The Influence of Ethnic Experience in Cognitive Ability Assessment.
66. SUAREZ, PA The Relationship between Subjective Cognitive Complaints, Depressive Symptoms and Neuropsychological Functioning Among HIV-seropositive Spanish vs. English Speakers.
67. LONSER, KA Evaluating Premorbid Level of Function in Dementia: The Influence of Ethnicity and Cognitive Status.
68. MOES, EJ The Effect of Socioeconomic Variables and Gender on Executive Tasks in Asian Indian Children: A Cross-Cultural Replication.
69. WONG, JT The effects of acculturation on language performance in a group of ethnically diverse individuals.

Imaging: Structural

70. BAVA, S Characterization of Visuospatial Impairment in a Genetic Metabolic Disorder using Diffusion Tensor Imaging.

Psychopathology: Depression

71. CONSTANTINIDOU, F Presentation Modality Effects in Children with Major Depressive Disorder and in Non-Depressed Cohorts.

12:30–2:00 PM

Poster Symposium 1
Neuroethics in Clinical and Research Practice
Room:Univ. of Mass Exhibit Hall (3rd floor)

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|----------------|---|
| 1. FORD, P | Autonomy, Ulysses, and Limits: Revoking Consent During Brain Surgery. |
| 2. KUBU, CS | Who Decides Who Should have Surgery? Neuroethics on a Functional Neurosurgery Multidisciplinary Team. |
| 3. GRIGGINS, C | The Diagnosis and Treatment of ADHD: A Social Justice Critique. |

2:00–3:30 PM

Symposium 6
Honouring Marcel Kinsbourne, Demolisher of Walls
Room:Grand Ballroom Salons B, C&D (4th floor)

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|-----------------|---|
| 1. PARLOW, SE | Honouring Marcel Kinsbourne, Demolisher of Walls. |
| 2. DENNETT, D | Since “Time and the Observer”: Thinking About Consciousness. |
| 3. TULVING, E | Episodic Memory: A Special Kind of Consciousness. |
| 4. LIEDERMAN, J | The CNS as a “CNS” (Competitive Network System). |
| 5. WOOD, F | Remembering the ‘70’s: Kinsbourne’s Influence on Psychology Graduate Students at Duke University. |
| 6. SWANSON, J | Laboratory Assessments of Stimulant Medication: The Impact of the Toronto Studies. |

2:00–3:30 PM

Symposium 7
Living With Amnesia: The Story Of Clive Wearing
Room:Grand Ballroom Salon G (4th floor)

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|------------------|---|
| 1. WILSON, BA | Living With Amnesia: The Story Of Clive Wearing. |
| 2. WILSON, BA | The Man Who Has Just Woken Up: A Twenty Year Follow Up Study. |
| 3. BIGLER, E | The Neuropathology of C.W. |
| 4. KOPELMAN, MD | CW: His Place in Memory Research. |
| 5. MOSCOVITCH, M | Discussant. |

2:00–3:30 PM

Symposium 8
A Critique of the Compensatory Hypothesis: Survey of Functional MRI Studies Across Neuropsychological Disorders
Room:Grand Ballroom Salon F (4th floor)

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|----------------|---|
| 1. CROSSON, BA | Compensatory Reorganization in Recovery from Aphasia After Stroke. |
| 2. BONDI, MW | Learning by APOE Genotype Among Nondemented Older Adults: Review of FMRI Evidence for the Compensatory Hypothesis. |
| 3. SAYKIN, AJ | Allocation of Memory Processing Resources after Mild TBI: Integrating Imaging, Pharmacologic Challenge and Genetic Approaches to Mechanism. |
| 4. BOBHOLZ, JA | Relationship Between Lesion Burden and Memory Activation Patterns In Relapsing Remitting Multiple Sclerosis: An FMRI Study. |
| 5. BROWN, GG | Potential Vascular Confounds in FMRI Studies of Brain Compensation in Schizophrenia. |
| 6. BONDI, MW | A Critique of the Compensatory Hypothesis: Survey of Functional MRI Studies Across Neuropsychological Disorders. |

2:00–3:30 PM

Symposium 9
Neuropsychological Perspectives on Skilled Motor Deficits in Children
Room:Grand Ballroom Salon E (4th floor)

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|-------------------|---|
| 1. RADONOVICH, K | Neuropsychological Perspectives on Skilled Motor Deficits in Children. |
| 2. DENCKLA, MB | Developmental Neurological Examination of the Motor System: Creation of the PANESS. |
| 3. RADONOVICH, KJ | Gait Analysis in Young Children with and without Autism. |
| 4. HEILMAN, KM | The Acquired Apraxias: An Overview. |
| 5. MOSTOFSKY, SH | Developmental Dyspraxia and Procedural Learning in Autism. |
| 6. PRICE, K | Dorsal Visual Stream Deficits in Asperger Syndrome. |

2:30–4:00 PM

Poster Session 5

Epilepsy

- | | |
|-------------------|--|
| 1. DAWSON, KA | The Cognitive Effects of Zonisamide; Influences on Attention, Memory and Verbal Fluency: A Case Study. |
| 2. KEISKI, M | Hippocampal Volumes and Wisconsin Card Sorting Test Performance in Temporal Lobe Epilepsy. |
| 3. KATZENSTEIN, J | The Relationship Between Seizure Focus, Age of Onset, and Rapid Naming in Pediatric Epilepsy. |
| 4. LEE, GP | False Recognition Errors During Wada Memory Assessment Are More Frequent in Patients with Frontal Lobe Seizures. |

5. DOSS, R Auditory Naming Performance in Temporal Lobe Epilepsy.
6. BROWN, TM Prediction of Seizure Focus Using a Neuropsychological Lateralization Rating Scale in the Pre-Surgical Evaluation of Children with Medically Intractable Epilepsy.
7. CHAYTOR, NS Evidence of Improved Executive Functioning in Patients Undergoing Temporal Lobe Resection for the Control of Intractable Epilepsy: Exploration of the Nociferous Cortex Hypothesis.
8. DULAY, MF Rates of Intra-individual Change on Three Tests of Nonverbal Recall Following Right Anterior Temporal Lobectomy.
9. AKDAG, S Memory Outcome Following Tailored Temporal Lobe Resection for Patients with Epilepsy.
10. VAN WINKLE, A The Impact of Learning on Children Diagnosed with Early Onset Epilepsy.
11. FOSTER, PS Lateral differences in psychomotor speed among patients with left and right temporal lobe epilepsy.
12. HAUT, JS Cross-Validation of a Regression Equation for Predicting WISC-III FSIQ Scores after Epilepsy Surgery.
13. LOYDEN, JJ Predictors of Seizure, Cognitive, and Psychological Outcome Post ATL.
14. LAMBERT, N Comparison of Preoperative Measures in Predicting Cognitive Outcome After Temporal Lobectomy.
15. COLLINS, DW Psychosocial Subtyping and Brain Metabolism in Children with Epilepsy.
16. HUNTER, SJ Neuropsychological change associated with levetiracetam (Keppra) when treating children with Epilepsy.
17. CUNNINGHAM, NC Neuropsychological Factors as Predictors of Social Competence in Adolescents With Epilepsy.
18. SHERMAN, E Frontal Lobe Epilepsy in Children and the Utility of CVLT-C Process Scores in Detecting Executive Dysfunction.
19. KEISKI, M Hypomania Scores Predict List Recall in Right Temporal Lobe Epilepsy.
20. STROUP, E PAI vs. MMPI in the Classification of Patients with Epileptic and Psychogenic Nonepileptic Seizures: Overall Accuracy and Advantages.
21. ZAROFF, CM Psychopathology in non-mentally retarded children with Tuberos Sclerosis Complex.
22. EISENMAN, DD Validation of a Neuropsychological Wada Procedure.
23. JONES, RD Left Hemisphere Dominance for American Sign Language in a Congenitally Deaf Subject During Intracarotid Sodium Amytal Testing.
24. BERL, MM Effect of Seizure Chronicity on Working Memory and Receptive Language.
25. CLEAVINGER, HB Material Specific Patterns of Brain Activation During Novelty Detection in Temporal Lobe Epilepsy.
26. HAMPSTEAD, BM Memory Test Performance After Hours as Opposed to Minutes is Better Associated with Hippocampal Dysfunction in Temporal Lobe Epilepsy.
27. LUNDMARK, J The WISC-IV in the Assessment of Children with Intractable Epilepsy.
28. CAHN-WEINER, DA Stability of Executive Function following Temporal Lobectomy.
29. BALDWIN, E The Role of the Hippocampus in Confrontation Naming: Outcome Following Selective Amygdalohippocampectomy.
30. CHANG, Y Level of Preoperative Frontal Functioning Predicts Postoperative Memory Change in Adults with Temporal Lobe Epilepsy.
31. KLAAS, PA Dissociation In Memory for Faces and for Dot Location in Children With Temporal Lobe Epilepsy: Pre and Post Surgery.
32. PULSIPHER, DT Duration of Temporal Lobe Epilepsy and Caudate Nucleus Volumes.
33. GERTZMAN, L Behavioral Disorders in Children with Epilepsy: Relation to Clinical and Demographic Variables.
34. WOLKIN, J Rates of SCID-Diagnosed Axis I Disorders in a Large Cohort of Patients with Epilepsy.
35. HAGGERTY, KA Changes in Anxiety Symptoms in Children Following Surgical Intervention for Treatment of Intractable Epilepsy.
36. DAVIS, J Family Functioning in Medically Controlled Versus Intractable Epilepsy.
37. BENDER, H Comparing the Diagnostic and Clinical Utility of the BASC-PRS and the CBCL in Children with Epilepsy.
38. OELKE, LE Self and Informant Reports of Subjective Memory in Temporal Lobectomy Patients.
39. PENG, H Voxel-based Analysis of Diffusion Anisotropy in Temporal Lobe Epilepsy.
40. BUTTERFIELD, LC Quality of Life Following Temporal Lobectomy.
41. CHICOTA, C Passing the Wada Test as it Relates to Non-Verbal Memory Performance.

Executive Abilities/Frontal System

42. ROTH, D Interrelationships of Intelligence, Memory and Executive Functions.

Forensic Neuropsychology

43. REICKER, LI The Effects of Differential Cognitive Demands on Malingering.
44. SMART, CM Identification of Secondary Gain Using the MMPI-2: An Optimal Classification Tree Analysis.
45. SILVERBERG, N An Effort Index for a Cognitive Screening Battery: The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).
46. LARRABEE, GJ Malingering Formulae for The Continuous Visual Memory Test and Continuous Recognition Memory Test.
47. YANTZ, CL Passing or Failing Symptom Validity Measures: The Differential Impact on Memory Functioning in a Sample of Litigants.
48. NELSON, NW Meta-Analysis of the MMPI-2 Fake Bad Scale.
49. WAGNER, LA Is There a Relationship Between Motor Speed and Intelligence?: Correlations in Large Samples of Incarcerated and Nonincarcerated Individuals.
50. WILLIAMS, BR A Comparison of the Relationship Between IQ and Verbal Fluency in Incarcerated and Nonincarcerated Individuals.
51. BERRY, DT A Meta-Analytic Review of Objective Procedures for the Detection of Feigned Psychiatric Symptom Reports During Forensic Neuropsychological Examinations.

52. HORWITZ, JE Interplay of Examinee Anxiety and Presence of Third Party Observers on Tests of Executive Function.
53. HORWITZ, JE Are Measures of Symptom Validity All Equal? Preliminary Findings.
54. WHITESIDE, D Detection of Decreased Effort in Neuropsychological Assessment: A Pilot Study.
55. BOONE, KB Somatization and malingering of cognitive deficit in six cases of "toxic mold" exposure.
56. POWELL, M TOMM Performance in a Mixed Chronic Pain Treatment Seeking Sample is Unrelated to Mood, Memory, and Common Variables Associated with Suboptimal Effort.
57. CHELUNE, GJ Effects Of Intervention For Incomplete Testing Effort Among Patients With Multiple Sclerosis (MS).
58. NEUDECKER, JJ Evaluation of a Novel Malingering Detection Method Involving Symptom Validity Testing, Performance Curve Analysis, and Response Time.
59. GREIFFENSTEIN, M Validity Test Failure Prevalence in a Large Sample of Workers Compensation Applicants.
60. WISE, J Detecting Neuropsychological Malingering of Mild TBI: Effects of Internet Based Coaching.
61. MACHER, R The MMPI-2 Fake Bad Scale (FBS) for Detection of Incomplete Effort on Neuropsychological Testing: An Extension and Cross-Validation.
62. DENBOER, J TOMM vs. WMT vs. CARB: Specificity, Sensitivity, and Face Validity.
63. DENBOER, J Successful Simulated Malingering on Popular Symptom Validity Tests.
64. LU, PH Cross-Validation of Four Measures of Suspect Effort.
65. HEBERT, KR A Growing Challenge: The Need for Functional Assessment of Decisional Capacity Among Older Adults Seeking Legal Services.
66. GREVE, KW The Prevalence of Malingering in Persons Reporting Exposure to Environmental and Industrial Toxins.
67. GREVE, KW Sensitivity and Specificity of Wisconsin Card Sorting Test Indicators of Potential Malingered Neurocognitive Dysfunction in Traumatic Brain Injury.

5:00–6:30 PM**Poster Session 6****Child - Acquired Disorder: Other**

1. FERRETTI, L Neuropsychological Function and Developmental Trajectories in Lead-Exposed Children: A Family Case Study.
2. BRIERE, M Longitudinal Cognitive Outcomes in Pediatric Brain Tumors Survivors.
3. MICKLEWRIGHT, JL Learning and Memory in Children with Brain Tumors: The Role of the Third Ventricle Region.
4. KUSHALNAGAR, P A Case of Tourette's Syndrome with Ocular-Motor Abnormalities in a Deaf Male Adolescent Signer.
5. PAPAZOGLU, A Measures of Language as Predictors of Later Adaptive Functioning in Children with Brain Tumors.
6. CHAPIESKI, L Cognitive and Academic Sequelae of Near-Drowning Accidents in a Pediatric Population.
7. LANDA, J Differential Memory Functioning in Acquired Hypoxic-Ischemic Brain Damage.
8. MEADOWS, M Adult Survivors of Childhood Leukemia: Neuropsychological findings.
9. HEFFELFINGER, A Associations of Neuropsychological Functioning and Adolescent Activities with Adaptation Outcomes in Adolescents with Spina Bifida.
10. GOLDMAN, ML Neurocognitive and Educational Outcomes of Childhood Cancer- A Longitudinal Study.
11. KUNIN-BATSON, A Neuropsychological and Psychosocial Functioning in Survivors of Bone Marrow Transplant.
12. MILLER, J Pattern of Neurodevelopment in Very Young Children with Craniosynostosis Compared to Hydrocephalus: Parent Report Versus Standardized Assessment.
13. WHITE, RF fMRI Findings in Adolescents with High Prenatal Exposures to Methylmercury and PCBs.
14. DE SONNEVILLE, L Impairments in Attention and Executive Function Underlying Long-term Academic Limitations after Bacterial Meningitis in Childhood.
15. BUIZER, AI Risk Factors for Attentional Dysfunction after Chemotherapy in Survivors of Childhood ALL and Wilms Tumor.
16. REY-CASSERLY, C Neuropsychological Outcomes in Children Following Posterior Fossa Syndrome.
17. BONGIOLATTI, SR The Role of Sleep Fragmentation in Disruptive Behaviors in Children with Epilepsy and Co-morbid Sleep Breathing Disorders.
18. MATSON, MA Short-Term Follow-Up in Pediatric Brain Tumor Examined Through MRI, MRS, DTI, and Neuropsychological Assessment: A Case Study.

Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)

19. ZIMMERMAN, EK Driving Risk and Cognitive Testing in Parkinson Disease (PD).
20. PURTON, A Motor Speech and Cognitive Discourse Changes Are Not Correlated in Early Parkinson's Disease.
21. PIROGOVSKY, E Impairments in Source Memory for Olfactory and Visual Stimuli in Preclinical and Clinical Stages of Huntington's Disease.
22. CAMPBELL, M Mechanisms and Mediating Factors Affecting Set-Shifting in Parkinson's Disease.
23. CRUCIAN, GP Visual-Spatial Disembedding In Parkinsons Disease.
24. FOSTER, PS Relationships between verbal and nonverbal memory and the laterality of Parkinsonian signs.
25. AMICK, M Body Side of Motor Symptom Onset in Parkinson's Disease Influences Memory Performance.
26. FIELDS, JA Semantic Priming in Parkinson's Disease Before and After Subthalamic Deep Brain Stimulation (DBS).
27. SCHIEHSER, DM The Impact of Mood, Cognition, and Motor Symptoms on Quality of Life in Patients with Parkinson's Disease.
28. HOTH, KF Impaired Awareness of Deficits in Huntington's Disease.
29. DAVIDSDOTTIR, S Visuoconstructional Impairment in Parkinson's Disease.
30. KITAHARA, E Impairments in learning of sequential movements in patients with Parkinson's disease :a study with structural equation modeling.
31. NATH, P Neuropsychologic Correlates of Measures of Personality and Self in Parkinson's Disease.

32. HARRIS, E Elevated "Machiavellianism" in Patients with Parkinson's Disease.
 33. SOLOMON, AC Dissociable Roles for the Caudate Nucleus and Putamen in Cognitive and Motor Processes: Evidence from Pre-clinical Huntington's Disease.
 34. SOLOMON, AC Movement Initiation, Execution, and Planning in Pre-clinical Huntington's Disease.
 35. KIRSCH-DARROW, L Apathy: An Important "Factor" in Parkinson's Disease.
 36. FERNANDEZ GUINEA, S Priming and procedural learning of cognitive skills in Parkinson's Disease.
 37. KELLISON, I Improvement in Facial Expressivity in a Patient with Parkinson's Disease Following Expiratory Muscle Strength Training.

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

38. WILD, K Cognitive Performance and In-Home Activity Levels of MCI and Healthy Elders.
 39. KATO, Y GABA-Minergic Therapy for Manipulospacial Dysfunction in Vascular Dementia.
 40. JEFFERSON, AL Cognitive predictors of Hooper Visual Organization Test (HVOT) performance differ between patients with mild cognitive impairment (MCI) and geriatric normal controls (NC).
 41. REILLY, J Serial Recall and Word Learning in Semantic Dementia: A Model of Cognitive-Linguistic Loss.
 42. ZELLER, MA Anosognosia, Executive Functioning and Depression Among Patients With Amnesic Mild Cognitive Impairment.
 43. STAMENOVA, V Progression of Apraxia in Corticobasal Degeneration-A Case Study.
 44. MOORE, PN Confrontation naming in Semantic Dementia (SD), Progressive Non-Fluent Aphasia (PNFA), and Progressive Mixed Aphasia (PMA) Patients.
 45. DRAGO, V Lewy Body Dementia and Creativity: Case Report.
 46. MCLAUGHLIN, NC Olfactory Dysfunction in Frontotemporal Dementia.
 47. BANKS, S Clinical Dementia Rating (CDR) for Behavioral Variant Frontotemporal Dementia (bvFTD) and Primary Progressive Aphasia (PPA).
 48. LEVY, N Executive Dysfunction and Cerebral Perfusion in Alzheimer's disease and Frontotemporal dementia.
 49. MEDINA, J Characterizing Depressed and Non-Depressed Patients Diagnosed with Primary Progressive Aphasia.
 50. WYLIE, SA Response Conflict In Mild Cognitive Impairment (MCI): Delta Plots Reveal Inhibition Deficits.
 51. CAHN-WEINER, DA Executive Function Predicts Future Change in Instrumental Activities of Daily Living.
 52. WICKLUND, AH Word List versus Story Memory in Alzheimer's Disease and Frontotemporal Dementia.
 53. SUTHERLAND, ES A Preliminary Cross-Validation of Education Corrections for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Total Scale Indices in a Clinical Geriatric Sample.
 54. QUITANIA, L Apathy and Cognitive Contributions to Activities of Daily Living.
 55. FREILICH, B The Inventory of Vascular and Alzheimer's Characteristics (IVAC): An Empirically-Based Checklist for the Differential Diagnosis of Alzheimer's Disease, Vascular Dementia, and Mixed Dementia.
 56. KANG, Y Relationship Between Depression and Cognitive Functions in the Dementia of the Alzheimer's Type and the Vascular Dementia.
 57. SUH, M Ideogram Alexia in Patients with Semantic Dementia.
 58. MIKOS, AE Memory for Emotional Words in Mild Cognitive Impairment.
 59. SANTOS-MODESITT, W Spontaneous Social Behaviors that Discriminate FTLD from Vascular and other Dementias.
 60. KANE, RL Cognitive Predictors of Functional Status in Dementia Clinic Outpatients.
 61. RANKIN, KP Specific Right Frontal Structures Mediate Social Self-Monitoring In Dementia.
 62. GLENN, S Evidence Against Ventral Orbitofrontal Involvement in Visual Perspective Taking.
 63. ROPER, BL Unusually Rapid Onset of Primary Progressive Aphasia: Case Report.
 64. PAVLIC, D Deficits in Realistic Non-Verbal Comprehension in Frontotemporal Lobar Degeneration.
 65. RAUDABAUGH, BJ Right Temporal Lobe Volume Predicts Empathy in Dementia.
 66. WELDON, R Structures in Right and Left Frontal Lobes Mediate Social Dominance.
 67. JULIAN, LJ Hypertension is Associated with MRI Markers of Cerebrovascular Disease and Course of Cognitive Functioning and Depression.
 68. DELANO-WOOD, L Evidence for Heterogeneity in Mild Cognitive Impairment (MCI): Differences in Neuropsychological Profile and Associated White Matter Lesion Pathology.

Other (Please Specify):

69. BURTON, CL Instrumental Activities of Daily Living and Everyday Problem Solving in Older Adults with Mild Cognitive Impairment.

FRIDAY, FEBRUARY 3, 2006**9:00–10:30 AM****Paper Session 3
Disorders of Childhood
Room:Grand Ballroom Salon E (4th floor)**

1. EWING-COBBS, L Long-Term Intellectual and Academic Outcomes Following Inflicted and Noninflicted Traumatic Brain Injury Sustained During Early Childhood.
2. WOZNIAK, JR Diffusion Tensor Imaging (DTI) in Sub-Threshold Fetal Alcohol Syndrome: Evidence for Microstructural Brain Abnormalities and Associated Neurocognitive and Behavioral Deficits.
3. MILLAR, K Impairment of Children's Cognitive Function after Anesthesia.
4. SCHRETLEN, DJ Quantitative Structural Brain Abnormalities in Lesch-Nyhan Disease and Its Variants.

9:00–10:30 AM**Poster Session 7****Aneurysms**

1. DIAMOND, BJ Spatial Discrimination, Memory and Executive Function in Anterior Communicating Artery Aneurysm.
2. HRICK, AJ Trajectories of Cognitive Function over the First Year Following Subarachnoid Hemorrhage.
3. VAN ZANDVOORT, M Cognitive sequelae of subarachnoid haemorrhage in the long term.

Electrophysiology/EEG/ERP

4. MOYLE, J Event-Related Potentials in Adults with Phenylketonuria.

Imaging: Functional

5. NAGEL, BJ The Unique Influences of Age and Task Performance on fMRI Response to Visual Working Memory Across Early Adolescent Development.
 6. RIMRODT, S fMRI of Word Frequency and Words in Sentential Context in Children with Reading Disability.
 7. STRICKER, JL Compensation in Action: Networks of Activation Differ in Sleep Deprived and Well-Rested Participants.
 8. MATTHES, J Cognitive Outcome Following Brain Tumor Surgery: The Role of Pathology and fMRI Activation.
 9. O'CONNOR, M An fMRI Study of the Interface Between Affective and Cognitive Circuitry in Pediatric Bipolar Disorder.
 10. HOUSTON, WS Correlation Maps of APOE Gene Dose by Brain Response During Learning.
 11. MACHULDA, MM An fMRI Study of Endogenous Spatial Orienting in Normal Aging and Amnesic Mild Cognitive Impairment.
 12. GALLO, J Detecting Action Errors: Reflections on the Mirror-Neuron System.
 13. SOLLINGER, AB Localization of Sensory-Independent Language Comprehension Cortex: A Functional Magnetic Resonance Imaging Protocol.
 14. KESSEL, Y Practice Dependent Decrease in Brain Activation in a Spatial Working Memory Task.
 15. CRAGGS, JC Using fMRI to Examine Cortical Connectivity and Communication of the "Pain-Matrix" in Individuals with Irritable Bowel Syndrome.
 16. CARLSON EMERTON, BE Discordant IAP and fMRI language lateralization: A case report and cautionary tale.
 17. ORYNICH, C Time Courses of fMRI Activations Spanning The Stimulus-Response Interval During Word Generation By Non-fluent Aphasics.
 18. JANUSZ, J Neural Basis of Response Inhibition in Children with and without NF1 and ADHD: A Functional MRI study.
 19. PENDERGRASS, J Relationship Between Neural Correlates of Response Inhibition and Reaction Time Variability.
 20. ALOIA, MS The Effects of Treatment for Sleep Apnea on Brain Activity during a Working Memory Task.
 21. RAMATI, A Reliability Estimation of a New Approach to Modeling Event-Related Functional MRI Data.
 22. SAYKIN, AJ Altered Brain Activation Following Systemic Chemotherapy for Breast Cancer: Interim Analysis from a Prospective fMRI Study.
 23. COLE, MA Clinical Preoperative Functional Magnetic Resonance Imaging of Language.
 24. MECHANIC-HAMILTON, D Neural Changes in fMRI Activation After Surgical Intervention for Temporal Lobe Epilepsy.
 25. WISHART, HA BDNF Genotype Predicts Brain Activity Associated with Episodic Memory in Healthy Adults.
 26. DOUVILLE, K Famous Faces and Landmarks: An FMRI Investigation.
 27. CHANG, Y fMRI Reveals Neural Reorganization of Overt Pseudoword Repetition Following Phonological-Motor Treatment of Phonological Alexia in Nonfluent Aphasia.
 28. JOE, WQ A Rapid Event-Related fMRI Study of Auditory Attention.
- Multiple Sclerosis/ALS/Demyelinating Diseases**
29. BRUCE, J Visual Acuity Disturbances Are Associated with Performance on Tests of Complex Visual Attention in MS.
 30. GOVEROVER, Y What is the Relationship between Performance of Activities of Daily Living and Self-awareness of Functional Status in Individuals with MS?
 31. SOBEL, A Objective Evidence of Cognitive Fatigue on the PASAT in a Pediatric MS Sample.
 32. GAUDINO-GOERING, EA Using the MSFC to predict Performance of Complex Activities of Daily Living in MS.
 33. BUTLER, MA The Relationship between Psychiatry and Neurology from the 1800s to the Present and its Impact on Patient Care in Multiple Sclerosis.

34. KUZNETSOVA, A Relations between Information Processing Efficiency and 1H-MRS Measures of Neural Integrity in Patients with Relapsing-Remitting Multiple Sclerosis.
35. WITGERT, ME Behavioral Change in Amyotrophic Lateral Sclerosis (ALS).
36. BASSO, M Self-reported Executive Dysfunction, Neuropsychological Impairment, and Functional Outcomes in Multiple Sclerosis.
37. GIOGKARAKI, E The Brief Repeatable Battery of Neuropsychological Tests in Greek patients with multiple sclerosis: performance on the memory tasks in subtypes of multiple sclerosis.
38. GENOVA, HM An Examination of Processing Speed Impairments in Multiple Sclerosis Using fMRI.
39. GLEASON, AC Use of fMRI activation patterns as an outcome measure for clinical trials of disease-modifying medications in multiple sclerosis: A pilot study.
40. MCDONALD, BC Thalamic Atrophy Predicts Cognitive Functioning in Relapsing-Remitting MS.
41. SCHRAMKE, CJ Antidepressant Use in Multiple Sclerosis: A Follow Up Study of Newly Diagnosed Patients.
42. PARMENTER, BA Information Processing Speed Deficits in MS: a Matter of Complexity.
43. ROSEN, AH Fornix Volume in Relapsing-Remitting Multiple Sclerosis.
44. ARNETT, PA MS Patients' Perceptions of the Relative Impact of Several Common Symptoms.
45. TRITTSCHUH, EH Decreased gray matter volume among MS patients in regions identified with fMRI.
46. SHUCARD, JL Event-related Brain Potentials and Processing Speed in MS.
47. MACALLISTER, WS Executive Functioning in Pediatric Multiple Sclerosis.
48. LENGENFELDER, J Examining Metamemory in MS Using a Complex Working Memory Task.
49. LENGENFELDER, J The Effects of Processing Speed on Reading Difficulties in MS.
50. O'BRIEN, A Predicting Objective & Subjective Functional Outcomes in Multiple Sclerosis Using Simple & Complex Processing Speed.
51. HOMOLESKI, BA Temporal Stem Volume in Relapsing-Remitting Multiple Sclerosis.
52. BARWICK, F Relationship Between Long-Term Cognitive Decline and Depressive Symptoms in MS.
53. MOSNIK, DM The Dissociation of Dysarthria from Cognitive Dysfunction in ALS.

Stroke

54. CHAN, RC Care burden experienced by family caregivers of stroke survivors: An exploratory study in Guangzhou.
55. WETTER, SR Predictors of Self-Reported Disability after Unilateral Stroke.
56. EBERT, PL The Role of Neuropsychological Assessment in Predicting Stroke Outcomes.
57. FABRIZIO, K Automatic and Controlled Cognitive Processes in Post-Stroke Depression.
58. WILDE, MC The performance of Acute Stroke patients on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).
59. VICKERY, C Changes in Emotional Functioning Over Time Following Stroke as a Function of Laterality.
60. VICKERY, C Ecological Validity of the RBANS as Pertains to Health and Safety Reasoning.
61. BENNETT, T RBANS Performance Following Stroke: Effects of Laterality and Corticality.
62. VICKERY, C Early Screening with the Modified Mini-Mental Status Exam and Neuropsychological Performance in the Acute and Post-acute Phases Following Stroke.
63. LOMBARDI, S Performance Errors During the Physical Enactment of Novel Naturalistic Actions in Stroke Patients.
64. JOHNSON-GREENE, D Comparison of Psychometric Measures for Assessment of Post-Stroke Depression.
65. DE HAAN, EH Neuropsychological Sequelae of Cerebellar Stroke.
66. WILLIAMSON, JB Baseline Demographic and Cognitive Differences between Reverters and Nonreverters with Vascular Cognitive Impairment No Dementia.
67. ZINN, S White Matter Involvement in Processing Speed, Short Term and Working Memory: Evidence from Cerebrovascular Disease.
68. WILLIAMSON, JB White Matter Hyperintensities in Vascular CIND Reverters and Nonreverters: A Region of Interest Analysis.

10:45 AM–12:15 PM

Poster Session 8

Autoimmune Disorders (e.g., CFS, Lupus, Fibromyalgia)

1. KOZORA, E Associations Between Negative Life Stress, Disengage Coping and Cognitive Dysfunction in Patients with Systemic Lupus Erythematosus.
2. MCCOY, K Intraindividual Variability in Cognitive Performance in Systemic Lupus Erythematosus, Fibromyalgia, and Normals.

Endocrine Disorders/Hormones

3. SANTINI, V Relationship between Thyroid Function and Cognition in Healthy Euthyroid Elderly.
4. HERSHEY, T Glucose Control, Cognition and Parent-rated Behavior Problems in Children and Adolescents with Type 1 Diabetes Mellitus (T1DM).
5. WEBER, M Cognition, Mood and Hormones in Perimenopause.
6. MRAKOTSKY, C Executive Functions and Memory in Children Treated for Inflammatory Bowel Disease: Impact of Steroids vs. Disease Factors.

Epidemiology

7. VITALE, S Decline in Mini-Mental State Examination is Associated with White Matter Hyperintensities in the Framingham Offspring.
 8. TROLAND, K Neuropsychological Effects After a Saturation Dive with a Low Incidence of Venous Gas Microembolism.
 9. TROLAND, K The Haukeland University Hospital Prospective Study of Norwegian Occupational Divers: CNS Effects of Diving.

Genetic Disorders

10. BILDER, RM Neuropsychology in the Phenomic Era.
 11. FINE, JG Why not study differences among family members for heritable disorders?
 12. KENDRA, B Neuropsychological Function in Attenuated MPS I: Possible Decline of Memory and Visual Spatial Function.
 13. CARSWELL, MA Neuropsychological Findings of Kallmann's Syndrome Spectrum: A Clinical Case Study.
 14. JANUSZ, J Relationship Between Behavioral Functioning and Symptom Severity in Children with Neurofibromatosis Type 1.

HIV/AIDS

15. SMITH, R The Effect of Perinatal HIV Infection and Related Risk Factors on Cognitive Development in Young Children.
 16. SUHR, J Relation of Depression to Neuropsychological Performance in HIV+ Older Adults.
 17. FAMA, R Upper and Lower Limb Motor Function in HIV, Alcoholism, and their Comorbidity.
 18. WOODS, S Increased Cognitive Load Exacerbates HIV-1-Associated Time-Based Prospective Memory Impairment.
 19. SCOTT, JC Recency Effects in HIV-Associated Dementia Are Characterized by Deficient Encoding.
 20. MELROSE, R Reasoning Ability and Fronto-striatal Circuitry in HIV.
 21. MORGAN, EE Development and Predictive Validity of Demographically-Adjusted Normative Data for the HIV Dementia Scale.
 22. FOLEY, JM Evidence for a Subcortical Pattern of Neuropsychological Deficits in HIV/AIDS Patients?
 23. GONGVATANA, A Semantic Clustering Inefficiency in HIV-Associated Dementia.
 24. WOODS, S Neural Substrates of Mental Rotation in HIV-1 Infection.
 25. GOULD, F The Relationship between Subjective Memory Rating and Performance on Objective Measures in Midlife HIV + Women.
 26. MOORE, DJ Cognitive Impairment Among Individuals with Bipolar Disorder and HIV Infection.
 27. CAREY, CL Prospective Memory Complaints in HIV-1 Infection.
 28. HASSENSTAB, J Ethnic Differences in Risk for HIV-associated Neuropsychological Impairment: Role of Depression and Low Literacy.
 29. RICHARDSON, MA Effects of Depressed Mood or Major Depression on Learning and Memory Among Triply-Diagnosed HIV+ Adults.
 30. BARCLAY, TR Neuropsychological Effects of HIV and Hepatitis C Co-Infection.
 31. COLE, MA The Relationship between Neuropsychiatric Status and Cognition in HIV.

Hydrocephalus

32. KOOP, J Unshunted Compensated Hydrocephalus in Three Preschoolers: Neuropsychological and Clinical Outcomes.
 33. PYYKKONEN, BA Long-Term Cognitive Effects In Shunted Hydrocephalus Patients.
 34. LACY, M Cognitive Outcome as a Function of Surgical Intervention in Hydrocephalus.
 35. URBAN, A Cognitive Functioning Pre and Post Lumbar Drain Trial in Normal Pressure Hydrocephalus.
 36. CLANCY, CA Corticostriatal Impairments and their Neuropsychological Correlates in Children with Spina Bifida and Shunted Hydrocephalus and Healthy Siblings.

Medical Disorders

37. D'APRILE, A Lacunar Lesion Load and Attention in Treated Cardiovascular Disease.
 38. GUNSTAD, J Elevated Body Mass Index and Executive Dysfunction in Healthy Adults.
 39. WILDE, MC Cognitive Impairment in Patients with Traumatic Brain Injury (TBI) and Obstructive Sleep Apnea (OSA).
 40. WHITE, JG Comparison of Cognitive Complaints and Neurocognitive Impairments in Patients with Pulmonary Arterial Hypertension.
 41. LAGEMAN, SK The Long-Term Cognitive and Emotional Impact of Standard Adjuvant Treatments on Women With Early-Stage Breast Cancer.
 42. LUND GELB, S Memory Performance after Kidney Transplantation.
 43. BRANDS, I Cognition and Psychological Distress in Type 2 Diabetes Mellitus.
 44. PARSONS, TD Cognitive Sequelae of Subthalamic Nucleus Deep Brain Stimulation in Parkinson's Disease: A Meta-Analytic Review.
 45. RAMATI, A Oculomotor Abnormalities as an Indication of Cognitive Dysfunction in Electrical Injury Patients.
 46. LARSON, MJ Neurocognitive Sequelae in ARDS Patients With and Without Recall of the Intensive Care Unit.
 47. DICKINSON, M Cognitive Effects of Marimastat in Individuals with Primary Brain Tumors.
 48. KELLY, MP Neuropsychological Functioning in Sandfly Fever Encephalitis.
 49. NYMAN, H Cognitive Function after Off Pump Compared to On Pump Coronary Artery Bypass Grafting.
 50. WHITE, JG Predictors of Cognitive Sequelae in Patients with Pulmonary Arterial Hypertension.
 51. MILLER, A Neurobehavioral and Neurocognitive Changes in Chronic Hepatitis C patients with Interferon Treatment.

52. ZIMMERMAN, ME Normalization of Memory Performance with PAP in Memory-Impaired Patients with Obstructive Sleep Apnea.
 53. BEGLINGER, LJ Neuropsychological and Psychiatric Characteristics of Adults Patients Undergoing Hematopoietic Stem Cell Transplant.
 54. INSCORE, AB Serum Uric Acid and Aggregate Volume of Cerebral White Matter Hyperintensities.
 55. FRUCHTER, DE Neuropsychological Functioning of Women in the First Trimester of Pregnancy.
 56. DEEN, JE Lipid Profile and Cognitive Impairment.
 57. BAUGHMAN, B Neuropsychological Recovery from Medication-induced Hyperthyroidism: A Case Study.
 58. SADEK, JR West Nile Neuroinvasive Disease Produces Mild Chronic Cognitive Deficits.
 59. MILLER, LS Prevalence of sub-optimal effort in Disability applicants.
 60. GROFF, AR The Relationship Between Obesity and Frontal Lobe Functions.
 61. HODGES, E Neuropsychological and Behavioral Functioning in Children Scheduled for Adenotonsillectomy in Comparison to Controls.
 62. ROGERS, H Cognitive Profile of a Sample of Middle-aged Chinese Hypertensive Patients.
 63. ROMAN, DD Effects of Heart Failure on Brain Functioning.

Sex Differences/Sex Hormones

64. CLEMENTS, AM Do sex differences in cerebral laterality exist in children on language and visuospatial tasks?
 65. YI, AS A Methodological Approach to Gender Differences in Cognition Among Older Adults.
 66. HOLLAND, K Sex Differences in Motor Precision as a Function of Cerebral Asymmetry.
 67. YI, AS Gender Differences in Subtypes of Mild Cognitive Impairment.

11:00 AM–12:30 PM

Symposium 10 Cognitive Rehabilitation and Functional Outcomes in Spanish-Speaking TBI Survivors Room:Grand Ballroom Salon G (4th floor)

1. ARANGO, JC Cognitive rehabilitation and functional outcomes in Spanish-speaking TBI survivors.
 2. PONTON, MO Brain injury and the Hispanic patient: A retrospective study.
 3. ALVARO, BO Cognitive predictors of functional outcome in a post acute TBI rehabilitation setting.
 4. ARANGO, JC Functional outcomes after inpatient rehabilitation in Hispanics with TBI.
 5. ECEMENDIA, RJ Cultural factors in brain injury rehabilitation among Hispanics.
 6. LEON-CARRION, J The time course of recovery of TBI cognitive deficits during rehabilitation.

11:00 AM–12:30 PM

Symposium 11 Neuropsychological Impairments as Endophenotypes for ADHD Room:Grand Ballroom Salon F (4th floor)

1. WILLCUTT, EG Twin Study of the Etiology of the Relation Between ADHD and Executive Dysfunction.
 2. NIGG, JT Executive Functioning as an ADHD Endophenotype: Familial and Molecular Genetic Evidence.
 3. DOYLE, AE Familial Aggregation of ADHD Symptom Dimensions and Executive Functions.
 4. DOYLE, AE Neuropsychological Impairments as Endophenotypes for ADHD.
 5. WALDMAN, ID Assessing the Validity and Utility of Executive Function Endophenotypes for ADHD: Associations with the Adrenergic Receptor 2A Gene (ADRA2A).

11:00 AM–12:30 PM

Symposium 12 Language, Executive Function, and Aging Room:Grand Ballroom Salon E (4th floor)

1. CORAL, M Language, Executive Function, and Aging.
 2. GROSSMAN, M The Aging of Language: Clinical and fMRI Data Investigating Executive Resources in Sentence Processing.
 3. CORAL, M Age, Executive Function, and Hearing as Predictors of Comprehension of Syntactically Complex Sentences.
 4. BRADY, C Semantic and Letter Fluency Tasks: Indices of Frontal Systems Function in Older Adults?
 5. WINGFIELD, A Sensory and Cognitive Interactions on Comprehension and Memory for Spoken Language in Older Adulthood: An Effortfulness Hypothesis.

12:30–2:00 PM

Poster Session 9

Executive Abilities/Frontal System

1. SEDO, MA Multicultural Digital Stroop: The Ability to Mobilize Mental Effort Differentiates Normals from Neurological Patients.
 2. CHAN, RC The latent structure of multitasking behaviour: A confirmatory factor analytical study.
 3. CHAN, RC Exploration of Multitasking Behaviour in Patients with Brain Damage.
 4. ANDERSON, E Incentives, Decision-Making, and the Young Adult Prefrontal Cortex.

5. DEROCHE, KK Meta-Analysis of Executive Function and Intelligence Outcomes in Early-Treated Phenylketonuria.
6. LIOSSI, C The relationship between general intellectual ability and performance on ecologically valid executive tests in a severe brain injury sample.
7. SUHR, J Does a Generally Risky Personality Contribute to IGT Impairment in Substance Abuse?
8. WELSH, M Executive Function in High-risk Children and Adolescents Before and After the BrainWise® Intervention Program.
9. VIGIL, DM Dietary Restraint and Working Memory Skills in College Women: The Role of Preoccupying Cognitions.
10. VERDEJO, AJ Multicultural Assessment Of Different Forms Of Response Inhibition And Impulsiveness In Individuals With Substance Dependence.
11. ROSS, TP The Reliability and Validity of the Self-Ordered Pointing Task.
12. GEENEN, E Executive Dysfunction in Children with History of Early Severe Social Deprivation.
13. BRUCE, AS The Relationship between Executive Functioning and Dissociation.
14. KUBU, CS Evaluating Parkinson's Disease: A Comparison of the Frontal Systems Behavior Scale (FrSBe) Family Version and Neuropsychological Measures.
15. BECK, KD Differences in Executive Functioning Using the Behavioral Dyscontrol Scale Among Patients with Probable Alzheimer's Disease and Vascular Related Cognitive Decline.
16. HAJEK, CA Abnormally High Failure Rates on the Frontal Assessment Battery in a VA Population.
17. DRAGO, V Cognitive Festination and Impersistence in Parkinson's Disease.
18. RANDALL, K An Investigation of Components of Inhibition: Childhood to Adult.
19. FRIED, R Impact of Psychometrically-Defined Executive Function Deficits in Adults with ADHD.
20. HOOFIEN, D A Study of the Interactive Relations between Risk-taking, Cognitive-Impulsivity and Valence on the Bechara Gambling Task (BGT).
21. HASEGAWA, A Executive dysfunction among patients with subcortical infarctions.
22. HAYDEN, KE Verbal Fluency Clustering and Switching in Children with Heavy Prenatal Alcohol Exposure.
23. DULAY, MF Neuropsychological Outcome after Bilateral Deep Brain Stimulation Surgery for Advanced Parkinson's disease: Base Rates Adjusted for Practice Effects, Test Unreliability, and Natural Disease Progression.
24. YANG, C Temporal Order Memory in Nondemented Patients with Parkinson's Disease.
25. YOCHIM, BP Executive Functioning Mediates the Relationship Between Depression and IADL in Geriatric Rehabilitation Patients.
26. ANDERSON, RE Reliability and Validity of the Progressive Planning Task.
27. MCAULEY, T Developmental Changes in Strategic Learning.
28. MCAULEY, T Strategic Learning in Older Adults.
29. BALDO, J Working Memory and Language Comprehension in Patients with Inferior Parietal and Inferior Frontal Lesions.
30. FLORES LAZARO, J Development of Executive Functions from 6 to 30 years old.
31. EASTVOLD, A The detection of subtle executive deficits with the Behavioral Dyscontrol Scale - Electronic Version in a sample of sex offenders.
32. KODITUWAKKU, PW Learning and Shifting of Strategies during Cognitive Planning: Evidence for Intense and Relaxed Engagement of the Executive System.
33. KETELSEN, K Working Memory and Mental Arithmetic: A Case for Dual Central Executive Resources.
34. PYTLAK, K The Role of Performance-Based and Personality Measures in the Prediction of Alcohol Consumption.
35. KILLGORE, WD Decision-Making is Impaired Following 2-Days of Sleep Deprivation.
36. ROTH, RM The Duality of Action Monitoring in Healthy Adults.
37. BRANDLING-BENNETT, E Strategic Processing in Typically Developing Children.
38. DERIA, S Executive Functioning Impairments in Elderly Patients with Chronic Kidney Disease: Evidence from the Dementia Rating Scale-2.
39. PILARSKI, CR A Comparison of College Drinkers and Non-Drinkers on a Behavioral Measure of Decision-Making.
40. NYBERG, LE The Proposed Interaction of Working Memory and Inhibition.
41. TUNSTALL, JR A New Task to Assess Everyday Planning Ability After Acquired Brain Injury (ABI).
42. DAVIS, A Exploratory Factor Analysis of the Delis-Kaplan Executive Function System Trail Making Test.
43. MABRY, JL Ecological Validity of Executive Function in Children: The Relationship Between the D-KEFS and the BRIEF.
44. DAVIS, A The Internal Consistency of the D-KEFS Color Word Interference Test.
45. MANNING, K The Completions and Corrections Test: A New Measure of Executive Control.
46. QUITANIA, L Neuroanatomical Correlates of Two Different Set-Shifting Paradigms.
47. BARBER, CE The Relationship of CVLT Clustering Scores to Memory and Executive Functions in Elderly African-Americans at Cardiovascular Risk.
48. GRANDE, LJ Executive Function and White Matter Changes in Elderly African-Americans with Cardiovascular Disease.
49. MANNING, K Construct Validity of a Recency Discrimination Task in Healthy Adults.
50. JOHNSON, CP A Novel Performance Test of Working Memory and Inhibitory Control in Children.
51. SCHWARTZ, TP Gender Differences in the Relationship Between Executive Functioning and Intellectual Ability in Healthy Children.
52. BLANKNER, JG Effect of Short-term Memory Load on Activation Associated with Motor Response Inhibition.
53. GIOIA, GA Evidence of Validity based on Exploratory Factor Analysis of the BRIEF-Adult Version.
54. NIKI, C Decision-Making Impairments in Patients with Left Insula Damage.
55. KRAYBILL, M Motor Task Performance Among Individuals With Varying Levels of Executive Abilities: Novelty and Complexity as Important Moderator Variables.
56. BROWN, AB Awareness of Executive Cognitive Deficits in Patients with Parkinson's Disease (PD).
57. MITCHELL, MB The Ecological Validity of Delis-Kaplan Executive Function System (D-KEFS) Tests: Prediction of Functional Status in Older Adults.

58. ISQUITH, PK Mood States as Mediators in Self-Awareness of Executive Functioning.
 59. MOES, EJ The Relationship Between Activation Level (Tonic and Phasic Arousal) and Executive Functioning in School Children from India Ages 9 to 11 years.
 60. BOEKA, A The Iowa Gambling Task as a Measure of Decision Making in Bulimia Nervosa.

12:30–2:00 PM

Poster Symposium 2
Collaborative Research in Pediatric Settings: Experiences from General Clinical Research Centers
Room:Univ. of Mass Exhibit Hall (3rd floor)

1. RADCLIFFE, J Collaborative Research in Pediatric Settings: Experiences from General Clinical Research Centers.
 2. HATTIANGADI, N Human Subjects Issues in Collaborative Pediatric Research.
 3. RIS, D Initiating A Behavioral/Neuropsychology Research Core: Recommendations and Lessons Learned.
 4. MAHONE, M Marketing Pediatric Neuropsychology: The Johns Hopkins GCRC Experience.
 5. GIOIA, G Strategies for Effective Implementation of Services across Multiple Protocols: The GCRC Experience at Children's National Medical Center.

1:15–2:45 PM

Featured Symposium
Translating Cognitive Theory into Rehabilitation Treatment
Room:Grand Ballroom Salon G (4th floor)

1. BAUM, M Linking Behavior and Performance to Everyday Life.
 2. HELM-ESTABROOKS, N "Executive" Skills and Functional Carry-Over of Aphasia Therapy.
 3. CORBETTA, M Attention Systems of the Human Brain and Their Breakdown After Injury.
 4. LEVINE, B Meeting the challenges of executive functioning rehabilitation.

1:15–2:45 PM

Symposium 13
The NIH MRI Study of Normal Brain Development
Room:Grand Ballroom Salon F (4th floor)

1. RUMSEY, JM The NIH MRI Study of Normal Brain Development.
 2. RIVKIN, MJ The NIH MRI Study of Normal Brain Development: Magnetic Resonance Imaging (MRI) Procedures and Findings.
 3. WABER, DP The NIH MRI Study of Normal Brain Development: Sampling Procedures and Behavioral Findings.
 4. ASARNOW, RF The NIH MRI Study of Normal Brain Development: The Relationship Between Developmental Changes in Brain Volume and Verbal Learning and Memory Abilities.
 5. PAUS, T The NIH MRI Study of Normal Brain Development: Brain Behaviour Relationships in the Executive Domain.

1:15–2:45 PM

Symposium 14
Cognitive Reserve, Schooling, Autonomy and Lifespan
Room:Grand Ballroom Salon E (4th floor)

1. DELLATOLAS, G Autonomy, Quality Of Life and Schooling in Relation to Cognitive Deficits in Children with Epilepsy and/or Acquired or Congenital Brain Lesions.
 2. SANTOS, FD Autonomy, Aging and Intellectual Disabilities.
 3. ANDRADE, VM Cognitive Reserve, Health Aging and Brain Damage.
 4. CASTRO-CALDAS, A Learning to read in adulthood.
 5. BUENO, OF Cognitive reserve, Schooling, Autonomy and Lifespan.

2:15–3:45 PM**Poster Session 10****Aging**

1. ZEC, R A Longitudinal Study of Confrontation Naming in the "Normal" Elderly.
 2. ASHENDORF, L Age-related decline on the Wisconsin Card Sorting Test.
 3. VANDERHILL, S Noncognitive Correlates of Mild Cognitive Impairment Subgroups.
 4. COOK, SE Longitudinal Outcomes of Cognitive Impairment in Elderly African Americans: Patterns and Predictors.
 5. CORNEY, P The Impact of Task Difficulty on Age-Associated Differences in Three Domains of Attention.
 6. DONNELL, AJ Validity of the WAIS-III Short-Form for Elderly Clinical Samples.
 7. COOK, SE The Use of the Telephone Interview for Cognitive Status in the Detection of Mild Cognitive Impairment.
 8. READY, R Age Differences in the Structure of Emotion Knowledge: Priming Effects for Valence and Time Frame.
 9. HOLTZER, R Using Neuropsychological Tests to Predict Falls in Normal Aging.
 10. GAGER, PJ Elderly Less Able to Learn from Feedback on an Unfamiliar Memory-Based Mobility Task.

11. HOLTZER, R Extending the Administration Time of the Letter Fluency Test Results in Increased Sensitivity to Cognitive Status in Aging.
12. BREIER, JI Neurophysiological Changes in Receptive Language Cortex with Age Using Magnetoencephalography.
13. ECONOMOU, A Intraindividual Variability in Memory Test Performance in Middle Aged and Elderly Persons from the Community.
14. WOO, E Cognitive Support for Verbal Episodic Memory in Older Adults.
15. JONSDOTTIR, MK Retrospective Time Estimation in an Elderly Cohort: Relationship to Cognitive Functioning.
16. WIEDERKEHR, S Impact of Vascular Risk Factors on Cognition in the Elderly: A Cross-Sectional Analysis of the Data from the Canadian Study of Health and Aging.
17. ZIMMERMAN, ME Region and Age-Specific Relationships between Frontal Lobe Gray Matter Volume and Cognitive Function across the Healthy Adult Lifespan.
18. MITCHELL, L Cognitive Aging and the Role of Processing Speed.
19. MILLER, LS The Georgia Centenarian Study: Functional capacity in the Oldest Old.
20. WEHLING, E Subjective memory complaints and neuropsychological test performance in middle aged and older adults at genetic risk for Alzheimer's disease.
21. WOOD, S Older Adults are Adaptive Decision Makers: Evidence from the Iowa Gambling Task.
22. BUTTARO, M Using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to Identify Mild Cognitive Impairment.
23. KAUP, AR Poor Decision-Making Among Older Adults is Related to Elevated Levels of Neuroticism.
24. DOTSON, V Aging and Cognitive Control Dysfunction: An ERP Study.
25. GALE, SD White Matter Volume in the Elderly with a Remote History of Traumatic Brain Injury: A Voxel-Based Morphometry Study.
26. LOWE, CG The Relationship Between Subclinical Hypothyroidism, Mood and Cognitive Functioning.
27. PANNU, JK Tip-of-the-Tongue States in Aging: An Event-Related fMRI Study.
28. THORNTON, GM Category-Letter Fluency Discrepancies in Healthy Older Adults: Normative Data and Reliability.
29. FOLEY, J Gender Discrepancies in Processing Speed Across the Lifespan.
30. DAMON, J Predictors of Cognitive Decline in MCI Patients.
31. JITTLER, S Perceived Stress, Cognition and Steroid Hormones in Elderly Men.
32. GUTCHESS, A Aging and the Self-Reference Effect in Long-term Memory.
33. PELOQUIN, AA Cognitive Predictors for Independent Functional Abilities in High-Risk Older Adults.

Learning Disabilities/ADHD

34. FINE, JG Smaller Corpus Callosum Midbody in Poorer Readers within Families.
35. NEWMAN, AC The Role of a Nonverbal Learning Disability in Understanding Psychiatric Illness: A Case Study.
36. DIRKS, E Cognitive and neuropsychological characteristics of children with combined reading and arithmetic disabilities.
37. PROCTOR-WEBER, ZE Neuropsychological Approach for Classifying Adults Seeking Post Secondary Accommodations.
38. HARDER, L The Relation Between Executive Functions and Written Expression in College Students with Attention Deficit Hyperactivity Disorder.
39. STROTHER, DM AD/HD and Dyslexia: A Case Study of Monozygotic/Dizygotic Triplets.
40. WEYANDT, L Neuropsychological Functioning of College Students with ADHD.
41. BARNARD, HD Is "Pure" ADD Etiologically Distinct from ADHD-Combined Type? A Behavioral Genetic Analysis.
42. KIBBY, MY A Morphological Test of the Cerebellar Deficit Hypothesis: Possible Subtypes?
43. SCHWARTZ, DD Time Perception and Time Use in AD/HD: The Role of Interest.
44. MATEREK, AD Analytical Elements of Syntactic Processing in Older Children.
45. WILLIAMS, BR Inconsistency in Reaction Time Performance in Children with Attention Deficit Hyperactivity Disorder (ADHD).
46. MILLER, JA Neuropsychology and the Diagnosis of Learning Disabilities Under IDEA 2004.
47. GETZ, GE Behavior Rating Inventory of Executive Function in ADHD vs. Adjustment Disorder.
48. MARTEL, MM Executive Function, Speed, and ADHD Symptom Domains in Boys and Girls.
49. LAW, RT Performance on a Word Selective Reminding Memory Test in ADHD Subtypes.
50. CRAIG, N Diagnosing Adult ADHD: A Comparison of Two Continuous Performance Tests with a Symptom Checklist.
51. SHUNK, AW Comorbidity Subtype Profiles for Attention Deficit Hyperactivity Disorder.
52. MCGRATH, L Children with Comorbid Speech Sound Disorder and Specific Language Impairment Have Increased Rates of Attention-Deficit/Hyperactivity Disorder.
53. EVANS, AS The Validity of the Test of Everyday Attention for Children (TEA-Ch) in Diagnosing ADHD in a Clinical Setting.
54. EVANS, AS Distinguishing Executive Deficits Associated with Reading Disorders and ADHD.
55. DEY, S Relationship between Executive Functions and Reading Problems in Children with ADHD.
56. HELLAND, T Level of Reading and Spelling at Age 6 in Children at Risk of Developing Dyslexia Corresponds with their Language Comprehension Skills at Age 5.
57. BAWDEN, HN Stability of Early Onset Attention-Deficit/Hyperactivity Disorder.
58. KIBBY, MY Analysis of Children's Memory Scale Performance in Children with Dyslexia and/or ADHD.
59. MATUTE, E Phonological Awareness in the Spanish-speaking School Age Child.
60. PRESTON, AS Effects of ADHD Medications on Behavior and Attentional Test Performance.
61. BLASKEY, L Inhibitory Language Deficits in Attention Deficit/Hyperactivity Disorder and Reading Disorder: A Candidate Shared Deficit.
62. PRESTON, AS Relationship Between Attentional Skills and Academic Achievement in ADHD.
63. CIRINO, P Cognitive Arithmetic Differences in Learning Disability Groups and the Role of Behavioral Inattention.

Normal Aging

64. NELSON, AA The Cost of Switching: The Relationship Between Switch Costs and D-KEFS Trails Performance in Healthy Older Adults.
65. GREENAWAY, MC Mayo's Older Americans Normative Studies (MOANS): Factor Analysis of an Expanded Neuropsychological Battery.
66. MORENO-MARTINEZ, F A new set of items for evaluation of living / nonliving dissociations with norms collected from healthy elderly Spanish.
67. YOO, H Age differences in integrating and coordinating visual and verbal information.
68. BRUSHFIELD, AM Differential Effects of Normal Aging on Memory for Odor-Place and Object-Place Associations.
69. VANNORSDALL, TD Relationship of White Matter Hyperintensity Volumes with Cognitive Function in a Community Sample.
70. PAXTON, JL Age Differences in Sustained and Transient Prefrontal Activity During Performance of a Cognitive Control Task.
71. BLOSS, CS The APOE-ε4 Allele is Independently Associated with Lower Educational Attainment in an Elderly Sample.
72. BANGEN, KJ Age-Related Changes in Baseline Hippocampal Perfusion: An Arterial Spin Labeling Study.
73. LUKATELA, K Executive Frontal Lobe Functions in Healthy Elderly with Active Lifestyle.
74. CONNOR, BB Enhancement of Neurocognitive Function in Healthy Older Adults Using a Novel Brain Plasticity Training Program.

2:45–4:15 PM**Symposium 15
Tribute to Edith Kaplan
Room:Suffolk**

1. HEILMAN, K Cognitive Motor Disorders: The Apraxias.
2. BARR, W Historical Influences on the Boston Process Approach.
3. FEIN, D Studies in Autism.
4. MILBERG, W One More Time: Further Adventures in Clinical Applications of Clock Drawing.
5. DELIS, D Contributions of the Process Approach to Neuropsychological Test Development: Lessons Learned Along the Way.

3:15–4:45 PM**Symposium 16
Diffusion Tensor Imaging: Applications to Neuropsychological Research
Room:Grand Ballroom Salon E (4th floor)**

1. MORI, S Principle, Applications, and Limitations of Diffusion Tensor Imaging.
2. RANJEVA, J DTI and FMRI to Study Working Memory in Early Multiple Sclerosis.
3. MOELLER, G Diffusion Tensor Imaging and Behavior in Cocaine Dependence.
4. SULLIVAN, EV White Matter Integrity Quantified with Diffusion Tensor Imaging and Fiber Tracking in Normal Aging and Chronic Alcoholism.
5. BIGLER, ED Diffusion Tensor, Structural and Volumetric MRI Analyses in Autism.
6. WILDE, EA Diffusion Tensor Imaging in Relation to Cognitive Control in Children Following Moderate to Severe Traumatic Brain Injury.

4:00–5:30 PM**Poster Session 11****Child - Acquired Disorder: TBI**

1. FERGUSON SMITH, A The Predictive Contributions of Spatial Planning to Adaptive and Cognitive Functioning in Children Diagnosed With Brain Tumors.
2. FAY, T Behavior Problems Following Mild to Moderate Pediatric Traumatic Brain Injury: Prevalence, Risk Factors, and Correlates at 12 Months Post Injury.
3. WALZ, NC Stability and Correlates of Temperament Following TBI and Orthopedic Injuries in Preschoolers.
4. CONKLIN, HM Performance- and Rater-Based Measures of Working Memory in Children and Adolescents Following Moderate to Severe Traumatic Brain Injury.
5. SHANY-UR, T Does Impaired Understanding of Emotional Deception Entail Impaired Understanding of Cognitive Deception and Knowledge of Social Display Rules in Children with Brain Damage?
6. AYR, LK Dimensions of Post-Concussive Symptoms in Children with Mild Head Injuries.
7. RUMBLE, SM Gender Differences in Verbal Learning and Memory After Traumatic Brain Injury in Children.
8. WRIGHT, SE Post-concussive Symptoms in a Pediatric Population: The Importance of "What We Ask, Whom We Ask, and When We Ask It".
9. WADE, SL Educational Concerns and Services following Pediatric Brain Injury.
10. EVEN, A Cerebello-Frontal Diaschisis as an Explanatory Mechanism for Mutism in a Case of Traumatic Brain Injury.
11. FEARING, MA Morphometric Findings in the Thalamus and Brainstem in Children after Moderate to Severe Traumatic Brain Injury.
12. PRASAD, MR Health Related Quality of Life in Infants and Preschoolers with Traumatic Brain Injury.
13. HAHN, L Attentional Profiles in Pediatric TBI and ADHD: A Pilot Study.

Drug/Toxin-Related Disorders (Incl. Alcoholism)

14. VADHAN, NP Does Smoked Marijuana Disrupt Decision-Making in Experienced Users?
 15. SCHWEINSBURG, AD Adolescent Marijuana Use and fMRI Response During Verbal Learning.
 16. JACOBUS, J Ecstasy use is associated with prospective memory deficits.
 17. REINHARD, MJ Neuropsychological Exploration of Alleged Mold Neurotoxicity.
 18. FORTIER, CB Discrimination and Reversal Associative Learning in Abstinent Chronic Alcoholics.
 19. FEARING, MA Variability in Basal Ganglia Lesions Following Anoxic Brain Injury.
 20. FEARING, MA Neuropsychological and Neuroimaging Outcomes Following Group Carbon Monoxide Poisoning.
 21. FONG, GW Differential Activation of Reward Circuitry During Reward Outcome in Alcoholics Who Subsequently Relapse: A fMRI Investigation.
 22. FULTON, JB Depression, Anxiety, and PTSD Following Mass Carbon Monoxide Poisoning.
 23. HO, M The Performance of Alcoholic Patients on an Impulsive Choice Task: A Quantitative Analysis.
 24. TAYLOR, MJ Microstructural Disruption of White Matter Integrity in Recently-Detoxified Alcoholics Measured with Diffusion Tensor Imaging.
 25. SULLIVAN, K Pesticide Exposure, Health Functioning, and Neuropsychological Outcome in Gulf War I Veterans.
 26. VADHAN, NP Attentional Bias Towards Cocaine-Related Verbal Stimuli in Cocaine-Dependent Individuals: A Comparison of Treatment-Seekers and Treatment-Nonseekers.

Traumatic Brain Injury

27. MOTTRAM, L Cluster Subtypes of the California Verbal Learning Test Childrens Version (CVLTC) after Pediatric Traumatic Brain Injury.
 28. KASHLUBA, S Sensitivity and Specificity of ICD-10 Postconcussion Syndrome After MTBI.
 29. CANTIN, J Evolution of the condition of people with mild traumatic brain injury: A prospective study.
 30. CANTIN, J Relationship between cognitive measures and locomotor performance in complex environments in persons with traumatic brain injury and healthy subjects.
 31. DREER, LE Social Problem-Solving Abilities and Functional Outcomes Following Traumatic Brain Injury.
 32. GOVEROVER, Y What is the Relationship between Functional Performance to Task-Specific and General Self Awareness in Individuals with Brain Injury.
 33. BENGE, J Wisconsin Card Sorting Test: Factor Structure and Relationship to Productivity and Supervision Needs Outcome in Severe Traumatic Brain Injury.
 34. NAKASE-RICHARDSON, R Initial Neuroimaging is Predictive of Confusion at One-Month Post Traumatic Brain Injury.
 35. TANGEN, RB WISC-IV Performance after Pediatric Traumatic Brain Injury.
 36. HART, T Neuropsychological Validation of an Attention Rating Scale for Traumatic Brain Injury.
 37. STOUTER, JH Relationship of Initial CT Scan Data to Early Neuropsychological Assessment in TBI Patients.
 38. WRIGHT, M Investigating the Foundations of Verbal Memory Dysfunction Following High-Velocity Closed-Head Injury: An Application of the Item Specific Deficit Approach to the CVLT.
 39. BARAK, O Hope and its Role as Mediator of Depression Severity Following Traumatic Brain Injury.
 40. LEBOWITZ, BK The Cognitive Effects of Persistent Post-Concussion Syndrome Following Mild Traumatic Brain Injury.
 41. DE BEAUMONT, L N2pc and P300 Alterations in Concussed Athletes.
 42. MCKAY, C Reliability and Validity of the RBANS in a Traumatic Brain Injured Population.
 43. THYSEN, JA The Relationship Between S100B Protein Levels and Effort in Mild Traumatic Brain Injury.
 44. LEE-WILK, T The Relationship Between S100B Protein and Neuropsychological Performance in Mild Traumatic Brain Injury.
 45. BAGLEY, AD Traumatic Brain Injury and Risk-Taking Behavior in a Criminal Population.
 46. BALDWIN, E The Functional Consequences of Lightning Injury: A Case Study.
 47. PATRY, BN "Navigating Your Week": A New Board Game to Measure Prospective Memory in Adults with Traumatic Brain Injury.
 48. GANESALINGAM, K Executive Functions and Social Outcomes in Preschool Children 6 Months Following Traumatic Brain Injury.
 49. TELLIER, A Mild Traumatic Brain Injury: How heterogeneous is it?
 50. SCHEIBEL, RS Brain Activation During Response Inhibition after Moderate to Severe Traumatic Brain Injury.
 51. THERIAULT, M Well-functioning multiple concussions athletes show attenuated P3 component amplitude.
 52. PAGULAYAN, KF Determinants of Patient and Collateral Report of Functional Status After Traumatic Brain Injury.
 53. PARDINI, J Relation Between Symptom Report of Feeling Slowed Down and Cognitive Performance on Neuropsychological Testing.
 54. FAZIO, V A Comparison of the Diagnostic Utility of the SCAT and ImPACT Assessment Systems in Sports Concussion.
 55. DREER, LE Neurocognitive Predictors of Medical Decision-Making Capacity in Patients with Traumatic Brain Injury.
 56. PICA, AA The Utility of Group Administration of Paper and Pencil Neuropsychological Measures in Sports Concussion Baseline Assessment.
 57. REES, L A Measure of Information Processing Speed: the Computerized Tests of Information Processing (CTIP).
 58. SIM, A Normative Study of Post-Concussion Symptoms in High School Athletes and the Effects of Previous Head Injury.

SATURDAY, FEBRUARY 4, 2006**9:00–10:30 AM****Paper 4****Language, Reading, and Dyslexia****Room:Grand Ballroom Salon G (4th floor)**

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|--|---|
| <ol style="list-style-type: none"> 1. FRYE, RE 2. LU, LH 3. PATAEL, SR 4. LUNDERVOLD, AJ 5. WISE, J | <p>Dyslexic Readers Fail to Use Large Scale Neural Network During Phonological Decoding.</p> <p>Differentiating Between Phonological Processing and Rapid Naming Using Structural MRI.</p> <p>Semantic and Phonological Processing in Oral Reading and Oral Naming: A Case Study of Deep Dyslexia.</p> <p>Intellectual, behavioural and emotional function among children with teacher reports of language impairment.</p> <p>Cognitive, Linguistic, and Neuropsychological Skills Associated with Successful Dyslexic Remediation.</p> |
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9:00–10:30 AM**Symposium 17****Multicultural Neuropsychological Assessment: Challenges and New Perspectives****Room:Grand Ballroom Salon F (4th floor)**

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|---|--|
| <ol style="list-style-type: none"> 1. STERN, Y 2. MANLY, JJ 3. OSTROSKY-SOLIS, F 4. MATUTE, E 5. JUDD, T 6. OSTROSKY-SOLIS, F | <p>FMRI Studies of the Neural Representation of Cognitive Reserve.</p> <p>Literacy and incident dementia among ethnically diverse elders.</p> <p>Multicultural Neuropsychological Assessment: Challenges and New Perspectives.</p> <p>A Neuropsychological Battery for Spanish-speaking children.</p> <p>Cross-Cultural Forensic Neuropsychological Assessment.</p> <p>Semantic Verbal Fluency: A Cross-Cultural Analysis.</p> |
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9:00–10:30 AM**Symposium 18****Models of Thyroid Hormone Influence on the Developing Brain****Room:Grand Ballroom Salon E (4th floor)**

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| <ol style="list-style-type: none"> 1. ROVET, JF 2. HINTON, V 3. KOHSTRA, L 4. HEPWORTH, S 5. ROVET, JF | <p>Cognitive Development in Offspring of Hypothyroid Women.</p> <p>Cognitive Development in Children with Transient Hypothyroxinemia of Prematurity.</p> <p>Attention and Motor Problems in Early-Treated Congenital Hypothyroidism.</p> <p>Memory Functioning in Early-Treated Congenital Hypothyroidism.</p> <p>Models of Thyroid Hormone Influence on the Developing Brain.</p> |
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9:00–10:30 AM**Poster Session 12****Emotion**

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| <ol style="list-style-type: none"> 1. MOLLET, CA 2. PERNA, RB 3. WEINER, S 4. WALTERS, R 5. SPRINGER, US 6. JENKINS, RA 7. KOSMIDIS, MH 8. MCKINNON, M 9. CASTILLO-PARRA, C | <p>Differences In Hand Grip Strength as a Function of Hostility, Sex, and Stress.</p> <p>Brain Injury: Incidence of Depression and Suicidality.</p> <p>The Comprehensive Affect Testing System: Effects of Age on Performance.</p> <p>High Hostile Men: Increased Error Rate for Nonverbal Fluency.</p> <p>Differences in psychophysiological reactivity while viewing static vs dynamic facial affect.</p> <p>Factors that Modify the Performance of Right Hemisphere Stroke Patients on the Facial Affect Recognition Test.</p> <p>The Impact of Social Context on Facial Perception in Schizophrenia and Bipolar Disorder.</p> <p>Emotion enhances autobiographical recollection in older adults and patients with frontotemporal dementia.</p> <p>Emotional Information Processing In Major Depression: Increased Sensitivity To Negative Or To Positive Events?</p> |
| <ol style="list-style-type: none"> 10. PROSJE, MA 11. KILLGORE, WD 12. KILLGORE, WD 13. BOROD, JC 14. VAN 'T WOUT, M 15. SELKE, C 16. SANTORELLI, NT 17. JACKSON, DC 18. KIRSCH-DARROW, L 19. HALFACRE, MM | <p>Emotional Intelligence Following Unilateral Temporal Lobectomy or Amygdalohippocampectomy.</p> <p>Neural Correlates of Emotional Intelligence in Adolescent Children.</p> <p>Social Anxiety Predicts Amygdala Activation in Adolescents Viewing Fearful Faces.</p> <p>The Effect of Emotional Valence on Facial Expression across the Adult Life Span.</p> <p>Social-emotional processing in schizophrenia and first-degree relatives of patients.</p> <p>Enhanced Startle Modulation to Contamination Pictures in Obsessive-Compulsive Disorder: A Case Study.</p> <p>Perception of Emotional Cues from Facial Expression and Affective Prosody.</p> <p>Frontal EEG Asymmetry Predicts Instructed and Uninstructed Regulation of Negative Emotion.</p> <p>Case Study: Apathy in the Absence of Cognitive Frontal Lobe Deficits.</p> <p>Emotional and Nonemotional Lexical Expression in Parkinson's Disease.</p> |

Psychopathology/Neuropsychiatry/Other

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| <ol style="list-style-type: none"> 20. FLECK, DE 21. LIOSSI, C 22. MILLER, SK 23. GIULIANO, AJ 24. FRISINA, PG 25. BORGOS, MJ | <p>Cognitive Performance in Bipolar Disorder: A Processing Efficiency Account.</p> <p>Neuropsychological and Neurobehavioural Correlates of Aggression Following Traumatic Brain Injury.</p> <p>A Post-Neurosurgical Case of Phantom Boarder Symptom Without Dementia.</p> <p>Attention and Working Memory in Pediatric Bipolar Disorder.</p> <p>The Efficacy and Side-Effect Profile of Antidepressants in Parkinson's Disease Patients: A Meta-Analysis.</p> <p>Assessment of Practical Judgment in a Mixed Neuropsychiatric Sample Using the TOP-J.</p> |
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26. KOVEN, NS Relationship between Symptom Severity and fMRI Activation During Executive Control in Bipolar I Disorder.
 27. AYCICEGI, A Schizotypal Personality and Executive Dysfunction in a Turkish Sample.
 28. MILLIKIN, C Delusions Following Basal Ganglia Infarcts: A Report of Six Cases.
 29. GROFF, AR Frontal Lobe Function and Eating Pathology: Evidence of a Neurocognitive Risk Factor in the Development of Eating Disorders.
 30. JULIAN, LJ Apathy and Minor Late-life Depression: Neuropsychological and MRI Correlates.

Psychopathology: Anxiety/Stress

31. JOHNSEN, G Learning Strategies in Patients with PTSD.

Psychopathology: Depression

32. JASPER, BW A Longitudinal Study of Psychological Symptoms and Personality Profiles Following Carbon Monoxide Poisoning: Short-form MMPI and SCL-90-R.
 33. BECK, KD Impact of Depression on Performance on the Behavioral Dyscontrol Scale in a Heterogeneous Clinical Population.
 34. BASSO, M Memory Impairment and Performance Effort in Inpatient Depressives.
 35. SEIGNOUREL, PJ Enhanced Explicit Memory for Negative Words in Depression: Efficient Processing or Response Bias?
 36. TORRES, IJ Neuropsychological Functioning in First Episode Bipolar Disorder.
 37. LEFING, S Evaluating the Beck Depression Inventory-II for Use in Individuals with Movement Disorders.
 38. MILLER, KM Patterns of Depressed Mood Symptoms in Parkinson's Disease, Dystonia, and Essential Tremor.
 39. STORY, TJ Distinctions in the Relationship Between Late-Life Depression and Neurocognitive Function.
 40. MARQUART, MS The Effect of Patient Depression on Accuracy of Collateral Informant and Patient Ratings of Executive Functioning.
 41. BHALLA, RK Persistence of Executive and Memory Functioning in Early- vs. Late-Onset Major Depression.

Psychopathology: Schizophrenia

42. LEAVITT, VM Source Localization of Early Auditory Evoked Potentials in Schizophrenia Patients: Evidence for Disruption of the Dorsal Auditory Pathway.
 43. BOCHICCHIO, MJ The Relationship of Neurocognitive Skills, Facial Affect Recognition, and Social Skills in Outpatients with Schizophrenia.
 44. MOELTER, ST Formal Thought Disorder and N400 Repetition Effects During List-Learning in Schizophrenia.
 45. DONINGER, N Neuropsychological Functioning in Neuroleptically Naive Individuals with First-Episode Psychosis.
 46. THYSEN, JA The relationship Between the Brief Assessment of Cognition in Schizophrenia (BACS) and Functional Outcome.
 47. COHEN, H The Longterm Effects of Neuroleptics on Verbal Memory, Attention, and Symptomatology in Schizophrenia.
 48. SITZER, DI Cognition and Driving Status in Schizophrenia Patients.
 49. NAYAK SAVLA, G Rates of Significant Discrepancies Between Crystallized Verbal Knowledge and Other Cognitive Abilities among Schizophrenia Patients.
 50. NEWMAN, P Neuropsychological Correlates of Thalamic D2/D3 Receptor Availability Detected with [F-18] Fallypride Among Neuroleptic Naive Individuals with Schizophrenia and Healthy Controls.
 51. RICHARDSON, R Cognitive Predictors of Functional Outcome in Schizophrenia and Affective Disorders.
 52. HEY, CT Cognitive and Psychiatric Factors Associated with Capacity for Informed Consent in Schizophrenia Research.
 53. FOLEY, JM Nature and Extent of Neuropsychological Compromise in Older Seriously Mentally Ill Populations.
 54. SHAVER, GW Effort and Cognition in Persistently Psychiatrically Disabled Patients.
 55. STONE, WS The Consortium on the Genetics of Schizophrenia (COGS): Preliminary Findings of Learning and Memory on the California Verbal Learning Test, Second Edition (CVLT-II) in Subjects with Schizophrenia, Their Relatives, and Healthy Controls in a Multisite Study.

11:00 AM–12:30 PM

Poster Session 13

Agnosia/Disordered Representations

1. COLE, JR A Case of Reduplicative Paramnesia Associated with Basal Frontal Meningioma.
 2. KEENAN, JP The neurological correlates of the self.
 3. KELLY, KJ Using Transcranial Magnetic Stimulation to Create Disorders of Self.
 4. NIJBOER, T Colour Information and Scene Identification in Colour Agnosia.

Apraxia/Motor Sequencing

5. CHIPMAN, K A Female Advantage in the Accuracy of Gesture Production by Preschool Children.
 6. QUENCER, KB Limb Kinetic Apraxia in Parkinson's Disease.
 7. AHMETI, S Test Re-test Reliability of the Florida Action Recall Test-Revised (FAST-R).
 8. EFROS, DB Assessment Methods for the Diagnosis of Ideomotor Limb Apraxia.

Behavioral Neurology

9. ISOMURA, AJ Cognitive Impairments in Patients with Essential Tremor.

10. ZANDI, T Use of Neurobehavioral Measurements in Management of Behavioral Disturbances of Dementia Residents in Long Term Care.
11. ANTANI, S Social Feature Knowledge in Non-Aphasic Frontotemporal Dementia.
12. HAMILTON, RH A Case of an Acquired Deficit of Audiovisual Integration of Speech.
13. HALPERN, CH Vanishing Small Numbers in Corticobasal Degeneration: Correlation with High-Resolution MRI.
14. LEE, BH The frequency of neglect dyslexia in acute hemispatial neglect patients with and without visual field defect: A stroke population study.
15. BEHL, P Effects of Cholinesterase Inhibitors on Cognition and Function in AD: A Two Year Study Comparing Treated and Untreated Patients in the Sunnybrook Dementia Cohort.

Cognitive Intervention/Rehabilitation

16. YOUSE, KM Treatment for Attentional Deficits and Conversational Discourse Following Closed-Head Injury.
17. WILKINSON, D Identification and Treatment of a Patient with Impaired Face Recognition but Relatively Intact Object Recognition.
18. DAWSON, LK Psychosocial Outcomes One-to-Seven Years After Comprehensive Milieu-Oriented Neurorehabilitation: The Role of Pre-Injury Status.
19. BELFOR, N A Novel Computerized Cognitive Rehabilitation Training Program Improves Learning and Attention in Patients with Mild Cognitive Impairment (MCI).
20. BERNABEU, J Neuropsychological Rehabilitation in Pediatric Oncology: comparison of neuropsychological profiles after intervention.
21. TATE, RL The Evidence Base Of Neuropsychological Rehabilitation: How Good Is The Research?
22. EBERT, PL Multi-faceted Approach to Memory Enhancement in Older Adults.
23. MINOW, JA Use It or Lose It: Can Active Older Adults Benefit from a Novel Brain-Plasticity-Based Computer Training Program?

Dementia Alzheimer's Disease

24. PEKKALA, S Impaired Repetition of Pseudowords and Words of Foreign Origin as an Indication of Phonological Difficulties in Mild Alzheimer's Disease.

Hemispheric Asymmetry/Laterality/Callosal Studies

25. MILLER, VM Emotion vs. Language Processing Across the Hemispheres: Apathy as an Emotional and Semantic Construct.
26. BRODEUR, K Investigating the Clinical Utility of Logical Memory and Visual Reproduction in Differentiating Lesion Laterality.
27. TECHENTIN, C Word Frequency Effects in the Fused Dichotic Words Task.
28. FINE, JG Some Lessons Learned from Comparing MRI Area and Volume Measurements of the Corpus Callosum.
29. LEE, J Age Differences in Hemispheric Asymmetry: An Investigation of Memory Using Dichotic Listening, Tactile, and Visual Hemi-Field Tests.
30. HORNE, NR Increased Prevalence of D-KEFS Cognitive Asymmetries in the Very-Old.
31. PROPPER, RE Frontal EEG Gamma Frequency Coherence Decreases Following Bilateral Visual Stimulation.
32. MUELLER, KO Bimanual Motor Coordination in Individuals with Partial and Complete Callosal Agenesis.
33. CHRISTMAN, S Placebos and Belief Updating: Strong Right-handers Do Not Show Placebo Effects.
34. ROSA, C Self-Voice Recognition: Greater Implication of the Right Hemisphere in a Commissurotomy Patient.
35. ONO, M Theory of Mind in Individuals with Schizophrenia and Agenesis of the Corpus Callosum.
36. BRIDGMAN, MW Facial Emotion Recognition in Primary Agenesis of the Corpus Callosum.
37. RAITER, J The Time Course of Semantic Priming: A Within Subjects Study.
38. SPINA, SM MMPI Profiles in Agenesis of the Corpus Callosum.
39. DEJONG, JE Semantic Priming in Individuals with Callosal Agenesis.
40. ANDREWS, GL Parental Behavioral Observations in Primary ACC: Comparisons to Children with Prenatal Alcohol Exposure and Autism.
41. ANDREWS, GL The Effects of Caffeine on Response Time, Accuracy and P1: A Gender Difference.
42. FRYE, RE Hemispheric Differences in Voice Onset Time Coding.
43. MAHONE, M Right-Left Time Differences on Neuromotor Examination in Children.
44. EISENBERG, P Callosal Functioning in Children with Cleft Palate.

Imaging: Structural

45. BRAMLEY, K Cortical and Subcortical Lacunar Infarctions and Global Cognitive Function Among Treated Cardiovascular Patients.
46. LANCASTER, MA Sex Differences in White Matter Microstructure.
47. KANZ, JE Quantitative MRI hippocampal T2 signal intensity asymmetries correlate with intracarotid amobarbital memory asymmetry scores.
48. ADAIR, JC White Matter Abnormalities Predict Symptom Awareness in Mild Cognitive Impairment (MCI).
49. BECK, CJ Prevalence of White Matter Hyperintensities in a Healthy Normal Population.
50. ROVET, JF Abnormal MRS Profiles in Children with Congenital Hypothyroidism.
51. CORREIA, S Diffusion-Tensor MRI Tractography Methods For Assessing White Matter Health In Normal And Cognitively Impaired Elderly.

52. JAK, AJ Apolipoprotein E Epsilon 4 Allele And Hippocampal Volumes In Non-Demented Older Adults.
 53. IGUCHI, L Dorsolateral Prefrontal Cortex Volume Correlates With Aggression And Impulsivity In Psychiatric Patients.
 54. BRICKMAN, AM Structural MRI Covariance Patterns Associated with Aging and Neuropsychological Function.
 55. DELANO-WOOD, L White Matter Integrity in Nondemented Older Adults At-Risk for Alzheimer's Disease: A Diffusion Tensor Imaging Study.
 56. HILLARY, FG Using Structural and Functional Imaging Data to Quantify Lesion Volume Change in Brain Trauma.

Language: Aphasia

57. BALASUBRAMANIAN, V Oral Reading And Writing In Broca's Aphasia: A Psycholinguistic Case Study.
 58. LERITZ, EC Using Preserved Lexical Access to Estimate Premorbid IQ in Aphasia.
 59. RAYMER, AM Conversational Gesture Use Following Verbal+Gestural Training in Aphasia.
 60. PARKINSON, RB Lesion Characteristics Related to Naming Improvement in Aphasic Stroke Patients: the Role of Anterior Cortex and the Basal Ganglia.
 61. GAIEFSKY, M Self-Perception of Language Performance Following Stroke.
 62. PURDY, M Training Cognitive Flexibility in Aphasia.
 63. MCGREGOR, K An fMRI Investigation of Sentence Generation Attempts by Chronic Non-fluent Aphasics.
 64. MARSHALL, RS Extinction in Aphasia: Deficiencies in Binding or Resource Allocation?
 65. ASH, S Quantitative Analysis of Grammatical and Semantic Production Deficits during Narrative Production in Progressive Nonfluent Aphasia and Semantic Dementia.
 66. CHIOU, H Executive functions and Aphasia: Relationships Between Metacomprehension and Switching Behavior.
 67. CATO, M Lesion Pattern and Rehabilitative Treatment Success in Aphasia: Comparison of Quantitative Voxel-Based vs. Qualitative Lesion Rating Approaches.

Neglect

68. TANAKA, Y Evaluation of Sensory Extinction by EEG Mapping.
 69. WOODS, AJ Cold pressor stimulation improves neglect, magnitude estimation and arousal (P50 amplitude).
 70. JUNCADELLA, M Spatial hemineglect in vision and audition: Evidence for a dissociation.
 71. DRAGO, V Ipsilesional Neglect in Upper Versus Lower Space.
 72. NYS, GM Motor Perseveration in Neglect and Non-neglect Patients in the Acute Phase of Stroke.
 73. HOKENSON, KE Can We Improve Care Plans for Right Hemisphere Stroke and Spatial Neglect?

9:00–10:30 AM

Poster Symposium 3

The Quantified Process Approach - New Directions in Neuropsychological Assessment

Room:Univ. of Mass Exhibit Hall (3rd floor)

1. WOODARD, JL Memory Performance Indexes for the Rey Auditory Verbal Learning Test: Clinical Application of the Quantified Process Approach.
 2. SHEAR, PK Quantitative Aspects of Block Design Performance.
 3. LIBON, DJ Executive Control and Working Memory Deficits in Cortical and Subcortical Dementia: A Process Neuropsychological Analysis.
 4. POREH, AM The Quantified Process Approach - Providing Higher Resolution to Existing Neuropsychological Tests.

11:15 AM–12:45 PM

Paper Session 5

Neuropsychology and Aging

Room:Grand Ballroom Salon G (4th floor)

1. WOODARD, JL Neuropsychological Predictors of Functional Capacity in Centenarians and Octogenarians.
 2. CABO, R Interaction of Literacy and Education on Dementia Risk among Ethnically Diverse Elders.
 3. BURNETT, MM Longitudinal Brain Changes Predict Executive Function Decline in Healthy Aging.
 4. HAN, S Verbal Paired-Associate Learning by APOE Genotype in Non-Demented Older Adults: fMRI Evidence of a Right Hemispheric Compensatory Response.
 5. WOLFE, N The Role of Executive Functions and Education on Memory Performance in the Elderly.
 6. JEFFERSON, AL Subcortical hyperintensities are associated with systemic hypoperfusion in geriatric cardiac patients.

11:15 AM–12:45 PM

Symposium 19

Assessing the Contribution of Vascular Disease in Demented and Non-Demented Patients: The Paradigm of Vascular Load

Room:Grand Ballroom Salon F (4th floor)

1. LIBON, DJ Assessing the Contribution of Vascular Disease in Demented and Non-Demented Patients: The Paradigm of Vascular Load.
 2. LAMAR, M Leukoaraiosis and Working Memory Deficits in Dementia.

3. COHEN, R Vascular Cognitive Impairment: Evidence for relationships among peripheral vascular function, structural brain abnormalities, and cognition.
4. STEBBINS, CT The Changing Nature of Vascular Load Following Ischemic Stroke.
5. NYENHUIS, DL Factors Associated with Post-Ischemic Stroke Cognitive Impairment.
6. PRICE, CC Pre-Operative White Matter Alterations Predicting Post-Operative Cognitive Decline in Healthy Older Adults.

11:15 AM–12:45 PM**Paper Session 6
Executive Abilities in Children
Room:Grand Ballroom Salon E (4th floor)**

1. EWING-COBBS, L Development of Working Memory and Inhibitory Control Processes Following Early Traumatic Brain Injury.
2. CHRIST, S Inhibitory Control in Children with Prefrontal Dysfunction Related to Phenylketonuria.
3. MAHONE, M Evidence That Response Inhibition is a Primary Deficit in ADHD.
4. BERWID, OG Differential Post-Error Reaction Time Slowing in Preschool Children with and without Hyperactivity/Inattention.

Abstracts Presented at the Thirty-Fourth Annual International Neuropsychological Society Conference

February 1-4, 2006
Boston, Massachusetts, USA

WEDNESDAY AFTERNOON, FEBRUARY 1, 2006

Symposium 1

4:45–6:15 p.m.

Experience-dependent Learning and Neural Plasticity: Implications for Rehabilitation Theory and Practice

Host: Bryan Kolb

C. MATEER, N. VIRJI-BABUL, J. GLOVER & B. SMITH. **Constraint Induced Motor Therapy: Results of contextualized constraint-based treatment for children with developmental hemiplegia.**

There has been growing interest in the use of constraint-induced motor therapy for adults with hemiplegia, and a few recent investigations using the technique in children and adolescents (Taub 2005). We will describe a study involving 6 children, aged 6-13 with varying degrees of hemiplegia of prenatal origin. The study was designed to incorporate essential features of the CIMT approach including 1) forced use of the hemiplegic limb (through use of a stiff mitt), and 2) intensive massed practice (6 hours per day for two weeks), carried out within an engaging, interactive summer camp environment. Multiple assessments of motor performance, functional motor skills, gait, and child/parent goal attainment were collected in 2 baseline assessments, and at 1 week, 6 and 12 months post treatment. Outcome data varied considerably across the children, but was overall encouraging. Findings will be discussed with particular emphasis on the limitations and challenges inherent in understanding and capturing the effects of treatment on motor performance, including the apparent changes in motor adaptation and accommodation. We will also discuss important parameters to consider in implementing CIMT in general, including the role of shaping, management of tone, and the potential negative side effects of the treatment, as well as parameters specific to use of the technique in children, including safety concerns, the child's motor awareness and engagement in activities, staffing support requirements, parent education and preparation, and the nature of developmental versus acquired motor disorders. Correspondence: *Leslie J. Gonzalez Rothi, PhD, Brain Rehabilitation Research Center, VA Medical Center, 151a, 1608 SW Archer Rd, Gainesville, FL 32608. E-mail: gonzalj@neurology.ufl.edu*

R.A. LILLIE. **Constraint in Cognitive Rehabilitation: A Useful Endeavor?**

Preliminary evidence suggests that constraint-induced therapies lead to improved functioning in motor and language domains (Taub, 2004; Pulvermuller et al., 2001). Principles of constraint-induced therapies may also prove useful more broadly in the treatment of cognitive dysfunction. We will present findings from two recent studies applying a new memory-training paradigm to individuals with memory dysfunction. Samples include a group of aging adults (N = 12; Jennings & Jacoby, 2003) and individuals with acquired brain injury (N = 10), both of whom evidenced difficulty identifying repeated items on a recognition test. Although based on a model distinct from that of constraint-induced therapies, the training paradigm applies several principles of constraint therapy including 1) intensive, massed practice and 2) constraint of an intact system to allow for focal, forced use in the proposed area of impairment. Implications and limitations of the training model in the context of constraint-induced therapies will be discussed. These include the potential benefit of forced, focal use; the application of a well-supported cognitive model for tailoring treatment; implications of teaching individuals to avoid use of an intact cognitive system; and principles of generalization. At the current stage, we suggest that constraint-induced therapies provide an intriguing treatment model for cognitive dysfunction. Identifying critical factors in constraint-induced therapies (e.g., massed practice vs. constraint) and potential pitfalls of their implementation in treating cognitive dysfunction (e.g., avoidance of intact systems) will be important in future endeavors.

Correspondence: *Leslie J. Gonzalez Rothi, PhD, Brain Rehabilitation Research Center, VA Medical Center, 151a, 1608 SW Archer Rd, Gainesville, FL 32608. E-mail: gonzalj@neurology.ufl.edu*

L.J. GONZALEZ ROTH. **Principles of experience-dependent learning and neural plasticity.**

We stand on the cusp of realizing the full potential of the CNS to recover functionally from injury through experiential and/or physiological interventions. The ability to optimize neuroplastic changes through experience in the recovering mature CNS will require that our behavioral interventions respect treatment principles in four general domains. First, are principles regarding dosing schedule including those related to quantity. For example, is more better than less? What defines quantity (time or amount)? Is there an optimal temporal dispersion of treatment (does it vary according to the nature of the condition?). What is the value of overlearning (does re-exposure beyond achievement impact generalization more than shorter). The second set of principles relates to experience/constraint and includes avoidance of compensation, persistence of attended skill developing activity, and complexity of task

demands. The third set of principles relates to the practicality of treatment activities and includes the salience of the stimuli, relevance of performing the behavior, and the embedding of the target behavior in a context. The final set of principles relates to the role of feedback including the usefulness versus cost of error experience, and the timing and nature of feedback. Each set of principles will be described.

Correspondence: *Leslie J. Gonzalez Rothi, PhD, Brain Rehabilitation Research Center, VA Medical Center, 151a, 160S SW Archer Rd, Gainesville, FL 32608. E-mail: gonzalj@neurology.ufl.edu*

C. MATEER & L.J. GONZALEZ ROTH. Experience-dependent Learning and Neural Plasticity: Implications for Rehabilitation Theory and Practice.

Symposium Description : Growing evidence of experience-dependent neuroplastic changes in the mature CNS, suggests there may be ways to more fully realize the full potential of functional recovery following neurological injury. The animal and human literature suggests that the ability to fully optimize neuroplastic changes through experience in the recovering CNS will require that our behavioral interventions attend to the amount/intensity of treatment and to the timing/scheduling of treatment. Recently described techniques, particularly those involving constraint-based approaches include persistence, avoidance of reliance on compensation, and behavioral/contextual shaping have a basis in principles of experience dependent learning. In this symposium, we will highlight these principles from the perspective of both nonhuman and human work, and then illustrate the use and clinical effectiveness of techniques designed to enhance experience-dependent learning in several domains. The benefits, challenges, and risks of rehabilitation activities couched in experience-dependent learning paradigms, including constraint-based approaches, will be presented in motor, language, and memory domains.

Correspondence: *Leslie J. Gonzalez Rothi, PhD, Brain Rehabilitation Research Center, VA Medical Center, 151a, 160S SW Archer Rd, Gainesville, FL 32608. E-mail: gonzalj@neurology.ufl.edu*

M. LYNN, C. OCHIPA, A. HOLLAND & L. ROTH. Constraint Induced Language Therapy: A Preliminary Study of the Contributions of Practice Schedule and Constraint.

Recent investigations (Pulvermuller et al. 2001, Meinzer et al., 2005) have suggested that individuals with chronic aphasia can benefit from language therapy designed to include attributes of Constraint Therapies (Taub, 2000) such as the principles of: 1) massed practice in an enriched environment, 2) constraint of other communication modalities through the application of visual barriers, and 3) forced use of language in a supported environment. We will describe preliminary results of a study designed to contrast treatment intensity versus use-dependent learning in an effort to determine the relative impact of these principles on outcome. To address the impact of treatment intensity, dyads of patients with chronic aphasia were treated during forced-speech interactions either intensively (three hours a day, four days a week for three consecutive weeks; N = 10) or distributed (1.5 hours a day, twice a week for three months; N = 4). To address the impact of use-dependent learning, these two groups were compared to other dyads who were treated under the same two treatment schedules using a modified PACE approach which encouraged all modes of communication including drawing, writing, gesturing, pointing, etc (N = 10). Pre and post treatment testing and daily probe measures were obtained. Preliminary analyses suggested that both constraint and intensity contribute to positive treatment effects. This study was supported by the VA RR&D.

Correspondence: *Leslie J. Gonzalez Rothi, PhD, Brain Rehabilitation Research Center, VA Medical Center, 151a, 160S SW Archer Rd, Gainesville, FL 32608. E-mail: gonzalj@neurology.ufl.edu*

Symposium 2

4:45–6:15 p.m.

ADHD: Beyond Executive Dysfunction

J.M. RUMSEY, F. CASTELLANOS, J.N. EPSTEIN, J.T. NIGG & E.J. SONUGA-BARKE. ADHD: Beyond Executive Dysfunction.

Symposium Description : Executive function deficits, e.g., in response inhibition, working memory, planning, are well established contributors to impairments associated with ADHD and appropriate targets of treatment. Neurobiological studies have begun to map the fronto-striatal-cerebellar circuitry affected in this disorder, the influence of catecholamines on affected prefrontal cortical functions, and the impact of current pharmacologic treatments on these substrates. Nonetheless, ADHD is multifactorial and our understanding of developmental influences on ADHD remains incomplete, perhaps contributing to a disconnect between high rates of effective short-term stimulant responses and the frequent failure of stimulant treatments to alter long-term course. This symposium will look beyond executive dysfunction to explore the impact of additional motivational, state regulation and temperamental factors in ADHD with an eye toward refining our concepts of ADHD in order to inform improved assessment and treatment. Dr. Castellanos will discuss the influence of reward sensitivity/delay aversion on functioning in ADHD. Dr. Epstein will describe recent developments in understanding performance inconsistency/response variability, one of the most consistent findings in ADHD. Dr. Nigg will report new findings involving the influence of temperament within the ADHD spectrum. Finally, Dr. Sonuga-Barke will discuss and integrate the findings in these domains, emphasizing multiple developmental pathways to ADHD with significant implications for research and clinical practice.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsey@mail.nih.gov*

F. CASTELLANOS, A. SCHERES, M.P. MILHAM & B. KNUTSON. Dissecting Rewards in Attention-Deficit/Hyperactivity Disorder (ADHD): A Preliminary fMRI Study of Salience.

Although dysfunction of the mesolimbic reward circuitry has been proposed to underlie Attention-Deficit/Hyperactivity Disorder (ADHD), this hypothesis has not been directly tested. We conducted BOLD fMRI in 11 adolescents with ADHD (all scanned without medications) and 11 age- and sex-matched comparison subjects during a monetary reward anticipation task previously shown to activate the ventral striatum in healthy adults and adolescents by Knutson and colleagues. Using random effects analyses, we found significantly reduced ventral striatal activation in ADHD compared to controls. Moreover, ventral striatal activation was negatively and significantly correlated with levels of hyperactivity/impulsivity in the sample as a whole (including participants with ADHD and controls). These findings suggest that hypo-responsiveness of the ventral striatum during reward anticipation is associated with ADHD and that there is a negative association between ventral striatal activation during reward anticipation and hyperactive/impulsive behavior that extends to behavior in the non-clinical range. Results will be discussed in light of another neuropsychological study of temporal discounting also designed to examine reward-related responding in ADHD.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsey@mail.nih.gov*

J.N. EPSTEIN, A.S. HERVEY, S.T. TONEV, C. CONNERS, J. CURRY, L. ARNOLD, H.B. ABIKOFF, G. ELLIOTT & S. MTA COOPERATIVE. Response Variability in Children with ADHD.

Performance inconsistency is a commonly noted behavioral characteristic of children with Attention Deficit Hyperactivity Disorder (ADHD). On neuropsychological tests, children with ADHD consistently display increased variability, often measured by variance in reaction times (RT). Several authors have argued that performance variability is the essence of ADHD and emphasize the roles that temporal and contextual variables play in this inconsistency. Recently, several investigators have used advanced statistical methods to more specifically identify patterns of response variability. Leth-Stenson et al. (2000) utilized ex-Gaussian indicators and Castellanos et al. (2005) used fast Fourier Transform analyses to demonstrate that children with ADHD have frequent attentional lapses and that RT variability appears to occur at predicted temporal intervals throughout a task. Using data from the Multimodal Treatment Study of ADHD (MTA) and similar statistical methods, reaction time variability was examined for this report. Children with ADHD were observed to have more positive skew (i.e., ex-Gaussian tau) in their RT distributions than matched normal controls. Also, after this positive skew was controlled, ADHD children demonstrated faster RT than normal controls. Between-group RT differences dissipated when inter-stimulus-intervals were decreased. In addition, stimulant medications normalized performance across all RT variables. While several theories can be utilized to explain the current pattern of results, the results are interpreted in the context of the Cognitive-Energetic Model of ADHD. This model combines theories of executive functioning, information processing, and state regulation to explain ADHD-related behavioral and neuropsychological deficits.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 61S0, Rockville, MD 20852. E-mail: jrumsy@mail.nih.gov*

J.T. NIGG & M.M. MARTEL. Temperament and Executive Functioning: Joint Clues About Multiple Inputs to ADHD.

The etiology of ADHD may include distinct streams of influence on symptoms of (1) inattention/disorganization and (b) hyperactivity/impulsivity. In addition to evaluating this hypothesis with neuropsychological measures, it is useful to evaluate it in relation to temperament-related traits. It is important that these measures be examined together, because neuropsychological and temperament measures may represent partially related functional domains involving closely related neurocircuitry. In the current study, 266 children (174 boys), from 6-12 years old ($M=9.48$, $SD=1.18$), completed a neuropsychological battery; the primary parent completed the California Q-Sort, from which scores were derived for key traits following Eisenberg et al. (1996). The sample included children with ADHD Combined type ($n=103$), Inattentive type ($n=40$), Hyperactive type ($n=2$), NOS or subthreshold ($n=41$), and non-ADHD Controls ($n=80$), thus providing a relatively complete range of symptoms and traits and encompassing the clinical end of the spectrum. Resiliency (ability to adapt flexibly, conceptually related to frontal cortex) was uniquely related to inattention with hyperactivity controlled ($r=-.13$, $p<.05$). Reactive Control (relatively automatic impulsive over- or under-control, conceptually related to limbic systems) was uniquely related to hyperactivity/impulsivity ($r=-.22$, $p<.01$). Resiliency mediated the relationship between child executive function (i.e., time taken to complete Trails B) and residual inattention symptoms ($B=.14$, $p<.10$ at regression Step 1; $B=.06$, $p>.10$ at Step 2). Reactive Control mediated the relationship between speed (i.e., Trails A errors) and residual hyperactive/impulsive symptoms. These data suggest that distinct and multiple temperament influences converge in the development of ADHD and partially overlap with neuropsychological deficits.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 61S0, Rockville, MD 20852. E-mail: jrumsy@mail.nih.gov*

E.J. SONUGA-BARKE. Toward a New Paradigm for the Neuropsychology of ADHD.

In proposing Beyond Executive Function as a model for the neuropsychology of ADHD, the current symposium nicely catches the mood of the moment. The notion that ADHD can be understood as the result of a shared core deficit in inhibitory-based executive functions, dominant over the past decade, is reconsidered in light of new evidence: While many children with ADHD perform poorly on tests of executive function, the interpretation of this fact is complicated by the findings that (i) the executive functions of many children with ADHD appear to be intact; (ii) many children without ADHD (or other disorders) show deficits in executive function; (iii) where dysfunction is present, the specific executive function affected varies from child to child and (iv) executive dysfunction in ADHD appears to be conditional on contextual and state-related factors. These factors lead us to consider a new paradigm wherein other neuropsychological candidates are considered as playing a causative role in the complex and heterogeneous disorder of ADHD. The three talks in this symposium beautifully illustrate the potential of three such candidates—reward, reactive/resilient personality and cognitive energetic factors. This paradigm incorporates new evidence concerning multiple, over-lapping deficits that mediate different pathways to the clinical phenomenon. The basis of this new paradigm will be described and its implications for research and clinical practice discussed.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 61S0, Rockville, MD 20852. E-mail: jrumsy@mail.nih.gov*

Symposium 3

4:45–6:15 p.m.

Rethinking Post-Concussion Syndrome: Lessons Learned from Sports Concussion Research

M. MCCREA, W. BARR, M. MCCREA, C. RANDOLPH, T. HAMMEKE & S. MILLIS. Rethinking Post-Concussion Syndrome: Lessons Learned from Sports Concussion Research.

Symposium Description : How long should it take to recover after an uncomplicated mild traumatic brain injury (MTBI)? Neuropsychologists in a variety of clinical and forensic settings are frequently confronted with this question. Existing literature indicates that most individuals reach a full recovery within three months of a MTBI, but a small percentage of patients continue to report ongoing symptoms commonly characterized as Post-Concussion Syndrome (PCS). For this subgroup with persistent symptoms, neuropsychologists are frequently assigned the role of objectively measuring the cognitive and symptomatic effects of injury, and differentiating to what extent neurological or psychological factors are contributing to the patient's persistent symptoms. This clinical determination is complicated by a debate over the expected course of recovery after MTBI, as well as a lack of prospective, controlled studies on the natural history of MTBI. Neuropsychologists now recognize that a sports concussion assessment model not only provides direct benefit to the sports medicine community, but also creates a unique laboratory to advance our scientific understanding of the effects and recovery after MTBI. This symposium will provide an overview of the methodological advantages inherent to the sports concussion research model, and present data from several large-scale, prospective studies

applying standardized methods, neuropsychological testing, and functional magnetic resonance imaging (fMRI) to investigate the natural history of MTBI. Methodological issues related to measuring MTBI recovery on neuropsychological testing will also be discussed. Collectively, the symposium is intended to apply recent research on MTBI recovery to gain new clinical perspective on the diagnosis and treatment of PCS.

Correspondence: *Michael McCrea, PhD, ABPP, Neuroscience Center, Waukesha Memorial Hospital, 721 American Avenue, Suite 501, Waukesha, WI 53188. E-mail: michael.mccrea@phci.org*

W. BARR. The Sports Concussion Model: Methodological Advantages for the Study of MTBI.

Examining the effects of concussion in athletes provides a unique opportunity to conduct prospective investigational research on the nature and course of mild traumatic brain injury (MTBI). We will provide epidemiologic data on concussion in sport and examine how it compares to what is generally observed in non-athlete samples. There will be a discussion of the methodological advantages gained by obtaining baseline information on large numbers of athletes "at-risk" for subsequent injury. This presentation will critically review the current guidelines for diagnosing and managing MTBI in athlete and non-athlete samples, and demonstrate how the clinical utility of these guidelines can be assessed empirically through the study of athletes. Similarities and differences between MTBI in athletes and non-athletes will be presented through clinical case vignettes. The discussion will include information regarding the critical mechanisms underlying MTBI, as determined by results from biomechanical studies of athlete injuries and neurophysiologic studies using animal models. We will argue that the Sports Laboratory Assessment Model (SLAM), as developed by Barth and colleagues, provides the most effective method that is currently available for understanding the pathological effects of MTBI.

Correspondence: *Michael McCrea, PhD, ABPP, Neuroscience Center, Waukesha Memorial Hospital, 721 American Avenue, Suite 501, Waukesha, WI 53188. E-mail: michael.mccrea@phci.org*

M. MCCREA. Objective Measurement of Acute Effects and Early Recovery After MTBI.

Over the past several years, there has been a movement toward the standardization of objective methods to assess neurocognitive functioning, postural stability, and symptomatology during the acute phase after sport-related concussion. Several brief clinical measures have been designed to move away from a subjective assessment of injury (e.g., gross orientation questions such as "where are we?") to quantifying the acute effects of concussion and establishing an early, objective benchmark against which to track post-injury recovery. This portion of the symposium will provide a review of findings from several large-scale, prospective studies demonstrating the reliability, validity, sensitivity and clinical utility of these measures in the assessment of sport-related concussion. Recent findings on the prospective measurement of acute effects (within minutes of injury) and early recovery course (within hours to days) after concussion will also be presented. As a larger benefit to the neurosciences, application of standardized measures has provided neuropsychologists with a framework to prospectively study the natural history of mild traumatic brain injury from its most acute stage to long-term recovery, and to better understand factors that predict post-concussive recovery. Clinically, findings from prospective studies of the acute effects and early recovery after sport-related concussion have provided the neuropsychologist with a new perspective to consider in the diagnosis and treatment of Post-Concussion Syndrome (PCS).

Correspondence: *Michael McCrea, PhD, ABPP, Neuroscience Center, Waukesha Memorial Hospital, 721 American Avenue, Suite 501, Waukesha, WI 53188. E-mail: michael.mccrea@phci.org*

C. RANDOLPH. Methodological Issues in Measuring MTBI Recovery on Neuropsychological Testing.

Neuropsychological (NP) testing has been utilized for several years as a method for detecting the effects of sport-related concussion, in order to aid in making return-to-play determinations. In addition to standard "pencil-and-paper" tests, computerized NP tests are being commercially marketed for this purpose, for application at the professional, collegiate, high school, and elementary school levels. The purpose of this talk is to review all prospective controlled studies of NP testing in sport-related concussion, in order to illustrate how transient and difficult to detect concussion-related impairments are, even utilizing reliable change methodology in order to compare a concussed player to his/her own baseline. The effects of concussion on NP test performance are often so subtle even during the acute phase of injury (1-3 days post-injury) that they often fail to reach statistical significance in-group comparisons. Although a number of these studies have been hampered by methodological shortcomings, the results suggest that NP testing may not be capable of reliably detecting cognitive impairment in individuals shortly following concussion, even when baseline test data are available. The implications of this for clinical assessments of concussed patients will be discussed.

Correspondence: *Michael McCrea, PhD, ABPP, Neuroscience Center, Waukesha Memorial Hospital, 721 American Avenue, Suite 501, Waukesha, WI 53188. E-mail: michael.mccrea@phci.org*

T. HAMMEKE. Functional Magnetic Resonance Imaging in Sports-Related Concussion.

The speed and extent of recovery after sport-related concussion remain controversial. Functional magnetic resonance imaging (fMRI) is a promising technique for understanding aberrations in the neurophysiological correlates of traumatic brain injury. This presentation will briefly review fMRI methodology, activation protocols used to study mild traumatic brain injury and interpretations of functional datasets derived from them, and provide a summary of an ongoing fMRI project investigating recovery after concussion. In the project, 16 high school football athletes with AAN Grade 2 or 3 concussion underwent a fMRI study within 12-18 hours of injury and again 6 weeks after injury. Measures of post-concussive symptoms, neuropsychological function and postural steadiness were completed at the same intervals. Teammates matched to the injured players on demographics and a preseason neurocognitive measure underwent the same studies. Whole brain echoplanar imaging was conducted while subjects performed the Sternberg memory scanning task. An event-related design and deconvolution analysis was used to investigate fMRI signal changes under different memory-load condition. Sternberg behavioral data found the concussed players to show slower reaction times than control subjects for each memory-load condition in the initial post-injury session that resolved by the 6-week session. Functional imaging results showed a pattern of decreased load-related activation in select brain regions on the day following concussion in injured relative to control players that was not present 6 weeks later, findings that paralleled symptom report and measures of postural steadiness. Alternative methodological and theoretical explanations of the findings will be reviewed.

Correspondence: *Michael McCrea, PhD, ABPP, Neuroscience Center, Waukesha Memorial Hospital, 721 American Avenue, Suite 501, Waukesha, WI 53188. E-mail: michael.mccrea@phci.org*

A.M. POREH, P.K. SHEAR, J.L. WOODARD, D.J. LIBON, E. KAPLAN & A.M. POREH. The Quantified Process Approach - New Directions in Neuropsychological Assessment.

Symposium Description : During the past decade a growing number of studies have attempted to quantify the clinical observations outlined by the proponents of the Boston Process Approach. This paradigmatic shift, from qualitative

analysis of test taking behavior to its quantification, follows several methodologies, which have been collectively termed 'The Quantified Process Approach' (QPA). The chair of the symposium will briefly introduce the three main methodologies that have been utilized to quantify clinicians' observations using standard psychometric procedures. Paula Shear will outline the application of the composition approach to the analysis of the Block Design test. John Woodward will describe the application of the decomposition approach to the analysis of the Rey Auditory Verbal Learning Test. David Libon will present on the application of the QPA to the analysis of errors on neuropsychological measures of executive control and working memory. Amir Poreh will then present computerized software applications of the QPA which will help clinical researchers to integrate the QPA into their day to day practice. Finally, the discussant, Edith Kaplan, will summarize the symposium and present her unique insights into this emerging field.

Correspondence: *Amir M. Poreh, Ph.D., Psychology, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115. E-mail: aporeh@yahoo.com*

Poster Session 1/4:45–6:15 p.m.

Attention

P.S. FOSTER, G.P. CRUCIAN, D.W. BURKS, J. MIELKE, B.V. SHENAL, R.D. RHODES, L.J. GRANDE, K. WOMACK, A. RILEY & K.M. HEILMAN. The Effects of Movement Direction and Hemispace on Estimates of Distance Traveled.

Objective: The degree of attention directed to a stimulus can alter the perception of the magnitude of this stimulus.

Participants and Methods : To learn if normal right-handed subjects are influenced by the right-left direction or hemispace of movements we had blindfolded participants estimate the distance their arm was moved. Since we wanted subjects to estimate the distance traveled rather than compute the distance between the start and finish points, the subjects' arms were passively moved in sinusoidal trajectories at a constant speed.

Results : Subjects estimated leftward movements as longer than rightward movements, but there was no effect of hemispace.

Conclusions : Subjects might have over-estimated the distance associated with leftward versus rightward movement because right-handed people prefer to move their hand in a rightward direction and have learned to read and write using rightward movements. Thus, leftward movements might be more attended than rightward movements because they are novel and this enhanced directional attention might have influenced estimates of magnitude (distance). Alternatively, in right-handed people the right hemisphere is dominant for attention and thus, leftward movement might have activated the right hemisphere more than rightward movements.

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, D.G. WEBSTER, V. DRAGO, G.P. CRUCIAN & K.M. HEILMAN. Lateral and vertical attentional biases in normal individuals.

Objective: Using a line bisection task investigators have demonstrated that neurologically intact individuals attend more to left ('pseudoneglect') space and upper space. We sought to learn if normal subjects also have a preference for working in this portion of space. Thus, we used a paradigm involving the unrestrained placement of pegs on a board. We predicted that individuals would preferentially place the pegs in the upper left quadrant of the board.

Participants and Methods : A total of 124 undergraduates were asked to place 8 pegs on a 24" x 24" board. No instructions were provided regarding how or where to place the pegs. Dependent measures consisted of measuring the distance from the center of the board to the peg placed at the extreme right and left as well as the upper and lower extremes.

Results : The results indicated that the overall pattern of peg placement was significantly more to the left ($M = 28.15$ mm) than to the right ($M = 23.5$ mm) and upward ($M = 20.67$) than downward (16.94).

Conclusions : These results demonstrate that normal individuals have a propensity to work in the upper-left space. Further research will have to determine if this preference is learned or biologically endowed.

Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 8001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

V. DRAGO, G.P. CRUCIAN, D.B. FITZGERALD, T. MIZUNO, F. PISANI, Y. JEONG, G.R. FINNEY & K.M. HEILMAN. Spatial Attentional Bias in Normal People: Object or Viewer-Centered.

Objective: Normal subjects often have a subtle leftward spatial bias when performing the horizontal line bisection task ("pseudoneglect"), and an upward or distal bias with vertical and radial bisections. To help explain these systematic biases, it has been proposed that normal people are either biased to the top of the lines (object centered hypothesis) or to distal peripersonal space (viewer-centered and retinotopic hypotheses). The primary aim of this study is to test these alternative hypotheses.

Participants and Methods : We had 20 normal subjects bisect radial lines, placed in a clockwise distribution in the transverse plane, below eye level. This paradigm also allows us to compare the strength of the hemispheric-hemispace laterality bias to the radial bias.

Results : Our results demonstrate that the perception of the midpoint progressively changes as a function of the body-centered orientation of the lines with subjects demonstrating a progressively greater distal bias as they approached the 90 degree from horizontal coronal plane condition.

Conclusions : These results provide support for the peripersonal-retinotopic theory for this distal bias. In addition, our results demonstrate that in normal subjects this radial distal bias is greater than the lateral bias induced by having the lines in right or left hemispace.

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

P.A. TAYLOR-COOKE, J.H. BANOS & M.S. MENNEMEIER. Attentional Asymmetries may have Roots in the Visual Processing Pathways.

Objective: Attentional processes related to visual search (detection) and image fading (habituation) are asymmetric and "better" on the horizontal than vertical visual meridian. Visual search and image fading both depend on unique properties of the parvocellular processing system. We hypothesized that parvocellular processing is asymmetric with regard to cardinal visual meridians and that performance on tasks sensitive to parvocellular processing would converge with asymmetries observed on attentional habituation tasks like image fading.

Participants and Methods : Sixteen healthy participants were recruited (age range = 22 to 77, $M = 40.12$). Image fading was assessed for stationary targets located in peripheral vision during sustained fixation on a central target (i.e., Troxler Fading: TF). Parvocellular (PC) processing was similarly assessed using texture detection and pattern discrimination tasks. Magnocellular (MC) processing was assessed using motion detection and flicker fusion tasks. Scores on each task was standardized within subjects. Regression analysis was used to investigate if performance on PC and MC tasks was predictive of that on TF.

Results : While visual inspection reveals asymmetries in TF, PC and MC tasks, only asymmetries in texture discrimination (a PC task) were predictive of those in TF [$F(1, 12)=4.15, p=.06$]. No other task approached statistical significance.

Conclusions : This is the first evidence to our knowledge that PC processing is asymmetric across the retina. Further, asymmetries in PC (or MC) processing may contribute to “attentional” asymmetries depending on the processing requirements of tasks, like visual search or image fading.

Correspondence: *Patricia A. Taylor-Cooke, M.A., Department of Psychology, University of Alabama at Birmingham, 671 Idlewild Cir., Birmingham, AL 35205. E-mail: pataylor@uab.edu*

K. GOULD, M. LISS, B. AUSTIN, T. COYLE, L. PENDLETON, M. LEPAGE & J. MAILLOUX. Exploring the two factors of sensory processing sensitivity: Are there physiological or attentional differences?

Objective: Research has indicated that individuals may differ in sensory processing sensitivity. Individuals identified as “Highly Sensitive,” as measured by the Highly Sensitive Person Scale (HSPS, Aron and Aron, 1997) are characterized by being sensitive to subtle stimuli, easily over stimulated and more emotionally in tune with others. Recent research has suggested that sensory processing sensitivity may involve two constructs: being overwhelmed and being enriched by sensory stimuli (Liss and Mailloux, 2004) but it is unclear whether these differences are physiological or attentional.

Participants and Methods : In this study, two hundred fifteen individuals were administered the HSPS and a two factor solution (overwhelmed and enriched) was replicated. Seventy-three individuals scoring in the top or bottom thirds on these factors were brought back and given a variety of measures including touch test fibers and JP domes (to measure threshold and two point discrimination), the MSCEIT (a measure of emotional intelligence), a measure of overfocusing, the brief test of attention, digit span, as well as measures of depression, anxiety, and personality style.

Results : Individuals who reported being overwhelmed by their sensory processing sensitivity were more likely to over-focus, be unable to identify feelings as well as experience more depression and anxiety. There was no difference in emotional intelligence or either of the physiological measures.

Conclusions : This suggests that the difference between being overwhelmed and being enriched by sensory stimulation may be cognitive rather than physiological. Some highly sensitive people may overly focus on their sensations and thus become overwhelmed. However, more research into physiological differences is merited.

Correspondence: *Miriam Liss, Ph.D., University of Mary Washington, Department of Psychology, 1301 College Avenue, Fredericksburg, VA 22401. E-mail: mliss@umw.edu*

E. GOMEZ-PEREZ & F. OSTROSKY-SOLIS. The Development of Attention and Memory. A Cross-Sectional Life-Span Study.

Objective: Cognitive developmental research in few cases has encompassed a life-span analysis of diverse attention or memory subfunctions within a single project. These limitations restrict the comprehension of development as a process of diverse change patterns. The purpose of this study was to carry out a cross-sectional study about steadiness and change, related to age, in a battery to evaluate attention and memory.

Participants and Methods : A sample of 240 individuals, divided according to eight age groups (6-7, 8-11, 12-15, 16-30, 31-45, 46-55,

56-65 y 66-75 years) participated in this study. Selective attention, sustained attention, attentional control, memory span, working memory, auditory-verbal and visuospatial-non verbal encoding and recall were evaluated. Age effects were examined using analysis of variance, contrast analysis and post hoc comparisons.

Results : During childhood development of inhibitory function preceded development of selective attention, development of memory span preceded development of working memory. During aging a detriment of episodic memory and a relative steadiness of semantic information were observed. Attention had a long development during childhood and a relative steadiness during aging. Memory reached mature levels at a young age and showed a gradual and long detriment during aging.

Conclusions : Life-span analysis allowed to describe different developmental sequences for the evaluated abilities. Feasible relations between cognitive and cerebral development are discussed.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

Electrophysiology/EEG/ERP

M. KIM & J. KWON. ERP study of response inhibition in patients with obsessive-compulsive disorder.

Objective: In this study, we have attempted to determine the electrophysiological correlates of response inhibition in patients with obsessive-compulsive disorder (OCD).

Participants and Methods : In order to evaluate the response inhibition ability, we measured the N2 and P3 using Go/NoGo task. 15 OCD patients and 15 normal controls participated in this study. The controls were matched to the OCD patients by age, gender, years of education and IQ.

The N2/P3 amplitudes and latencies in the Go and NoGo conditions were analyzed by ANOVA, repeated measure, mixed design.

Results : The OCD and control groups did not differ in terms of overall error rate, commission and omission error rates.

Both OCD and control groups showed greater and more frontally distributed N2 and P3 amplitudes in the NoGo condition relative to the Go condition. However, OCD patients showed significantly reduced NoGo-N2 ($F(1,28)=4.76, p=.038$) and Go-N2 ($F(1,28)=4.97, p=.034$) amplitudes at frontocentral electrode sites compared to the controls. In addition, NoGo-N2 amplitude was more posteriorly distributed in OCD patients than in the controls. And NoGo-N2 amplitudes and latencies measured at frontocentral sites had negative correlations with obsession score of Y-BOCS. The OCD and control groups did not show any significant differences in terms of NoGo-P3 and Go-P3 amplitudes and latencies.

Conclusions : These findings suggest that OCD patients have an impairment of response inhibition, which is possibly due to the dysfunctions of the inferior prefrontal cortex. The present results also indicate that NoGo-N2 is a better index of response inhibition than NoGo-P3. Furthermore, the inhibitory deficit seems to be related to the pathophysiology of OCD.

Correspondence: *Myung-Sun Kim, Ph.D., Psychology, Sungshin Women's University, Sungbukgu Dongsun 3ga 249-1, Seoul 136-742, South Korea. E-mail: kimms@sungshin.ac.kr*

H. SALMINEN, T.K. GUTTORM, J. HAMALAINEN, K. EKLUND, H. LYYTINEN & P.H. LEPPANEN. Event-Related Potentials Reveal Differences in Pitch Change Processing Between Newborns With and Without Familial Risk for Dyslexia.

Objective: The objective of the present study was to investigate whether newborns at-risk for dyslexia differ from children without such a risk in their responses to frequency change.

Participants and Methods : Event-related brain potentials (ERPs) to sine wave pure tones were measured from 27 newborns with a familial risk for dyslexia and 31 control infants participating in the Jyväskylä Longitudinal Study of Dyslexia. Rarely occurring deviant tones of 1100 Hz (probability 12%) were embedded among repeated standard tones of 1000 Hz in an oddball-sequence with an onset-to-onset interstimulus interval of 425 ms.

Results : Analyses of factor scores extracted from principal component analysis (PCA) revealed significant group differences in frequency change processing, that were confirmed by further analysis of the mean amplitudes of the original averaged ERPs. At the latency of 270-425 ms the responses of the control group to the deviant stimuli were larger and more positive than those of the at-risk group; there were no significant differences between responses to standard and deviant stimuli in the at-risk group.

Conclusions : These results indicate that the cortical electrical activation evoked by frequency change in non-speech tones differs between children with and without dyslexia already shortly after birth. This provides evidence that already shortly after birth at-risk children suffer from a deficiency in auditory processing that is not speech specific but related to sound processing in more general.

Correspondence: *Hanne Salminen, University of Jyväskylä, PL35, Jyväskylän yliopisto, Jyväskylä 40014, Finland. E-mail: hanne.salminen@psyka.jyu.fi*

N.L. PRATT, T. GUTTORM, S. PEITSO, H. LYTTINEN & D. MOLFESE. Short Term Training Impacts the Adult Brain.

Objective: This study examined the impact of a short-term training paradigm on the ability of the adult brain to learn to discriminate a spectrum of back-vowels across different languages.

Participants and Methods : Researchers recorded ERPs to speech sounds from 8 adults in Finland and 8 in the U.S.A. Three stimuli were presented in random intervals for 3 separate blocks. Each block contained a standard stimulus for 80% of the trials and two deviants. Each deviant occurred on 10% of the trials and were either 1 standard deviation (less discriminable) from standard stimulus) or 3 standard deviations away (more discriminable) from standard. Participants heard the first block prior to training, then an initial training session followed by a second block of sounds, and then another training session followed by the final block of sounds.

Results : As predicted, differences occurred around 200 ms between deviant and standard stimuli. Deviant 1 (/o/) differed from deviant 2 (/a2/) only in block 2, after initial training ($t(15)=2.336, p=0.034$). Deviant 1 also differed from the standard stimuli at block 2 ($t(15)=2.311, p=0.035$). Most interestingly, the difficult deviant stimuli (/a2/) differed from the standard stimuli only after both training sessions in block 3 over the left temporal lobe ($t(15)=2.174, p=0.046$). For group differences, an analysis of mismatch negativity peak latencies indicated that Finnish speakers reliably discriminate between speech sounds 50 ms faster than U.S. speakers.

Conclusions : Short-term training impacts auditory discrimination of vowel sounds in the adult brain. Only after training did the brain distinguish between minor variations in the deviant stimuli from standard stimuli. In addition, familiarity with the sounds prior to training appeared to speed up brain processing during training as evidenced by faster latencies in Finnish speakers. Such findings may benefit reading researcher across languages in training children to phonologically discriminate and orthographically map phonemes within the brain.

Correspondence: *Nikki L. Pratt, Bachelor degree, Psychological and Brain Sciences, University of Louisville, 8715 Park Laureate Drive, Apt 111, Louisville, KY 40220. E-mail: nikki.pratt@louisville.edu*

M.C. FERGUSON, S.L. STRAUB, P.J. MOLFESE, A. FONARYOVA KEY & D.L. MOLFESE. Differences in Early Speech Processing in Breast-fed and Bottle-fed Infants.

Objective: Numerous studies report positive effects of breastfeeding on infant development, suggesting that breastfeeding during infancy ben-

efits cognitive processing and developmental outcomes (Quinn, et al., 2001). Amanda and Singh (1994) found that children who were breast-fed for more than 4 months during infancy scored higher on a mental abilities test than children who were bottle-fed for the same period. Ferugsson et al. (1983) reported higher scores among children who were breast-fed during infancy at 3-, 5-, and 7-years of age on measures of intelligence and language development. Recently, polyunsaturated fatty acids (PUFAs) have been identified as having great potential for increasing nutritional benefits. Although commercial businesses released PUFA enriched infant formula and claimed both neurological and cognitive long-term benefits, the importance of PUFA in formula as compared with the documented advantages of breast milk remains unclear.

Participants and Methods : Our study investigated the underlying neurological mechanisms associated with speech processing in groups of breast-fed and bottle-fed infants. Event-related potentials (ERPs) were recorded to speech syllables from 128 electrodes placed over left and right hemisphere sites of twelve 6-month old infants.

Results : A Group x Electrode interaction indicated that the ERPs differed between breast-fed and bottle-fed infants from 40-216 ms, $F(5,50)=4.61, p<.01$, observed power=.959. Post-hoc analyses revealed larger amplitudes over frontal, $t(10)=2.611, p<.05$, and occipital electrode sites, $t(10)=-3.781, p<.01$, for breast-fed infants, while no significant effects were noted for bottle-fed infants. Sensitivity to vowel sounds appeared to occur over left hemisphere sites for bottle-fed infants, $t(10)=-3.463, p<.01$, and right hemisphere sites for breast-fed infants, $t(10)=4.022, p<.01$.

Conclusions : These findings support that PUFA enriched formula may not be equivalent to breastfeeding for early language acquisition and long-term cognitive development.

Correspondence: *Melissa C. Ferguson, MA, Psychological and Brain Sciences, University of Louisville, 232 Crator Drive, Louisville, KY 40229. E-mail: melissa.ferguson@louisville.edu*

D.E. EVERHART, H.A. DEMAREE, S.E. EDWARDS & D.W. HARRISON. The influence of hostility on electroencephalographic activity and memory functioning during an affective memory task.

Objective: The present research was designed to better understand the neural correlates of emotional processing in hostility by determining the impact of the Auditory Affective Verbal Learning Test (AAVL) on cortical arousal, as measured by electroencephalography (EEG), among low- and high-hostile individuals.

Participants and Methods : Using the Cook-Medley Hostility Scale (CMHO), 60 right-handed undergraduates (16 men, 44 women) were classified as either low- or high-hostile. Participants were administered both AAVL lists in a counter-balanced manner, and were asked to recall the affective words over the course of a 5-trial learning paradigm. Of note, the AAVL is comprised of two 15-word lists, one of which contains positive affective words with the other consisting of negative affective words. EEG data were recorded before and following learning trials for subsequent analysis.

Results : As expected, the negative AAVL was found to significantly increase negative mood. Moreover, primacy effects were demonstrated with the negative version of the AAVL whereas recency effects were observed with the positive version of the AAVL. Unexpectedly, high hostile participants demonstrated greater right versus left hemisphere high alpha power. Low hostiles evidenced relatively greater alpha power and low beta power than did high hostile participants.

Conclusions : The data suggest electrophysiological differences between individuals who self-report high versus low levels of hostility. These differences are possibly related to different patterns of learning and memory that are sometimes seen as a function of hostility. The EEG data are discussed in terms of neural systems involved in emotional and memory processing.

Correspondence: *D. E. Everhart, PhD, Psychology, East Carolina University, Dept of Psychology, Rawl Building, Greenville, NC 27855. E-mail: everhardt@mail.ecu.edu*

I. ESTERLIS, R.F. KAPLAN & V.M. HESSELBROCK. The Relationship of the P300 to Cognition in Male Adolescent Sons of Substance Dependent Fathers.

Objective: Lower P300 responses have been identified in several clinical populations, including Alzheimer's disease and substance dependence disorders, and non-clinical populations, such as children with a positive family history of substance dependence. Although the P300 and related cognition both represent measures of brain function, the relationship between physiology and cognition remains unclear. This project was designed to examine the relationship between P300 amplitude and latency and cognitive functioning in this non-clinical population.

Participants and Methods : One hundred and forty-eight adolescent males, who were part of a larger study of the family history of substance dependence, completed a comprehensive battery of neurophysiological, neuropsychological and psychological assessments. P300 amplitude and latency were obtained during an "oddball" paradigm task and Stroop test.

Results : Higher anterior amplitude was related to better performance and longer posterior latency predicted longer response time on a measure of inhibition on the Stroop Test. Lower posterior amplitude was related to shorter response intervals during an incorrect response on the oddball paradigm task. However, P300 amplitude and latency values were typically unrelated to task performance on most measures.

Conclusions : Although attenuated P300 responses and impaired cognition have been demonstrated in adolescents with a positive family history of substance dependence, these two measures of brain function appear largely unrelated.

Correspondence: *Irina Esterlis, Ph.D., Psychiatry, Yale University, 950 Cambell Avenue, Building 5, C346, West Haven, CT 06516. E-mail: irina.esterlis@yale.edu*

J.M. BANKS, A. FONARYOVA KEY, K. PEACH & D.L. MOLFESE. Zygosity-Related Memory Differences For Complex Tone Sounds In 18 Month-Old Infants.

Objective: Electrophysiological studies note changes in how infants discriminate familiar from novel events from birth to 15 months. ERPs of newborn infants discriminate frequent from infrequent tone bursts between 204 ms and 396 ms (Alho, et al., 1990). By 5-months, infants generate a larger N2 to familiar stimuli (Thomas, 1995). By 14-months a large bilaterally distributed frontal N1 occurs to novel stimuli while familiar stimuli elicited a larger bilaterally distributed frontal P2 and larger left temporal and parietal responses (Molfese & Wetzell, 1992). The present study investigated infant discrimination of novel from familiar events at 18 months and examined for the first time the role that zygosity plays in this memory process.

Participants and Methods : Auditory event-related potentials (ERPs) were recorded using a 128-channel high-density array at 18 months of age from 5 pairs of monozygotic (6 males), and 7 pairs of dizygotic twins (7 males) during a habituation-novelty paradigm. Infants listened to 50 presentations of one tone and then heard the familiar tone randomly intermixed 50 times with 50 presentations of a novel tone.

Results : A Repeated measures ANOVA for Condition (3) x Electrode Regions (4) x Hemisphere (2) x Zygosity (2) was conducted on the Latency of the P2 component (range 305ms- 455ms). P2 peaks in only monozygotic twins occurred earlier over left hemisphere temporal regions in response to novel than familiar stimuli [355.2ms vs. 414.4ms, $t(18)=2.329, p<.05$]. However, monozygotic infants displayed faster latencies in response to the new stimuli over left parietal regions [353.43ms vs. 383.43ms, $t(26)=-2.095, p<.05$] while dizygotic twins responded faster to familiar stimuli, [354ms vs. 383 ms, $t(26)=-2.095, p<.05$].

Conclusions : ERP variations discriminating novel from familiar events appear to shift from frontal areas to temporal and parietal scalp regions by 18 months. In addition, identical twins responded differently from fraternal twins suggesting that zygosity impacts brain organization.

Correspondence: *Dennis L. Molfese, Ph.D., Psychological & Brain Sciences, University of Louisville, Life Sciences 317, Belknap Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

M.E. BARNES, K. PEACH, L. FENTRESS, D. GOZAL & D.L. MOLFESE. ERP Differences Detect Changes In Executive Functioning of Children When Sleep Is Reduced By Only One-Hour.

Objective: In society today, children receive less than recommended amounts of sleep on a continuing basis. The impact of this mild sleep loss on the development of cognitive skills, learning, and neurocognitive impact is poorly understood. To address this question, we investigated whether a one-hour reduction in sleep changed the way the left hemisphere discriminates different speech sounds in young children during an executive functioning task.

Participants and Methods : Differences in executive functioning and visual event-related potentials (ERPs) as an outcome of one hour of sleep reduction were investigated in 6 school-age children (mean age 7.51 years, 3 females) using a 128-electrode net during a Directional Stroop task, a well-documented measure of executive functioning (Diamond, 2003). Children participated in an overnight polysomnographic sleep study and an ERP session after a week of normal sleep to establish baseline sleep (Week 1). During Week 2, sleep time was reduced by 1 hour and another ERP session conducted. Weeks 3 and 4 tests served as measures of recovery. Sleep/wake cycles were confirmed by actigraphy across weeks.

Results : Repeated Measures Analysis of Variance was performed on ERP peak amplitude and latency measurements. Post Hoc t-tests identified a significant effect for N1 latency over the right parietal region that differed between week 2 (restriction) and week 4 (follow-up) [$F = 2.744, p = 0.001, \text{Observed Power} = 0.913$]. Amplitude differences also occurred for P2 and N2 at parietal sites between weeks 1 and 2 [P2: $F = 2.565, p = 0.004, \text{Observed Power} = 0.89$; N2: $F = 2.227, p = 0.01, \text{Observed Power} = 0.832$]. N2 amplitude differences at parietal sites between the baseline and sleep restriction conditions disappeared by Week 4, but P2 amplitude changes did not.

Conclusions : Our results indicate clear differences in the way that the brains of school-age children engage in executive function tasks following even a minor reduction in sleep.

Correspondence: *Dennis L. Molfese, Ph.D., Psychological & Brain Sciences, University of Louisville, Life Sciences 317, Belknap Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

M.C. WAGNER, V.J. MOLFESE & D.L. MOLFESE. Investigating The Relationship Between Early Reading Skills And Phonological Processing.

Objective: Previous research demonstrated phonological processing tests strongly correlate with reading abilities and discriminate poor from better readers (Savage, Frederickson, Goodwin, Patni, Smith, & Tuersley, 2005). Measures of brain activity such as event-related potentials (ERPs) detect underlying neural processing from different brain areas, with changes in neural activity reflecting cognitive differences related to task demands such as phonological processing. This technique complements and extends behavioral data in assessing preschool children, allowing behavioral measures of activities such as phonological processing to be supported by recorded activity over the brain during processing.

Participants and Methods : Event-related potentials (ERPs) were recorded using a 128-channel high-density array in 9 healthy children (age 5 years) in an auditory speech discrimination task. The children listened to a series of speech sounds /ba/ /da/ /ga/, each presented 25 times in random order.

Results : Repeated Measures Analysis of Variance (ANOVA) included Condition (3: /ba/ /da/ /ga/) x Electrode Region (4: frontal, central, temporal, parietal) x Hemisphere (2: left, right) x GRTR. The results indicated that brain activity of children with lower reading scores showed

longer latency measures in both P2 and N2 components when listening to speech syllables while children scoring higher exhibited shorter latencies for the same peaks. Children with better early reading skills displayed shorter latencies over central, temporal, and parietal regions in the N1 component of the ERP brain waves.

Conclusions : Results suggest that children scoring higher for reading skills discriminate between speech sounds faster than children scoring lower, and they generally exhibit shorter latencies in the N1 component of brain activity for the parietal, temporal and central regions of the brain across speech sounds, indicating a more efficient processing of information.

Correspondence: *Dennis L. Molfese, Ph.D., Psychological & Brain Sciences, University of Louisville, Life Sciences 317, Belknap Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

A.P. KEY, B. ROGERS, S.M. WILLIAMS & S. MATHIESEN. Converging ERP And fMRI Evidence Of Multiple Brain Networks For Math Processing.

Objective: Understanding brain mechanisms and cognitive processes involved in performance of basic math operations is critical for development of better teaching and assessment procedures. The current study examined differences in brain activity associated with performing exact vs. approximate calculations as measured by event-related potentials (ERPs) and fMRI. **Participants and Methods :** Visual ERPs were recorded from 10 adults (5 females; M=31.08 /-7.33 years) using 128-electrode nets. Stimuli included 1- and 2-digit addition problems and single or paired Greek letters. The participants were instructed to select the exact or approximate sum or choose an identical symbol from the 3 available options. fMRI data were obtained using the same paradigm in a 3T magnet. ERP/fMRI order was counterbalanced across the participants.

Results : PCA-ANOVA analysis noted that symbols and numbers were processed differently throughout the recording epoch. Problem type affected ERPs in the 300-700ms range where exact single digit calculations elicited larger amplitudes over posterior sites while approximate 2-digit problems had larger ERPs over frontal regions. In the later portion of the ERP, 2-digit problems elicited larger posterior amplitudes for all calculation types. fMRI analysis identified bilateral frontal and parietal activation for all problem types.

Conclusions : The results indicate that numbers are treated differently than symbols even in the simplest calculation. ERP and fMRI data note that different brain networks are engaged depending on the problem. Exact calculations and 2-digit problems are associated with posterior activity suggesting greater involvement of memory, while approximate answers and 1-digit problems were processed at anterior locations indicating greater contribution of attention.

Correspondence: *Alexandra P. Key, PhD, Vanderbilt University, Peabody Box 74, 230 Appleton Place, Nashville, TN 37203. E-mail: sasha.key@vanderbilt.edu*

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

J.E. CASTNER, H.J. CHENERY, D.A. COPLAND, T.J. COYNE, F. SINCLAIR & P.A. SILBURN. Timed Object and Action Picture Naming as a Function of Stimulation of the Subthalamic Nucleus in a Patient with Parkinson's Disease.

Objective: A number of studies have shown verb processing deficits in participants with Parkinson's disease (PD). This study aims to investigate the noun/verb dissociation in a participant with PD who receives stimulation of the subthalamic nucleus (STN) by using a timed object and action picture naming task. The exploration of the effects of stimulation of the STN on object and action naming will help to define the influence of STN stimulation on frontal-subcortical involvement in verb processing.

Participants and Methods : One 64 year old male diagnosed with PD, participated in a timed object and action picture naming task 18 months after stimulators were implanted bilaterally in the STN. The participant was assessed with the stimulators turned on and retested 6 weeks later with the stimulators turned off. Five control participants were assessed to provide normative naming latency data. The stimuli consisted of 28 object and 28 action pictures.

Results : Object and action naming latency data for the PD participant was compared with the normal controls using the revised standardized difference test (Crawford & Garthwaite, 2005). This revealed a significant object and action naming dissociation (i.e., a mean 371ms delay in naming actions relative to objects) in the on-stimulation condition ($p < .05$), yet no significant dissociation was evident in the off-stimulation condition when compared with control data ($p = .48$).

Conclusions : The results suggest that STN stimulation and subsequent frontal-subcortical neuromodulation has a negative impact on action naming. The lack of noun/verb dissociation in the absence of STN stimulation does not support the presence of a verb deficit in PD participants; however, the presence of dissociation with STN stimulation supports the view that anterior cortical regions are involved in verb processing. Future group data will help to further define frontal-subcortical involvement in verb processing.

Correspondence: *Joanna Castner, BSpPath (Hons), Division of Speech Pathology, The University of Queensland, School of Health & Rehabilitation Sciences, The University of Queensland, Brisbane, QLD 4072, Australia. E-mail: j.castner@uq.edu.au*

L.J. ALTMANN & D.B. EFROS. Understanding Complex Sentences: Answer Position Interacts with Relative Clause Location and Type.

Objective: Directionality effects have been documented in a range of tasks involving pictures and sentences. The current study asked whether the position of the target picture in a sentence-picture matching task affected accuracy and response times for complex sentences comprising 4 types of relative clauses.

Participants and Methods : 27 college students (age 18-25) and 34 older adults (age 60-93) completed a sentence-picture matching task presented by computer. They pushed the right mouse button to choose the right picture; left mouse button to choose the left picture to match a simultaneously-presented written sentence. Stimuli crossed relative clause location (modifying the subject or object) and relative type (subject relatives or object relatives). Position of correct answer was counterbalanced within each condition. Accuracy and response times were analyzed using a (2) relative location by (2) relative type by (2) answer position by (2) group ANOVA.

Results : All main effects were significant for RTs, and all but relative type were significant for accuracy. Lower performance was found for older adults, pictures on the right, and object relatives. Relative type, relative location and answer position interacted in both analyses. Only sentences with object relatives were less accurate when the correct picture was on the right. Only stimuli with subject relatives modifying the sentence subject were significantly slower when the target picture was on the right; these were also the least accurate and most difficult for older adults.

Conclusions : These results suggest that location and type of relative clause contribute independently to the complexity of relative clause sentences, particularly for older adults. Moreover, the position of target pictures interacts with relative clause location and type to affect both accuracy and RTs when understanding complex sentences.

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*

A. CLEMENTS, J.J. ABEL, S.L. RIMRODT, J.J. PEKAR & L.E. CUTTING. Developmental differences in the neural circuitry associated with sentence comprehension.

Objective: Several functional neuroimaging studies have examined the neural circuitry associated with sentence comprehension. While most studies have focused on adult populations, few studies have looked at the relationship in activation patterns between adult and adolescent populations.

Participants and Methods : To address this issue, 18 participants (9 adults, 9 adolescents) completed a sentence comprehension task while in the scanner. Both groups had a normal range of reading ability and were matched on gender and task performance. The goal of the baseline task was to control for both single word reading and short-term memory requirements, to isolate comprehension specifically.

Results : Both groups activated left inferior frontal gyrus, right extrastriate and cerebellum. Two-sample t-tests were used to look at differences in activation patterns between groups. Results indicate that compared to adolescents, adults showed additional recruitment of bilateral frontal regions and middle temporal gyrus, right inferior parietal lobe, fusiform and supramarginal gyri. Compared to adults, the adolescent group showed additional recruitment in left precuneus and caudate. These results suggest that for both groups, regions known to be important for comprehension, beyond single word reading and short-term memory requirements are the left inferior frontal gyrus, right cerebellum, and extrastriate regions. The additional adult activation is consistent with previous literature, which suggests that the temporal lobe, fusiform gyrus, and supramarginal gyrus are additional areas important for reading and comprehending text.

Conclusions : The recruitment of additional areas in the left precuneus and caudate in adolescents suggest that there are differences in the techniques used by adolescents and adults to comprehend text.

Correspondence: *Amy M. Clements, Kennedy Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: clements@kennedykrieger.org*

S.N. SANTOS, J. GEE, M. WORK, V. TROIANI & M. GROSSMAN. Processing Sentences With a Temporary Structural Ambiguity Recruits Dissociable Neural Executive Resources: An fMRI Study.

Objective: We hypothesize that sentence comprehension recruits dissociable executive resources like working memory (WM) and planning, which are supported by a large-scale neural network. We monitored brain activation with fMRI during performance of a resource-demanding sentence comprehension task — resolution of temporary structural ambiguities. For example, as a sentence like “The citizens heard the election result was fixed” is being encountered, “the election result” at first seems the direct object of “heard.” However, it is ultimately interpreted as the subject of an unfolding sentence complement structure. The present study aims at identifying the neural resources recruited for this task.

Participants and Methods : 240 written sentences were shown to 19 subjects, in a phrase-by-phrase manner: [initial-phrase] [verb-phrase] [noun-phrase] ([WM-phrase]) [concluding-phrase]. Half had a direct object (DO) grammatical structure, half a sentence complement (SC) structure. In half, verb and noun were relatively compatible with the sentence structure; in the remainder, verb and/or noun were less compatible (see example above). Half of the sentences had an additional “WM phrase.” Sentences were read silently, and 20% were probed for content. Event-related BOLD fMRI was analyzed with a random effects model (SPM99). Images were registered, aligned (Talairach) and spatially smoothed (8mm). We analyzed the concluding phrase, where the structure was disambiguated, relative to the initial phrase of each sentence.

Results : Comparison of syntactically “less-compatible” minus “more-compatible” sentences showed dorsolateral prefrontal cortex activation. Left supramarginal activation remained after direct subtraction of “with-WM” minus “without-WM” conditions.

Conclusions : Processing sentences with a temporary structural ambiguity recruits dissociable neural executive resources.

Correspondence: *Susana N. Santos, MSc, Bioengineering, University of Pennsylvania, 3600 Market St, Suite 370, Philadelphia, PA 19104. E-mail: susana@seas.upenn.edu*

S.M. ANTONUCCI, P.M. BEESON, S.Z. RAPCSAK & D. LABINER. The Role of the Left Temporal Lobe in Naming and Semantic Knowledge.

Objective: Anomia is often demonstrated by individuals with damage to left inferior temporal cortex, and there is some evidence to suggest that the location of cortical damage affects the nature of the naming impairment. Specifically, damage to anterior left temporal regions (BA 38, 21, 20) has been associated with degradation to semantic knowledge (semantic anomia), whereas damage to more posterior regions (BA 37) has been associated with disconnection between preserved semantic knowledge and access to phonological word forms (pure anomia). The clinical examples of semantic anomia often come from individuals with damage extending beyond left temporal cortex, so that it remains unclear whether unilateral damage to this area will result in semantic degradation. In the current study, naming performance in individuals with focal damage to anterior versus posterior regions of the left inferior temporal lobe was examined to determine whether there was a difference in the nature of the anomia.

Participants and Methods : Eight individuals who underwent left anterior temporal lobectomy and eight individuals who sustained left posterior cerebral artery infarcts completed a battery of lexical retrieval and semantic processing tasks. High resolution structural brain scans were collected to conduct lesion analyses.

Results : Naming performance, which was correlated with lesion volume, ranged from severely impaired to unimpaired in both groups. Both groups demonstrated well preserved semantic knowledge regardless of the severity of the naming impairment, or the lesion location.

Conclusions : These findings suggest that unilateral damage to left inferior temporal cortex is not sufficient to significantly degrade semantic knowledge.

Correspondence: *Sharon M. Antonucci, Ph.D., CCC-SLP, Speech-Language Pathology and Audiology, New York University, 719 Broadway, Suite 200, New York, NY 10003. E-mail: sma208@nyu.edu*

A.E. ASBJORNSEN, J.E. OBRZUT & T. MANGER. Word Chain-Performance in Norwegian High School Students: Could It Be Explained by Phonological Skills?

Objective: The Wordchains Test (WCT) was designed as a simple first step screening of reading ability and has been proved sensitive for reading impairments in several languages, including Norwegian, Swedish and English. The test consist of three or four words chains and the task is to identify as many component words as possible within the time limit of three minutes. The task is expected to assess the word recognition skills of the examinee, but could the performance be predicted by phonological skills?

Participants and Methods : A sample of 40 normally achieving Norwegian high school students (age 13-18, mean 14.05) was assessed with the WCT and tests of single word and non-word reading in addition to tests of working memory and visual processing.

Results : Multiple regression analysis (forward stepwise analysis) showed that 66 % of the variance in WCT (multiple R = .83) could be explained by single word reading ($\beta = -.53$, $SE\beta = .11$, $B = -.49$, $p < .001$), symbol search ($\beta = .28$, $SE\beta = .11$, $B = .79$, $p < .001$) and working memory ($\beta = .21$, $SE\beta = .12$, $B = .29$, $p = .10$). Non-word reading, expected to assess phonological skills, was not included in the regression equation.

Conclusions : The results supported the assumptions that the WCT measures important phonological skills necessary for effective reading, and that impaired performance on WCT is a good predictor for development of these basic phonological skills important for reading acquisition. Furthermore, the results also suggest that visual skills must be considered when interpreting WCT performance.

Correspondence: *Arve E. Asbjørnsen, Ph. D., Department of Psychosocial Sciences, University of Bergen, Christiesgt 12, Bergen N-5015, Norway. E-mail: arve.asbjornsen@psysp.uib.no*

S. FERNANDEZ GUINEA, R. LOPEZ-HIGES, M. MARTIN ARAGONESES, D. DEL RIO GRANDE, M. GARCIA VIEDMA & P. SALES HEREDIA. Study of the Influence of Syntactic Complexity on Sentence Comprehension and on Working Memory Resources in the Elderly.

Objective: The aim of this study was to verify whether the syntactic complexity affect from different way to elders who present a specific profile with regard to the sentence comprehension abilities and to available working memory resources.

Participants and Methods : 66 individuals with an average age of 77.9 years and a mean score on MMSE of 27.83 participated voluntarily. The ECCO Battery (Cognitive Assessment of the Comprehension of Sentences; Lopez-Higes, del Rio & Fernandez-Guinea, 2005) was applied. It includes i) a test to measure working memory capacity (similar to the Reading Span Test); ii) the Lexical Knowledge test (word-picture association), and iii) the Sentence Comprehension test (simple sentence-picture verification task, that minimizes the memory demands).

Results : The statistical analysis allowed to establish three groups: a) control subjects, with a normal performance on the Sentence Comprehension and Lexical Knowledge tests, as well as a significantly greater working memory span; b) subjects with a decline profile, because they present the lowest performance, and c) subjects that present a mild decline.

Conclusions : Instead of syntactic complexity effects, that would support the hypothesis of a general verbal working memory system (Just & Carpenter, 1992), the results indicate that the differences between groups depended on the number of propositions. So a difficulty with post-interpretive processes exists, which is in favour of the separate working memory resources proposal (Waters & Caplan, 1999).

On the other hand, significant differences between the groups with decline in sentence comprehension, but not on the MMSE, call into question the sensibility of this instrument to detect differences at the cognitive deterioration extent.

Correspondence: *Maria Teresa Martin Aragoneses, Dpto. Psicología Básica II (Procesos Cognitivos). Facultad de Psicología, Universidad Complutense de Madrid, Despacho 1103 D. Buzón 07. Campus de Somosaguas., Pozuelo de Alarcón 28223, Spain. E-mail: mt.m.aragoneses@psi.ucm.es*

I. TALLBERG & K. BRUSEWITZ. Swedish Responses on Boston Naming Test.

Objective: The purpose was to obtain normative data of response patterns on Boston Naming Test (BNT) based on a sample of native Swedish-speaking healthy adults and children.

Participants and Methods : The study involved 111 adults (21-80 years of age) and 152 children (6-15 years of age). All participants' responses on BNT were classified into semantic categories. The adults were also assessed with other lexical tests and half of the group with tests of global cognitive function as well.

Results : The response analysis showed that there were significant differences in the use of the various semantic response classes amongst different ages and between subjects with different cognitive profile and demographic background. A higher performance on tests of global cog-

nitition was related to use of substitutions that were more specific and closer to the target words. The total number of correct answers had a clear relation to higher education. Comparisons were made between adults and children concerning number of correct answers and type of substitutions.

Conclusions : We can now offer normative data for BNT responses based on a sample of healthy Swedish-speaking persons. The results indicate that BNT not only is useful for assessment of patients naming ability but also can be used as a tool for estimation of lexical ability.

Correspondence: *Ing-Mari Tallberg, PhD, Logopedics and Phoniatrics, Dept for Clical Science, Intervention and Technology, Karolinska University Hospital, B69, Stockholm S141 86, Sweden. E-mail: ing-mari.tallberg@klinvet.ki.se*

R. DOYLE, R.D. MORRIS & D. WASHBURN. The Role of Eye Movements in the Relationship between Rapid Automatized Naming and Reading Ability.

Objective: The Rapid Automatized Naming test (RAN) has been shown to be a strong predictor of reading ability, however, the nature of this relationship remains unclear. This study evaluated whether the visual scanning and sequential components of the continuous RAN format are similar to visual processes required in reading, and whether these processes partially account for the relationship.

Participants and Methods : Fifty-seven undergraduate students read three short stories and the continuous versions of two RAN tasks (colors, letters). This study examined the percent of regressions and fixations during both tasks (reading text, RAN).

Results : The relationship between reading and underlying components of RAN was evaluated with linear regression. In the first model, rapid color naming standard scores were the dependent variable and the predictors were phonological processes, confrontation naming speed, and fixations and regressions on the color naming task. In the second model, the rapid color naming variables were replaced with the rapid letter naming variables. Both models explained significant portions of variance in RAN. The percent of fixations variable was the most significant predictor in both models. Pearson's r correlations were performed to evaluate the relationship between eye movements during the RAN and reading tasks. Percent of fixations in color and letter naming were significantly positively correlated with percent of fixations in the text reading tasks. Percent of regressions on letter naming and easy and average texts were significantly positively correlated.

Conclusions : The continuous RAN measures important visual scanning and sequencing processes that are similar to the visual scanning and sequencing processes required for reading.

Correspondence: *Rebecca Doyle, M.A., Psychology; Georgia State University; 3666 Corners Court, Norcross, GA 30092. E-mail: Beckygsu@aol.com*

L.H. RUBIN, K. MORDECAI & P.M. MAKI. Changes in the Contribution of Verbal Fluency Tasks as a Function of Practice.

Objective: Clustering and switching have been identified as two dissociable cognitive processes underlying verbal fluency tasks. Clustering is thought to be a relatively automatic process and involves generating words within a subcategory, and switching is suggested to be a more deliberate, effortful, strategic, and controlled process and involves switching to a new subcategory once a subcategory is exhausted (Chertokow & Bub, 1990; Gruenewald & Lockhead, 1980). We examined whether there were practice-related shifts (baseline, 1.5 months) in the use of clustering and switching on a phonemic fluency test.

Participants and Methods : Clustering and switching scores were computed on phonemic fluency in a sample of 107 healthy women, mean age 26 (range 18-45) and mean cumulative years of education 16.3(SD = 2.12, range 12-25).

Results : Repeated measures analysis of variance showed that the number of clusters decreased over time whereas the number of switches increased over time, $F(1, 104) = 7.31, p < .05, \eta = .07$, and $F(1, 104) = 7.52, p < .05, \eta = .07$, respectively.

Conclusions : These findings suggest that women are becoming more strategic and are using frontal neural structures with practice on phonemic fluency tasks. The results have potential implications for neuropsychologists as well as researchers conducting intervention studies because they suggest the difficulty of determining what mediates performance over time-practice or carry-over effects, pharmacological treatment (if used), or the implementation of an alternative strategy.

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*

W.D. KILLGORE, D.B. KILLGORE, S.A. MCBRIDE & T.J. BALKIN. Sustained Verbal Fluency Following Sleep Deprivation and Recovery Sleep: The Effects of Caffeine, Modafinil, and Dextroamphetamine.

Objective: Sleep loss reduces metabolic activity within the prefrontal cortex, a region critical to the ability to think divergently and generate response alternatives. It is not known whether sleep deprivation induced deficits in divergent thinking, as measured by sustained verbal fluency, are counteracted by stimulant medications. The effects of three stimulants and placebo on Controlled Oral Word Association Test (COWA) performance were compared following sleep deprivation and recovery sleep.

Participants and Methods : Fifty-four (29 men) healthy volunteers remained awake for 61 hours, followed by 12 hours of recovery sleep. Volunteers received a double-blind oral administration of caffeine 600 mg, modafinil 400 mg, dextroamphetamine 20 mg, or placebo at 44 hours. The COWA was administered once each day. Sustained verbal fluency performance was evaluated by calculating the ratio of the number of words generated in the last 15 second interval relative to the first 15 second interval.

Results : A mixed-model ANOVA, with age and verbal IQ as covariates, revealed an interaction between drug group and testing session on sustained performance, $p = .001$. There were no differences in sustained performance at any session except post-recovery sleep, $p = .021$. Overall, following recovery sleep, the dextroamphetamine group demonstrated poorer sustained verbal fluency relative to placebo, $p = .013$.

Conclusions : Although the total verbal fluency score was not affected, administration of dextroamphetamine during sleep deprivation adversely affected the ability to sustain continuous verbal fluency after recovery sleep, suggesting that the restorative aspects of recovery sleep may have been disrupted by this medication.

Correspondence: *William D. Killgore, Ph.D., Behavioral Biology, Walter Reed Army Institute of Research, Division of Psychiatry and Neuroscience, 503 Robert Grant Avenue, Silver Spring, MD 20910. E-mail: william.killgore@na.amedd.army.mil*

E.C. CIAMPA, L.A. WAGNER, B.R. WILLIAMS, M.L. GONEN & P.J. DONOVICK. The Connection Between IQ and Verbal Fluency.

Objective: Verbal fluency tests are widely used in neuropsychological evaluations. The present study evaluated the relationship between IQ and performance on the FAS portion of the COWA in referrals from a (1) general hospital; (2) private practice, and; (3) maximum security prison.

Participants and Methods : Archival data was retrieved from 43 general hospital, 56 private practice, and 117 prison files of adult clients. Total FAS score, FSIQ, and age were the data used in this study.

Results : Regardless of age, the mean IQ of individuals evaluated in a general hospital and private practice was 98, while it was 75 in prison.

Not surprisingly, on average, prisoners generated fewer words (25) on the FAS portion of the COWA than either clients seen in the hospital (31) or private practice (30). Age did not correlate with the number of words generated regardless of group. In all groups there was a positive correlation (about .55) between IQ and the total number of words generated.

Conclusions : These results suggest that IQ and verbal fluency are generally related across settings and cognitive abilities. Thus, despite the fact that the mean IQ of prisoners placed them in the borderline range of intelligence (one and two-thirds standard deviations below the other two groups), there was a significant relationship between IQ and verbal fluency.

Correspondence: *Lori A. Wagner, B.S., Clinical Psychology, Binghamton University (SUNY), PO Box 6000, Binghamton, NY 13902. E-mail: bj92174@binghamton.edu*

Memory

J.J. LY, M.S. PANIZZON, K. BLOOMINGDALE, S. DEY, M. THALL & M.G. O'CONNOR. Retrograde Amnesia Following Treatment with ECT.

Objective: Study the effects of ECT on memory with novel stimuli presented prior to initiation of treatment.

Participants and Methods : The retrograde memory abilities of 22 patients with Major Depressive Disorder (MDD) and 16 non-depressed (ND) participants were studied with novel (face and word) stimuli that were presented prior to treatment with ECT. Memory stimuli were presented at various time intervals preceding initiation of ECT. Mood and anterograde memory were assessed before and after the end of treatment. Recall and recognition of retrograde stimuli were assessed two days following the end of treatment. ECT was administered 3 times a week. Eleven patients underwent unilateral treatment and 11 had a combination of unilateral and bilateral stimulation.

Results : Results were analyzed with Repeated Measure ANOVAs and correlational analyses. At baseline, there were no significant differences between Unilateral and Bilateral MDD patients with regard to depression severity. Both groups demonstrated significantly reduced depression following ECT. There were no differences between Unilateral and Bilateral patients with regard to baseline or post-ECT anterograde memory. There were no group differences on tasks of retrograde memory at baseline. Following ECT both MDD groups were significantly impaired on all tasks of retrograde memory. There was no relationship between task performances and time of initial presentation, seizure duration, or stimulus intensity.

Conclusions : Current findings indicate that ECT had significant deleterious effects on four tasks of retrograde memory that varied with respect to processing demands and modality of presentation. Unilateral and bilateral groups demonstrated significant retrograde amnesia even though their anterograde memory abilities were intact. There was no significant relationship between time of presentation and retrograde memory performance. We did not find a relationship between seizure duration, stimulus intensity and task performance.

Correspondence: *Margaret G. O'Connor, Ph.D., Neurology, Beth Israel Deaconess Medical Center, 330 Brookline Avenue, Boston, MA 02115. E-mail: moconnor@bidmc.harvard.edu*

R. KESSELS & A. POSTMA. Feature Binding in Human Memory: A Comparison of What, Where and When in Young and Older Adults.

Objective: There is evidence that age-related memory decline does not affect all types of episodic information to an equal extent, but that especially memory for contextual information deteriorates. Furthermore, previous findings in brain-lesioned patients as well as neuroimaging studies suggest that the inability to integrate or bind together

multiple features in memory might be crucial for intact contextual memory function in general. However, results are inconclusive with respect to whether or not a binding deficit underlies the context-memory decline in normal aging. Hence, the current study set out to systematically compare age-related decline in item/context memory for single features with context memory for multiple features (in which information has to be integrated).

Participants and Methods : Forty healthy young adults and 40 older adults without dementia participated in the current study. Both groups were matched on IQ, gender and education level. A computerized visual memory task assessing target memory (object recognition), contextual memory (memory for positions or the temporal order of objects) and memory for the combinations of these features (spatial and temporal information) was performed.

Results : The results showed age-related decline on all task conditions, but memory for spatial information and temporal order declined to a greater extent than target memory. Furthermore, the performance on conditions requiring the binding of multiple features was affected equally in young and older adults compared to non-binding conditions.

Conclusions : The current findings are in agreement with studies showing a decline in memory for contextual features in normal aging (i.e., remembering spatial and temporal information). Possibly, this context-memory deficit might underlie poorer episodic memory in older participants. The results do not provide evidence for an age-related memory binding deficit. This finding is discussed using recent neuroimaging data on memory binding and the hippocampus.

Correspondence: *Roy Kessels, PhD, Dept. of Psychonomics, Utrecht University, Helmholtz Instituut, Heidelberglaan 2, Utrecht 6514 CV, Netherlands. E-mail: r.p.c.kessels@fss.uu.nl*

L.J. ALTMANN & D.B. EFROS. The Relationship between Verbal Working Memory and Vocabulary Tasks: A Factor Analysis.

Objective: Reading span and digit ordering tasks are described as verbal working memory (WM) tasks that are highly related to verbal ability, e.g., vocabulary size. This study explores the relationship between these WM tasks and vocabulary ability.

Participants and Methods : 108 college students completed 8 tests that included 3 vocabulary and 5 WM tasks. Vocabulary tasks included the WAIS III vocabulary, the Shipley Vocabulary, and a computerized word reading task that included words from 2 standardized word reading tests, scored for pronunciation accuracy and response times. WM tasks included digit span forward and backward, reading span, digit ordering and a self-paced 2-back task. Scores were analyzed using maximum-likelihood factor analysis with Varimax rotation.

Results : The best model ($\chi^2 = 5.48, p = .94$) yielded a 3 factor solution, accounting for 62% of the variance. The 2 vocabulary tasks, word reading accuracy and times loaded on factor 1, accounting for 32% of the variance. Both digit span tasks and digit ordering loaded on the second factor, along with word reading accuracy and WAIS vocabulary, to account for 19.5% of the variance. 2-back accuracy, reading span and digit ordering loaded on the 3rd factor, accounting for 11% of the variance.

Conclusions : Reading span shared no variance with vocabulary or verbal WM factors, contradicting previous findings in the literature. However, digit span and digit ordering scores shared variance with expressive vocabulary and word reading ability. This is likely due to a common dependence on the phonological loop in these WM tasks and in word learning. There was also a separable nonverbal WM component underlying 2-back performance, and, to a lesser extent, reading span and digit ordering. 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. NG & N.W. PARK. Factors Influencing the Superior Performance of Physical Enactment Relative to Verbal Recall during the Retrieval of Novel Naturalistic Actions.

Objective: To determine whether the factors affecting the superior performance of enactment relative to verbal recall of novel naturalistic actions (NNAs), which are unfamiliar tasks involving goal-directed actions, should influence the type of memory testing procedures used for stroke patients.

Participants and Methods : 32 undergraduates encoded two NNAs. Subsequently, they: 1. Verbally recalled the actions of the NNA; 2. Physically enacted the NNA; 3. Identified the actions that occurred; and 4. Identified the actions they thought were necessary to describe the NNA to a peer. Using a protocol based upon the Action Coding System (Schwartz, et al, 1991), performance was differentiated by crux (central actions) and non-crux actions.

Results : Physical enactment was superior to verbal recall for both the crux, $t(31) = 6.99, p < .001$, and non-crux actions, $t(31) = 28.23, p < .001$. Higher proportions of crux actions, $t(1,31) = 8.84, p < .001$, and non-crux actions, $t(31) = 8.30, p < .001$, were reported as necessary to describe than verbally recalled suggesting that retrieval failure was present during verbal recall. A higher proportion of non-crux actions was reported as occurring than necessary, $t(31) = 8.41, p < .001$, indicating that participants were editing their responses during verbal recall (i.e., during verbal recall, they were choosing to report only the actions that they thought were necessary to describe).

Conclusions : To our knowledge, the current study provides the first clear evidence that lower verbal than enactment performance of NNAs is partly a consequence of retrieval failure, and they suggest that enactment performance may be underestimated when it is based on verbal descriptions.

Correspondence: *Longena Ng, B.Sc, M.A., Psychology, York University, Room 226 Atkinson, 4700 Keele Street, Toronto, ON M3J1P3, Canada. E-mail: longena@yorku.ca*

M.E. KRAMER, C. CHIU, R.D. BROWN, V.J. SCHMITHORST & S.K. HOLLAND. Episodic Memory in Children: an fMRI Region of Interest Analysis of Hippocampal Activation.

Objective: Recent neuroimaging evidence confirms that the successful formation of episodic memories in adults is dependent on the integrity of the structures of the medial temporal lobe (MTL). However, it is unclear to what extent and for what types of episodic encoding tasks the MTL is activated in children. In order to examine the role of the MTL in episodic encoding in a developmental context, we examined a large database of functional magnetic resonance imaging (fMRI) data and behavioral data to determine if hippocampal activation during episodic encoding tasks was related to subsequent performance on recognition memory tests.

Participants and Methods : Participants were thirty-one 7 to 9 year olds and twenty-six 16 to 18 years olds who had successfully completed a MR scan and a recognition memory test for both a verb generation and story comprehension task (Chiu et al., in press). A region of interest (ROI) around the hippocampus was manually defined for each subject based on known anatomical markers. Percent signal change in the fMRI data within this ROI was computed for each encoding task for each subject.

Results : Hippocampal activation was not correlated with recognition memory performance even when controlling for age and general cognitive ability. Younger children and adolescents did not differ significantly in their recognition memory accuracy on the memory tests or in the percent change in activation of the hippocampus.

Conclusions : Consistent with the findings in adults, these data suggest that in children the hippocampus proper may play a less important role in item-specific encoding than in relational encoding.

Correspondence: *Megan E. Kramer, B.S., Psychology, University of Cincinnati, 2624 Clifton Ave, Dyer Hall Room 429, Cincinnati, OH 45221. E-mail: kramerm2@email.uc.edu*

J. DYER, W.R. LEVICK & M. HUNTER. Implicit and Explicit Memory in Extremely Low Birthweight (ELBW) Children.

Objective: ELBW children are reported to experience a rate of specific learning difficulties (SLD) significantly in excess of their normal birthweight peers. Compromise of a range of neuropsychological processes has been advanced to explain these difficulties. Recently, a number of studies have identified deficits in episodic memory in ELBW/VLBW children and adolescents and proposed these deficits as a contributing factor in their SLD. However, there is little evidence otherwise to suggest a link between episodic memory deficits and SLD. On the other hand, there is some evidence suggesting an implicit memory deficit in SLD.

Participants and Methods : In this study a group of 8 year old children with birthweight less than 1000g (n=29; 59% of a regional ELBW cohort) were assessed on experimental and clinical verbal and non-verbal implicit and explicit memory tasks and on IQ and a range of other cognitive, behavioural, and academic skill measures. A control group (n=43) matched for age, gender, and socioeconomic status completed the experimental implicit and explicit memory tasks and the IQ measures.

Results : Preliminary analyses indicate that the ELBW and control groups differed significantly on IQ but there were no differences between these groups on the experimental implicit or explicit verbal or visual memory tasks. Within the ELBW group there was a significant difference between WRAML Verbal and Visual Learning results. Relationships between the various memory measures and academic skills in the ELBW groups are also examined.

Conclusions : Methodological issues that may account for results are discussed together with the implications for the understanding and further exploration of memory in ELBW and SLD.

Correspondence: *Wayne R. Levick, Psychology, John Hunter Children's Hospital, Locked Bag 1, Hunter Region MC, NSW 2310, Australia. E-mail: wayne.levick@newcastle.edu.au*

J.N. BROWNDYKE, L. SWEET, K. TUCKER, J. PASKAVITZ, R. COHEN, K. WELSH-BOHMER, D. SCHMECHEL & J. BURKE. Neural Correlates of Malingered Memory Errors.

Objective: We employed event-related fMRI in an attempt to elucidate the patterns of neural activity associated with normal performance and simulated malingering on a visual-object recognition memory task.

Participants and Methods : Seven healthy young subjects were scanned using an event-related fMRI paradigm. EPI-BOLD data were collected during four alternating visual-object encoding and recognition runs. Subjects were instructed to respond "old/new" during the recognition runs, but during the last recognition run additional instructions were given to feign memory impairment for potential monetary gain. BOLD signal associated with normal and malingered recognition task responses were modeled by convolving stimulus onset vectors with a canonical HRF. Random-effects, paired t-test contrasts were conducted to detect signal differences between normal and malingered responses under conditions of shared stimulus familiarity.

Results : Analyses revealed dissociable suprathreshold activity relative to normal recognition memory target hits and foil correct rejections in the r/IMFG/SFG (BA9/10) and rSTG (BA39) for feigned omission errors (i.e., target misses) and activity in the rFG (BA19), rSTG (BA39), I.amygdala, I.insula (BA13), and IMFG (BA46) associated with feigned commission errors (e.g., false alarms).

Conclusions : Our results demonstrate what neural processes may be active or necessary for the production of feigned memory deficits and highlight that "poor effort" is not a unitary construct and is mediated, in part, by the type of error production. Bilateral frontal lobe involvement was seen during feigned errors of omission possibly reflecting response inhibition, while feigned errors of commission were associated with amygdala, peri-insular, and left frontal activity suggesting that these responses were associated with greater emotional/autonomic reactivity.

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*

P.S. FOSTER, V. DRAGO, K.M. HEILMAN & D.W. HARRISON. Verbal Learning Ability and Posterior Temporal Lobe Slow Wave Activity.

Objective: The ability to verbally learn is highly variable even in normal subjects, but the reason for this variability is unknown. One of the possibilities is that people who learn better are more likely to perform semantic encoding and it is primarily the left posterior temporo-parietal region that mediates verbal semantics. This investigation examined learning and recall on the Rey Auditory-Verbal Learning Test (RAVLT) as a function of left temporal EEG delta magnitude (a sign of low cortical activation), hypothesizing that high delta emanating from the posterior (versus anterior) left temporal lobe would be associated with lower learning scores.

Participants and Methods : The RAVLT was administered to 42 right-handed men and EEG was recorded from 8 electrode sites across the left hemisphere.

Results : The results indicated that individuals with higher delta magnitude over the left posterior temporal lobe scored significantly lower on trials 4 (High Delta M = 13.27; Low Delta M = 14.00) and 5 (High Delta M = 13.64; Low Delta M = 14.4). Whereas the two groups did not differ on a traditional index of learning (higher of Trials 4 or 5 minus Trial 1), the two groups did differ significantly using a new learning index that captures learning as a function of total recall (High Delta M = 322.05; Low Delta M = 376.70). No significant differences in delta activity were found between the groups for the left anterior temporal lobe.

Conclusions : Thus, decreased learning appears to be associated with a decreased activity in the posterior temporal network important in semantic encoding.

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. MARTIN, M. VERFAELLIE & M.M. KEANE. Impaired Priming for Novel Conceptual Associations in Amnesia.

Objective: Although it is well established that amnesic patients show impaired explicit memory for novel associations, less is known about the status of implicit memory for novel associations in amnesia. Prior work has suggested that while priming for perceptually based associations is intact in amnesic patients, priming for conceptually based associations may be impaired. The present study evaluated this question by examining priming for novel conceptual associations.

Participants and Methods : Twenty amnesic patients and 21 controls participated. In the study phase, participants were shown unrelated cue-target word pairs, the target being an exemplar from a category (e.g., democracy-pear, bite-trumpet, injury-pants). In the test phase, participants were presented with a cue and a category prompt and were asked to generate four exemplars from that category. In the "old" condition, the cue and prompt corresponded to a studied pair (e.g., democracy-fruit?), in the "recombined" condition, the cue and prompt constituted a recombination of a previously studied cue and target (e.g., bite-clothing?), and in the "new" condition, the cue and prompt were both unstudied (e.g., trails-color?).

Results : Analyses of variance indicated that control participants showed associative priming as reflected by a higher rate of target generations in the old compared to the recombined condition. This effect was absent in the amnesic group. A second experiment ruled out the possibility that the results were due to explicit memory contamination in the control group.

Conclusions : These findings suggest that there is an impairment in priming for novel conceptual associations in amnesia, independent of amnesic patients' deficit in explicit memory.

Correspondence: *Elizabeth Martin, B.S., Memory Disorders Research Center, Boston University School of Medicine, VA Healthcare System (151-A), 150 South Huntington Ave, Boston, MA 02130. E-mail: eammartin@hotmail.com*

C.L. CLASON, G.P. LEE & D.W. LORING. Do Subjective Material-Specific Memory Complaints Predict Objective Material-Specific Memory Performance in Epilepsy Surgery Patients?

Objective: Research suggests subjective memory complaints often do not reflect objective memory performance in healthy controls as well as psychiatric and neurologic patients. This study explored whether subjective memory complaints on a questionnaire were associated with performance on objective verbal and nonverbal memory measures in epilepsy surgery patients.

Participants and Methods : Data from 70 separate neuropsychological examinations (37 pre-surgery, 33 1-year post-surgery), including 13 pairs who were examined both pre and post operatively, were collected. MEASURES. Patients completed the Memory Complaints Inventory (MCI), a self-report of memory difficulties comprised of 9 subscales in which higher scores reflect greater subjective memory dysfunction. Neuropsychological memory measures included FSIQ, Selective Reminding Test (SRT, 6-Trials), WMS Logical Memory subtests: Paired Associates, Faces, and Family Pictures, and the Rey-Osterrieth Complex Figure Test (ROCFT). ANALYSES. Pearson product-moment correlational analyses were used to explore the relationship between subjective verbal memory complaints and objective memory performances.

Results : Statistically significant but modest relationships (Range: $r = -0.40$ to -0.24) were identified between both verbal and nonverbal memory complaints and verbal and nonverbal memory scores. That is, increased memory complaints were associated with reduced memory scores. The strongest associations were identified between subjective verbal and nonverbal memory complaints and SRT (verbal = $p = .0005$, nonverbal = $p = .001$). The poorer associations for both verbal and nonverbal complaints were on WMS, Faces.

Conclusions : Results suggest the severity of self-reported subjective memory impairment is associated to a moderate degree with reduced objective memory test performances for some epilepsy surgery patients. Correspondence: *Christie L. Clason, PhD, Department of Neurology, Medical College of Georgia, 2548 Carriage Creek Rd., Augusta, GA 30909. E-mail: cclason@mcg.edu*

E. BARBUTO, C. SHAPIRO, D.A. GOLD, D. SMITH & N.W. PARK. The Effects of Dual-Task at Retrieval on Memory for Serial Order.

Objective: A dual-task paradigm was used to investigate whether serial recall requires controlled processing. Studies showing that patients with frontal lobe damage are impaired in memory tasks that require the retrieval of serial order, but are unimpaired on tasks requiring retrieval of item information, suggests that controlled processing may be involved.

Participants and Methods : A total of 100 undergraduates participated in four experiments. Comparisons were made between participants' retrieval of serial order in isolation (single-task condition) and concurrently with a secondary task (dual-task condition).

Results : In Experiment 1, participants serially recalled verbally or visuospatially encoded items under single- or dual-task conditions, where the secondary task also entailed retrieval from memory of temporal information. Participants recalled significantly more information under single- ($M=61.9, SD=19.8$; $M=59.2, SD=30.4$) compared to dual-task at retrieval ($M=41.5, SD=13.3$; $M=37.9, SD=23.5$) for verbal and visuospatial serial recall. Experiment 2 showed that providing more time at retrieval had no effect on serial recall. Experiment 3 showed that pair-

ing serial recall with an attention-demanding secondary task requiring controlled processing yielded interference effects, with better recall under single- ($M=51.8, SD=27.7$; $M=95.5, SD=8.5$) compared to dual-task at retrieval ($M=36.6, SD=35.1$; $M=77.7, SD=24.0$) for both verbal and visuospatial serial recall. Experiment 4 showed that serial recall did not differ in the dual- ($M=72.0, SD=19.3$) vs. single-task ($M=76.6, SD=19.3$) conditions when the secondary task was a recognition memory test.

Conclusions : Results indicate that serial recall requires controlled processing at retrieval, but that concurrent retrieval of different memories is not interfering. Our findings suggest that impaired serial recall by patients with frontal lobe damage is, at least in part, a consequence of retrieval impairments.

Correspondence: *Erica Barbuto, M.A., York University; 2736 Folkway Drive, Unit 52, Mississauga, ON L5L 2G4, Canada. E-mail: ericab@yorku.ca*

M.R. LAWRENCE, M.R. POWELL, J.S. SMIGIELSKI & C. SLETTEN. After Controlling For Effort & Mood, Does Pain Severity Impact Cognitive Status in a Mixed Chronic Pain Treatment Seeking Sample?

Objective: To explore the impact of pain severity on cognitive status in a pain rehabilitation seeking sample after controlling for effort and mood. Previous work has highlighted the importance of controlling for confounds such as effort and mood when investigating neurocognitive status (Rohling et al., 2002; Suhr, 2003).

Participants and Methods : Twenty-five chronic pain rehabilitation seekers exhibiting good effort on the Test of Memory Malingering (Tombaugh, 1996) were included in this study. Participants completed the Rey Auditory Verbal Learning Test (AVLT; Rey, 1964), the Working Memory factor from the Wechsler Memory Scale-III (WMS-III WM; Wechsler, 1997), the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), and the Multidimensional Pain Inventory (MPI; Kermis et al., 1985). Severity of pain was operationalized by dichotomizing groups based on the MPI Pain Severity factor score.

Results : Groups were equivalent on education and reading achievement but not age (50 vs. 35 years). Multivariate analyses were conducted to determine the relationship between pain severity, working memory, verbal learning and retention while controlling for mood (CES-D) and age. Results reveal a significant relationship between pain severity and cognition ($F = 3.8, p < .05$). The high pain group performed significantly lower on verbal learning (21st percentile) relative to the low pain group (61st percentile) ($F = 7.3, p < .05$), whereas pain severity was unrelated to working memory and memory retention.

Conclusions : After controlling for cognitive effort, depression and age, increased pain severity negatively impacted verbal learning. Findings suggest that pain severity is an important variable to consider when interpreting memory performance.

Correspondence: *Michael R. Lawrence, PhD, Psychiatry, Geisinger Medical Center, 100 North Academy Avenue, Danville, PA 17821. E-mail: mrlawrence@geisinger.edu*

T.R. LUBINSKY, N.D. ANDERSON, F.I. CRAIK & J.B. RICH. Combining Errorless Learning and the Generation Effect: A Benefit to Cued Recall Performance.

Objective: Previous research has demonstrated that memory is enhanced when learning is **errorless** (when subjects are not allowed to guess during learning) and **self-generated** (when target information is generated by the subject). Our goal was to investigate whether the combination of these conditions is even more beneficial, and to determine the underlying mnemonic mechanism (implicit or explicit) of the errorless learning advantage.

Participants and Methods : Twenty four healthy older adults (M age = 73.7) completed 4 memory tasks representing the crossing of errorless / errorful and self-generated / experimenter-provided learning. Each list contained 12 word stems with 4 noun completions each (e.g., banner, band, banana, and bank for the word stem ban___). Memory was tested with free recall and stem-cued recall after each list. Following

presentation and recall of the 4 lists, implicit memory was measured by word-stem completion, involving 30 target stems studied during the experimental phase randomly mixed with 30 nonstudied target stems. Finally, participants completed a yes/no recognition test, which contained 60 target words and 240 lure words.

Results : Consistent with previous research, errorless learning enhanced memory on all memory tests. Despite the lack of a generation effect in free recall, we observed such an effect on cued recall. Moreover the combination of errorless learning and subject-generation was particularly beneficial to cued recall performance. On the implicit task, priming was greater for words studied in the errorless than errorful conditions, thereby supporting the theory that the errorless learning advantage is mediated by implicit memory. Eight individuals with mild cognitive impairment were also tested, and showed these same effects.

Conclusions : Given that retrieval is often cued (e.g., asking the name of a pictured person), the present results suggest that rehabilitation should involve errorless learning, especially that which requires participants to generate the target memoranda themselves.

Correspondence: *Tobi R. Lubinsky, M.A., Psychology, York University, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: tobi@yorku.ca*

J.B. RICH, E.S. STORY, S. KARANTZOLIS & J.A. MANGELS. Enactment and Categorization Effects on Free Recall, Temporal Order, and Recognition Memory.

Objective: Physically enacting commands in subject-performed tasks (SPTs) leads to superior recall and recognition compared to reading the commands aloud in verbal tasks (VTs). This phenomenon, termed the SPT effect, has been attributed to enhanced item-specific processing. In contrast, memory superiority for categorized compared to uncategorized lists is typically attributed to semantic associations between items. Thus, categorization may interfere with the SPT effect. Moreover, there should be no advantage (and maybe even a disadvantage) for SPTs over VTs on temporal order memory, which relies on temporal associations between items. To test these hypotheses, we examined the differential effects of enactment and categorization on free recall, temporal order, and recognition memory.

Participants and Methods : Forty-eight undergraduates (M age = 19.9) were presented with 4 lists of 20 object-action commands in a 2 (Task: SPT vs. VT) \times 2 (Categorized vs. Uncategorized lists) design. The categorized lists contained a random order of 5 commands each from 4 semantic categories. Testing included free recall of object-action pairs ($n=24$) or temporal reconstruction of the order in which the 20 pairs were presented ($n=24$). All participants completed yes/no object recognition and forced-choice action recognition.

Results : As expected, the standard SPT effect observed for free recall, $F=9.41$, $p=.005$, was reversed for temporal order memory, $F=6.34$, $p=.019$, and subsequently reinstated for recognition memory, $F=5.72$, $p<.02$. Contrary to expectations, list categorization had no effect on any memory measure ($F_s < 1$).

Conclusions : Results support the contention that SPTs enhance item-specific processing, which underlies the SPT effect on free recall and recognition memory, both of which benefit from such in-trait processing. Conversely, when memory requires interitem associations rather than enhanced processing of the individual object-action command, SPTs will be detrimental, as observed with temporal order memory testing.

Correspondence: *Jill B. Rich, PhD, Psychology, York University, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: jbr@yorku.ca*

L. BOEGEHOLD, C. GRAVER & L. BIELIAUSKAS. Relationships Between Delirium and Memory Performance in Older Adults.

Objective: Delirium affects up to 50% of elderly hospitalized inpatients and is associated with negative clinical outcomes, but our knowledge re-

garding the neuropsychological impact of delirium only extends to broad cognitive domains. Little is known about specific cognitive functions, such as delirium's influence on different types of memory abilities, but we hypothesized that recognition memory would be less affected by delirium than free recall.

Participants and Methods : Various aspects of memory performance were assessed in 38 delirious and 55 normal control patients. Participants were inpatients in the Extended Care Center of the Ann Arbor VA with a minimum age of 60 ($M=73.95$, $SD=8.32$). A standard neuropsychological screening battery was used to determine delirium status and memory performance, which included the Hopkins Verbal Learning Test (HVLT) and Memorial Delirium Assessment Scale (MDAS). For these analyses, a score of 7 or greater on the MDAS was used as an indicator of clinical delirium as suggested by Lawlor et al. (2005).

Results : The results showed that both groups were statistically equivalent with regard to demographics. The presence of clinically evident delirium was corroborated by significantly worse orientation and attention in the delirium group. Analyses of memory abilities indicated that the delirium group had significantly worse memory performance on the HVLT in immediate and delayed recall. Analyses of the discrimination score revealed that both groups performed equally well on their recognition of true positives, but the delirium group committed significantly more false positive intrusions than normal controls.

Conclusions : Implications of these findings for clinical interactions and decision making are discussed.

Correspondence: *Lindsey Boegehold, University of Michigan, 1750 Brookfield Dr., Ann Arbor, MI 48103. E-mail: alindsey@umich.edu*

D.A. GOLD, E. BARBUTO & N.W. PARK. The Effects of Dividing Attention at Study and Test on the Encoding and Enactment of Novel Naturalistic Actions (NNAs).

Objective: Routine naturalistic actions (NAs), familiar multi-step actions (e.g., shaving), have been shown by our lab to implicate similar cognitive resources as NNAs, unfamiliar multi-step actions (e.g., transferring from a wheelchair). The Schwartz group's investigation of various neurological patient's performance on NAs revealed similar error tendencies with action omissions being the most frequent type of error and omission rates increasing with clinical severity. This study determined the degree to which controlled processing is required in the encoding and enactment of NNAs by dividing attention as NNAs are being viewed, or at test, as they are being enacted, to help identify the cognitive processes involved with encoding and retrieval of action memories. The error profiles in the different conditions were examined to determine the relation to Schwartz's findings.

Participants and Methods : 18 undergraduates participated in this study wherein a repeated measures design was employed with encoding (study; full, divided) and retrieval (test; full, divided) as the factors. The secondary task was an attention demanding working memory task. Using a protocol based upon the Action Coding System, performance was differentiated by non-crux (enabling actions) and crux (central actions) actions and analyzed for errors.

Results : A within subjects ANOVA, with encoding (full, divided) and retrieval (full, divided) as factors, revealed a significant effect of attention at encoding on omission errors of crux actions $F(1,17)= 24.382$, $p=0.000$, whereby more omissions occurred under divided ($M=36.40$, $SD=22.06$) than full ($M=18.53$, $SD=15.56$) attention. There was no significant effect of attention at retrieval. Similar results for non-crux actions were found. The error profile resembled that of Schwartz's research.

Conclusions : Results suggest that controlled processing plays a critical role in the encoding of an NNA but not its enactment; the implication of this finding and error profile for theories of action impairment are discussed. Correspondence: *David A. Gold, B.A., Psychology, York University, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: dagold@yorku.ca*

N. PARE, A.J. SAYKIN, L.A. RABIN, H.A. WISHART, L.A. FLASHMAN, K.E. NUTTER-UPHAM, H.S. PIXLEY & R.B. SANTULLI. Differential Sensitivity and Specificity of Memory Measures for Classification of MCI.

Objective: Episodic memory is the first and most severely affected cognitive domain in Alzheimer's disease (AD) and is also the key early marker in preclinical stages including amnesic mild cognitive impairment (MCI). Although several studies have suggested that list-learning tests are the most sensitive measures for early detection of preclinical AD, the relative ability of memory measures to discriminate between MCI and normal aging has not been well characterized.

Participants and Methods : We examined the sensitivity and specificity of the CVLT-I/II, WMS-III LMI-II, WMS-III VRI-II, DRS-Memory and MMSE Word Recall which were administered to participants in the Dartmouth Memory and Aging Study at baseline evaluation (amnesic MCI, n=48; healthy controls, n=47). Diagnosis of MCI used the Petersen et al. (1999) criteria. Univariate logistic regression was used to estimate the optimal sensitivity and specificity for each measure. Multivariate logistic regression was used to determine the optimal combination of measures for classification.

Results : The CVLT learning score was the most accurate measure (sensitivity =97.9; specificity =80.9) followed by CVLT long and short delay scores. After the CVLT, WMS-III LM Story A Delayed Recall was the next best discriminator (sensitivity =89.6; specificity =74.5). Combining CVLT learning and LM-A Delay yielded the best overall classification (sensitivity = 93.8; specificity =97.9).

Conclusions : Verbal list learning appears most sensitive to amnesic MCI but a combination including delayed passage recall can enhance overall accuracy. Combining verbal learning and delayed memory measures appears to be the optimal strategy for identifying potential MCI participants for clinical trials.

Correspondence: *Nadia Pare, PhD, Psychiatry, DHMC, 1 medical center drive, Lebanon, NH 03756-0001. E-mail: nadia.pare@dartmouth.edu*

A. LOCALBO, W. JACKSON, J. WALLANDER, P. BLANTON, A.H. THURSTIN & T. NOVACK. Validation of a DMTS Task with Persons with Dementia of the Alzheimer's Type.

Objective: To validate a novel, computerized, visual delayed matching-to-sample (DMTS) task as an effective measure of working memory with persons with dementia of the Alzheimer's type (DAT).

Participants and Methods : Twelve persons with mild-moderate DAT (5 male, 7 female) and 21 controls (10 male, 11 female) aged 60+ years were recruited. Participants were administered the Wechsler Memory Scale (WMS), subtests of the Wechsler Adult Intelligence Scale, Revised (WAIS-R), the Controlled Oral Word Association Test (COWAT), and the DMTS task, which was comprised of trials with simultaneous presentation of target and choice designs (visual discrimination), 0-s delays (encoding), and 5-, 10-, 20-, and 30-s delays (retention) between presentation of the target and choice designs.

Results : Performance was similar between groups on simultaneous trials. Main effects of group and delay were significant, but a group X delay interaction was not. Controls obtained perfect scores at 0-s and 5-s delays, while some DAT participants missed these items. Performance across groups declined up to 20-s delays. DAT participants performed worse than controls at 10-s delays ($p=.05$), but performances converged at 20-s delays. At 30-s delays performance improved among controls ($p<.001$), but not DAT participants. In fact, DAT participants' scores did not differ at 10-, 20-, and 30-s delays. Composite delay scores were lower among DAT participants ($p=.02$) and correlated with Visual Memory and Associate Memory of the WMS.

Conclusions : This DMTS task appears capable of detecting memory impairment and differentiating between cognitively impaired and normal groups, and is thus a promising tool for future research.

Correspondence: *Anthony LoGalbo, PhD, VA Puget Sound Health Care System, 2508 164th Ave NE, Bellevue, WA 98008. E-mail: tonylogalbo@hotmail.com*

D.A. GOLD, C.S. LABRISH, O. RERRIE & N.W. PARK. The Effects of Response Type and Divided Attention on the Retrieval of Novel Naturalistic Actions (NNAs).

Objective: Routine naturalistic actions are familiar multi-step actions (e.g., toileting), whereas NNAs refer to unfamiliar multi-step actions (e.g., preparing an unfamiliar recipe). The purpose is to determine the nature of the cognitive processes required to retrieve an NNA. A previous study had shown that dividing attention during retrieval of an NNA had almost no effect on enactment performance. The verbal condition allows for the examination of the role of contextual cues in the recall of NNAs. In the enactment condition, viewing and manipulating the objects required to construct the NNA, along with the partially constructed NNA in hand, may facilitate the recall of the action memory associated with the NNA by serving as retrieval cues.

Participants and Methods : 24 undergraduates took part in the repeated measures design in which the factors were attention (full, divided) and performance (enactment, verbal description), with a secondary attention demanding tasks. NNA performance was measured at the level of crux and non-crux action performance using a protocol based upon the Action Coding System, along with an analysis of error.

Results : A within-subjects ANOVA revealed a significant effect of performance on omission errors of crux actions $F(1,22)=113.34$, $p=0.000$, whereby more omissions occurred under verbal retrieval ($M = 70.10$, $SD = 25.16$) than enactment ($M = 20.83$), $SD = 39.67$), partial Eta-squared = 0.84. Similar results for non-crux actions were found. Dividing attention at retrieval had no significant effect on enactment or retrieval. The error profile resembled that of Schwartz's research, and the implications of the differences will be discussed.

Conclusions : The finding of no effect of dividing attention at retrieval attests to the resilience of action memory retrieval processes, even when there is a distracting activity and an impoverished retrieval environment; however, the differences between verbal and enactment conditions suggests that contextual cues aid in retrieving action memories.

Correspondence: *David A. Gold, B.A., Psychology, York University, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: dagold@yorku.ca*

D.E. GRANT, L.C. BAXTER & R. CASELLI. Interaction between Age, Gender, and APOE Status on Verbal Learning and Memory in Cognitively Normal Individuals At Risk for Alzheimer's Disease.

Objective: Research has demonstrated that younger individuals perform better on tests of verbal memory than older individuals, and women out perform men. Age and gender interactions have also been shown. The $\epsilon 4$ allele of the apolipoprotein gene (APOE) has been shown to negatively effect new learning in cognitively intact individuals. The current study investigated the interaction between age, sex, and APOE status on verbal memory in a group of cognitively normal controls.

Participants and Methods : This is a retrospective study of cognitive performance in 386 healthy individuals 49-82 years of age participating in a longitudinal study on aging. Individuals with at least a first degree relative with a diagnosis of AD were recruited. A standardized neuropsychological test battery including the Auditory Verbal Learning Test (AVLT) was administered to all participants by a trained clinician. A factorial Manova and univariate statistics were conducted comparing AVLT memory performance over a two year interval.

Results : Delayed recall was worse in APOE $\epsilon 4$ carriers ($F=4.115$, $p=.045$) and an interaction between gender and APOE status ($F=5.966$, $p=.016$) indicated that male APOE $\epsilon 4$ carriers had significantly worse memory than any other group. For total word learning, a non-significant trend suggested that male APOE $\epsilon 4$ carriers tended to learn on average 4 fewer words than older men without the $\epsilon 4$ allele, or women regardless of APOE status.

Conclusions : In these cognitively normal individuals, the effect of APOE on long-term memory was specific to men, suggesting that there may be a different vulnerability for memory decline in at-risk individuals depending on their sex.

Correspondence: Douglas E. Grant, PhD, Department of Clinical Psychology, Barrows Neurological Institute, 222 W. Thomas Road, Suite 315, Phoenix, AZ 85013. E-mail: douglas.grant@chv.edu

J. CHIN, Y. KANG, E. JOO & S. HONG. Inconsistency Between the Logical Memory Test and the California Verbal Learning Test in the Left Temporal Lobe Epilepsy.

Objective: Since memory impairment is a main feature of the mesial temporal lobe epilepsy (MTLE), more than single memory test are often used for evaluating their memory deficits. However, we often observe cases where it is not easy to integrate and explain the inconsistent results from several different memory tests. The present study was conducted to examine the neuropsychological characteristics of the patients who showed the inconsistent performance between two verbal memory tests, the Logical Memory Test (LMT) and the Korean-California Verbal Learning Test (K-CVLT).

Participants and Methods : The subjects were 51 left MTLE patients. Among them, 5 patients showed normal performance (>16%ile) on the “delayed recall” of the LMT, but poor performance (<16%ile) on the “long delayed free recall” of the K-CVLT, whereas other 5 patients performed normal performance on the K-CVLT, but poor performance on the LMT. There was no difference in age, educational level, and seizure-onset age between the two groups.

Results : The first group showed better performance on the Wisconsin Card Sorting Test, the Korean-Color Word Stroop Test, and several subtests (Comprehension, Similarities, Block Design, & Picture Arrangement) of the Korean WAIS than the second group, while there were no group differences in visual memory tests, language tests, and IQ (Full, Verbal & Performance) scores.

Conclusions : These results suggest that the second group was more impaired in the frontal/executive functions than the first group and the LMT may require frontal lobe function as well as temporal lobe function. They also suggest that the different mechanisms may be involved in the prose recall test and the word-list recall test, although both tests have been used as representative verbal memory tests.

Correspondence: Yeonwook Kang, Ph.D., Psychology, Hallym University; Okchon-dong, Chuncheon 200702, South Korea. E-mail: ykang@hallym.ac.kr

D. ADDIS, M. MOSCOVITCH, S. BLACK, F. GAO & M. MCANDREWS. Hippocampal Atrophy and Autobiographical Memory in Temporal Lobe Epilepsy: Preliminary Findings.

Objective: The hippocampus has been shown to play a key role in episodic retrieval, particularly for autobiographical memory (AM), but appears less involved in semantic retrieval. Here, we investigated whether the degree of hippocampal atrophy in temporal lobe epilepsy (TLE) correlates with loss of episodic, but not semantic, aspects of AM.

Participants and Methods : Participants included 9 left (LTLE) and 6 right (RTLE) TLE patients (lateralization based on EEG criteria) and 14 age-matched controls. Participants recalled 4 AMs which were transcribed and scored for the number of episodic and semantic details produced. A linear hippocampal width measurement was made on MRI scans at a standardized location on a slice through the long axis of the hippocampus¹.

Results : TLE patients showed significant impairments of the episodic, but not the semantic, component of AM. The RTLE group exhibited significant bilateral hippocampal atrophy relative to controls, and those with LTLE showed a trend for atrophy in the left hippocampus. For the TLE patients, we found a significant correlation (controlling for IQ) between the number of AM details and total hippocampal width for episodic AM but this was not evident for the semantic AM.

Conclusions : This study extends previous work from our group showing that TLE patients exhibit a differential impairment of episodic relative to semantic AM² and that the structural integrity of the hippocampus is correlated with the ability to recollect personal experiences³.

¹Gao et al., *Neurobiol Aging*, 2004

²Viskontas et al., *J Neuroscience*, 2000

³Gilboa et al., *Hippocampus*, 2005

Correspondence: Donna Rose Addis, Ph.D., Dept. of Psychology, Harvard University; Rm. 854, William James Hall, 33 Kirkland St., Cambridge, MA 02138. E-mail: daddis@wjh.harvard.edu

M. MARIANI & D. SHORE. Working Memory, Map Learning, and Spatial Orientation: The Effects of Gender and Encoding Interference on the Acquisition of Survey Knowledge.

Objective: Males code the environment spatially and females verbally. Working memory (WM) research has used dual-task methodology to impede processing in the visuospatial sketchpad and the articulatory loop. The present study explored whether encumbering the subcomponents of WM would result in gender differences on a task of spatial orientation.

Participants and Methods : The sample consisted of 24 male and 29 female students ($M=23.33$; $SD=5.78$). Each participant was tested individually on their ability to study a map containing 14 labelled landmarks while performing 1 of 2 concurrent tasks (i.e., articulatory suppression, and spatial interference). Then, the participant was blindfolded and asked to point to different aspects of the environment. Orientation error was defined as the absolute mean deviation from the actual target, in degrees.

Results : A 3 (interference) by 2 (gender) between-subjects ANOVA revealed a main effect for encoding interference [$F(2, 47)=5.09$, $p=.010$], whereby participants in the control group displayed lower orientation error ($M=15.77$, $SD=9.09$) than either the verbal interference group ($M=25.84$, $SD=13.82$) or the spatial interference group ($M=27.37$, $SD=16.93$). Also, an interaction was observed [$F(4, 92)=2.47$, $p=.050$]. Females performed less accurately than males during articulatory suppression, whereas spatial interference yielded lower accuracy in males than females.

Conclusions : The results imply that the presence of any interference may have resulted in increased attentional demands, likely overwhelming the central executive's capacity to coordinate the activity of each WM subcomponent. The findings also suggest a male tendency to encode survey information spatially and a female tendency to encode it verbally because the gender differences in accuracy were only evident when the expected cognitive mapping strategies were hindered by interference. Thus, the fact that any differential interference effects on information processing were obtained adds support to the presence of dual encoding in WM. Correspondence: *Matias Mariani, M.A., Psychology, University of Windsor, 173 CHS, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: marian7@uwindsor.ca*

K.E. NUTTER-UPHAM, A.J. SAYKIN, R.M. ROTH, L.A. RABIN, H.A. WISHART, N. PARE, L.A. FLASHMAN, H.S. PIXLEY & R.B. SANTULLI. Verbal Fluency Performance in Probable AD, Amnesic MCI, and Older Adults with Cognitive Complaints.

Objective: Verbal fluency deficits are a frequent early finding in Alzheimer's disease (AD) but there has been little examination of these deficits in preclinical stages. In addition, there have been few reports regarding specific subtypes of fluency.

Participants and Methods : We evaluated participants with amnesic mild cognitive impairment (MCI; $N=36$), older adults with cognitive complaints (CC; $N=36$) who did not meet criteria for MCI, patients with probable AD ($N=11$), and healthy controls (HC; $N=30$). Participants completed fluency tests with phonemic (letter) and semantic (category, category switching and verb generation) constraints. Groups were matched and/or adjusted for age, education and sex composition.

Results : As expected, AD patients performed below all other groups. The MCI group performed worse than the HC group on the phonemic, semantic, category switching and verb generation tasks. No significant differences were observed between the CC and HC groups. An orthogonal factor analysis of the fluency measures yielding two factors (word production and category switching) showed a similar pattern of results. **Conclusions :** Verbal fluency measures are sensitive to impairment during the MCI preclinical stage of AD and may contribute to early detection. Subtypes of fluency appear similar in sensitivity to MCI.

Correspondence: *Andrew J. Saykin, PsyD, Brain Imaging Laboratory, DHMC, Dartmouth Medical School, DHMC, Lebanon, NH 03756. E-mail: saykin@dartmouth.edu*

M. LIPSZYC & D. WHITE. Cognitive Processes Underlying False Memory in Older and Young Adults.

Objective: Critical item intrusions during memory tasks are often used to assess false memory. For example, individuals often falsely report the word “sleep” when asked to recall or recognize a list of associates (e.g., bed, rest, awake, etc.). This phenomenon has been explained in terms of failed source monitoring and/or inhibitory control, both abilities thought to be subserved by the frontal lobes. Research suggests age-related changes in frontal lobe function contribute to more false memories for older than young adults; specifically, older adults make more critical item intrusions than young adults (Norman & Schacter, 1997). **Participants and Methods :** We administered the Deese-Roediger-McDermott paradigm (Roediger & McDermott, 1995) to 30 healthy older adults and 30 healthy young adults. Participants attempted recall and recognition of lists comprising 15 associates.

Results : Results confirmed older adults made more critical item intrusions than young adults during recall. However, after accounting for the contribution of noncritical item intrusions ($F(1, 58) = 8.82, p < .005$), there was not a significant age-related difference in critical item intrusions. This finding indicates that older adults are more likely than young adults to make intrusions during recall on false memory tasks in general, but they are not more likely to make critical item intrusions in particular.

Conclusions : To examine the cognitive abilities contributing to intrusions during recall on false memory tasks, source monitoring, inhibitory control, and associative processing were measured. Only source monitoring made a significant contribution to general intrusions, supporting the hypothesis that source monitoring plays a role in age-related differences in false memory.

Correspondence: *Michelle Lipszyc, M.A., Washington University, 615 Westwood, Apt. 6, Clayton, MO 63105. E-mail: Malipszyc@gmail.com*

T.E. SITZER & K. SANDS. The Impact of Psychiatric History on Memory Performance in Adults with Mild TBI: Interpreting Change in the Miserable Minority.

Objective: Psychiatric risk factors have been shown to affect recovery in a subset of mild traumatic brain injury (MTBI) patients. Recovery from MTBI is frequently evaluated using repeated neuropsychological assessment. However, practice effects and regression to the mean can affect change scores and obscure the effects of MTBI on neurocognitive functioning. The aim of this study was to evaluate the role of practice and to establish statistically meaningful methods for assessing memory functioning following MTBI in adults with remarkable psychiatric histories.

Participants and Methods : Test-retest scores for 24 MTBI patients with histories of depression, anxiety, and/or substance use on three variables of the Rey Auditory Verbal Learning Test (RAVLT; Total Trials 1-5, Delayed Recall, Recognition) were compared with the scores of 26 MTBI patients with unremarkable psychiatric histories. Reliable change indices adjusted for expected practice effects were calculated for the group without psychiatric histories and applied to the group with psychiatric histories.

Results : More individual variability was noted in MTBI patients with psychiatric histories as evidenced by lower test-retest reliabilities. Patients with psychiatric histories did not have significantly lower scores on RAVLT variables at baseline or follow-up testing. However, using the 90% confidence interval, the breakdown of reliable change for each RAVLT variable was as follows: Total 4.2% improved, 25% declined; Delayed Recall and Recognition 4.2% improved, 12.5% declined.

Conclusions : This breakdown is likely a reflection of these individuals as part of the ‘Miserable Minority.’ Application of reliable change indices allows for more precise determinations of improvement and decline for MTBI patients with significant psychiatric histories.

Correspondence: *Traci E. Sitzer, Ph.D., Gerontology, University of Southern California, 3715 McClintock Ave, Los Angeles, CA 90089. E-mail: tsitzer@usc.edu*

E. BIZET, I. ROULEAU, C. BRAUN & V. PARADIS. Improvement of prospective memory with episodic priming.

Objective: We all feel that ability to perform an action in the future (prospective memory: PM) depends not only on the perception of the target itself but often on the perception of a stimulus associated with it. This can be explained theoretically by an associative episodic network maintaining and enlarging activation effects. We found no research on this topic. This project aimed to determine whether a prospective cue could be strengthened by an associated prime

Participants and Methods : Since the temporal lobes contribute to associative learning, groups of right (N=11) and left (N = 13) temporal lobectomy (TL) patients and a normal group (N =11) were tested. Stimuli consisted of two PM cues (faces), two prime faces (one for each cue) and 112 distractor faces. Prior to the PM task, a story was told linking the cue face with the prime face. Subjects were exposed to 4 PM cues (2 primed, 2 unprimed) interspersed among 112 distractor faces. The concurrent task consisted of estimating the age of each face, and the PM task of hitting the space bar only when a cue appeared. A prime always occurred 3 trials before its cue.

Results : A main effect consisted of a 19% improvement of PM with primed versus unprimed cue ($p < .003$). The left TL group presented overall lower performances, but without any interaction effect. The beneficial effect of incidentally and episodically learned prime-cue pairings was strong and persistent throughout the task in all groups.

Conclusions : This finding introduces numerous possibilities for further experiments on aspects of PM which correspond to more natural situations.

Correspondence: *Isabelle Rouleau, Ph.D., psychology, UQAM, CP 8888, Succ. centre-ville, Montréal, QC H3C 3P8, Canada. E-mail: rouleau.isabelle@uqam.ca*

M. KRAMER, P. CHIU, V. SCHMITHORST, R.D. BROWN & S. HOLLAND. Neural Correlates of Verbal Encoding Strategies.

Objective: Verbal encoding strategies can dramatically improve episodic memory performance, an important topic for cognitive rehabilitation. We explored their neural substrate in this fMRI study.

Participants and Methods : Young healthy subjects rested or saw concrete nouns presented at 5s each across 30s blocks. Across blocks, subjects were asked to organize the words from different categories into groups (group) or imagine actions being performed on each presented word (action).

Results : Analysis using the General Linear Model (GLM) with a boxcar reference function revealed that relative to rest, the group condition activated a set of brain regions bilaterally including the cerebellum, lingual/fusiform gyrus, lateral and medial prefrontal cortex, middle and superior temporal gyrus, lateral parietal cortex, and the thalamus, with leftward asymmetry. The action condition activated largely the same brain

areas, albeit to a greater extent, but in addition also activated bilateral hippocampus, the right prefrontal cortex and the anterior cingulate. Independent component analyses (ICA) were performed to explore the extent to which these areas function as one or more coherent networks. Preliminary results revealed different component networks: one encompassing the bilateral lingual / fusiform gyri, anterior and posterior cingulate, and right inferior prefrontal cortex (with group > action in activation time course), as well as another network including the hippocampus, thalamus, lateral and midline prefrontal cortex, posterior cingulate, and superior and middle temporal gyrus (with an action > group action time course).

Conclusions : These results delineate the neural substrates important for verbal encoding and suggest the utility of combining ICA with traditional hypothesis driven statistical methods.

Correspondence: *Peter Chiu, PhD, Psychology, University of Cincinnati, 401A Dyer Hall, ML 0375, Cincinnati, OH 45221-0376. E-mail: peter.chiu@uc.edu*

S. RANE, J. NAJERA, L. DAVIS & M. HISCOCK. Are Verbal and Non-verbal Stimuli Registered in Separate Short-Term Memory Systems? An Examination of Serial-Position Curves.

Objective: The Baddeley and Hitch model of working memory posits separate short-term storage of verbal and nonverbal stimuli. Although the fractionation of short-term memory (STM) into verbal and visuospatial components is supported by various studies, other studies have yielded evidence that is consistent with a single unitary mechanism for the recall of both verbal and nonverbal material (e.g., Jones, Farrand, Stuart, & Morris, 1995). We address this issue in an experiment that combines selective interference with the analysis of serial-position curves.

Participants and Methods : Forty-eight university students (24 females, 24 males) participated in the experiment. Stimuli consisted of lists of either 7 letters or 7 dots. The letters were presented sequentially near the center of a computer screen. The dots were presented sequentially in random positions on the screen. Then, during a 15-second interval after presentation of the seventh item, a verbal or visuospatial interference task was performed. Immediately after the interference task, all 7 items from the primary task reappeared on the screen simultaneously and the participant used the computer mouse to indicate the order in which each stimulus had appeared previously. Serial-position curves were computed from these responses.

Results : Serial-position curves for recall of both letter names and dot positions showed significant quadratic trends, $p < .0001$, which reflect similarly bowed functions. Analysis of the final 3 positions yielded comparable recency effects for both kinds of material, although the effect for letters was entirely linear whereas the effect for dots contained both linear and quadratic components. No selective interference was found.

Conclusions : Apart from a minor difference in the shape of the recency function, the experiment yielded no evidence that would support the existence of separate systems for verbal and visuospatial STM. The findings are consistent with previous evidence that STM is subserved by a single, unitary mechanism.

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

C.W. HOPE. Effects of a motor distraction task on the categorization of living and non-living things.

Objective: Understanding how semantic information is organized in the brain is essential for theorizing about all other neuropsychological phenomena. Evidence pertaining to this issue comes from patients that present with deficits in their knowledge for living things, with intact knowledge for non-living things, and from those patients that have the opposite pattern of deficits. Presently, the dominant theory explaining this pattern is known as the sensory/functional hypothesis. This theory states that semantic information is organized

into sensory features and functional/motoric features, and damage to sensory features will differentially effect living things, while damage to functional/motoric features will have a greater impact on non-living things. In support of this, imaging studies have shown greater activation in the left PMv when categorizing non-living things compared to living things. The left PMv is believed to be involved in motor planning suggesting that categorizing non-living things requires the activation of certain motoric features. The present study was designed to further test the hypothesis that the left PMv is more active during the processing of non-living things than living things, suggesting that motoric features are more prevalent in non-living things.

Participants and Methods : In the present study 28 normal undergraduate students categorized a series of 100 line drawings (50 living and 50 non-living). All participants categorized half of the pictures with no distraction and the other half with distraction. The distraction task consisted of transferring marbles one at a time from one container to another using the right hand.

Results : The results showed greater slowing of reaction times for non-living things than living things by the motor distraction task.

Conclusions : The distraction task resulted in greater interference for non-living things suggesting that such items are more dependant on activity in the left PMv. This further supports the sensory/functional hypothesis.

Correspondence: *Chris W. Hope, MA, Psychology, University of Windsor, 516 Oak Avenue, Windsor, ON N9A5E6, Canada. E-mail: iamhoper@hotmail.com*

J.V. MORRONE-STRUPINSKY, L.C. BAXTER & S.D. GALE. Differential Hippocampal Activation in Response to Novel Happy and Sad Baby Faces.

Objective: We previously observed robust activation in the hippocampal region in response to novel valenced stimuli during an fMRI recognition memory paradigm. The current study extended our previous work by expanding the sample size.

Participants and Methods : In forty-eight right-handed participants (30F/18M; ages 19-85), neural activity was compared for novel and previously learned (familiar) items. Pictures of 5 baby faces (3 happy, 2 sad) were presented pseudorandomly 16 times (3 minutes). After a 15-20 minute memory consolidation interval, 5 baby faces were presented intermixed with new faces (half happy, half sad). Participants button pressed for new faces or previously learned faces. We analyzed neural reactivity during recognition to novel vs familiar faces (happy, sad, and combined). Random effects group analysis was performed using SPM2.

Results : Significant activity was observed bilaterally in fusiform and hippocampal regions in response to novel baby faces (happy and sad combined; happy faces alone) compared to previously learned faces. Other regions of activity included left cuneus and left inferior parietal lobule. Novel sad faces produced greater right hippocampal activation than familiar faces, as well as greater activity in right middle occipital, left fusiform, right inferior frontal, left superior frontal, left postcentral, and right precentral gyri.

Conclusions : This study revealed differential activation for happy and sad stimuli within the same memory paradigm. We demonstrated that encoding of happy and sad faces, which are mildly arousing positive and negative stimuli, produces activation patterns specific to the hippocampus. Studies in progress are examining physiological reactivity to elucidate the contribution of arousal to memory function.

Correspondence: *Jeannine V. Morrone-Strupinsky, Ph.D., Clinical Neuropsychology, Barrow Neurological Institute, 222 West Thomas Road, Suite 315, Phoenix, AZ 85013. E-mail: Jeannine.MorroneStrupinsky@chuv.edu*

Psychopathology: Schizophrenia

R.K. KESSLER, T. GIOVANNETTI, L. MACMULLEN, J.E. ROSNER & L. BRENNAN. Naturalistic Action Impairment in Chronic Schizophrenia/Schizoaffective Disorder.

Objective: Everyday action is impaired in schizophrenia, yet few studies characterize the nature of this impairment using performance-based measures. We examined the performance of individuals with schizophrenia on the Naturalistic Action Test (NAT) and compared it to that of other neurologically impaired populations reported in the literature. **Participants and Methods :** Thirteen inpatients (M age = 44.9) with schizophrenia/schizoaffective disorder were administered the NAT, which requires participants to perform three everyday tasks (e.g., preparing toast and coffee). Performance was videotaped and coded to quantify overall impairment (NAT Score) and specific errors (sequence, substitution, etc.). The distribution of error types was compared to that of other populations (dementia, stroke, and brain injury) that have been shown to perform similarly on the NAT.

Results : Overall performance was impaired (M NAT Score = 13.5), as indicated by cutoff scores in the manual (14.9). The distribution of error frequencies was distinct from those observed in other populations. Specifically, schizophrenia participants made fewer omissions (22% vs 44%) and more sequencing errors (37% vs 21%). Furthermore, unlike other populations, which show significant negative correlations between commissions and accomplishment scores (e.g., dementia $r = -.42$, $p = .001$), schizophrenia participants showed no relationship between these NAT variables.

Conclusions : Individuals with schizophrenia exhibit impaired performance on the NAT. The distribution of error types and relationships between NAT variables shown by this population is distinct from that of other neurologically impaired populations and may reflect differential cognitive deficits. Thus, the NAT appears to be a promising tool for assessing and describing everyday action impairments in schizophrenia. Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

Visuospatial Abilities

K.D. SULLIVAN, E. WEBER, S. DAVIDSDOTTIR & A. CRONIN-GOLOMB. Visuoconstruction in Two Frontostriatal Disorders: HIV and Parkinson's Disease.

Objective: Human Immunodeficiency Virus-1 (HIV-1) and Parkinson's disease (PD) are associated with changes in spatial abilities. Recent data suggest pathophysiological resemblances between these disorders within the frontostriatal brain system, which has reciprocal connections with parietal cortices. We compared the performance of individuals with HIV and PD on a simple visuoconstruction task. The constructions were analyzed using traditional quantitative scoring and a finer componential analysis.

Participants and Methods : There were 45 nondemented participants: 15 with asymptomatic HIV-1 disease, 15 with PD (9 left hemiparkinsonian: greater right than left basal-ganglia dysfunction [LPD], 6 right hemiparkinsonian: greater left than right basal-ganglia dysfunction [RPD]) and 15 healthy adults. All were administered the MMSE intersecting pentagons task and received a full score of 1 by traditional scoring. Componential analysis included ratios on seven measurements of horizontal and vertical dimensions of the primary forms and inner intersecting pentagon.

Results : Compared with the model stimulus, LPD drew the most compressed figures across all dimensions (82.4%) followed by RPD (90.4%), HIV (92.4%), and control (99.1%). Differences between control performance and patients were significant for LPD ($p=.003$) with a trend for RPD and HIV. HIV differed from LPD ($p=0.007$) but not from RPD ($p=0.55$).

Conclusions : This is the first study to directly compare visuoconstructive abilities in PD and HIV. The data suggest that individuals with HIV resemble those with RPD more than those with LPD in their ability to accurately reproduce a simple geometric figure. HIV allows relatively good visuoconstruction (as in RPD). In LPD, right hemisphere dysfunction confers more serious consequences on visuoconstructive performance. Correspondence: *Karen D. Sullivan, MA, Neuropsychology, Boston University, 65 Brookside Ave, Boston, MA 02130. E-mail: kds@bu.edu*

T.M. LEVINE, A.M. CLEMENTS, J.R. ABEL & L.E. CUTTING. Interrelationships Between Behavioral Performance and Neural Mechanisms Associated with Different Visuospatial Tasks.

Objective: Behavioral and neural mechanisms associated with visuospatial processing are of interest; however, few studies have examined these interrelationships across different visuospatial measures.

Participants and Methods : To investigate this issue, 17 typically developing children (ages 6 through 15) completed two neuropsychological tests, Benton's Judgment of Line Orientation (BJLO) and Visual Closure (VC) from the Developmental Test of Visual Perception, as well as a fMRI JLO analogue (JLO-A) task.

Results : Inter-correlations between behavioral performance on each task (accuracy) suggested significant overlap (BJLO, VC, $r = 0.758$; BJLO, JLO-A, $r = 0.511$; VC, JLO-A, $r = 0.796$; all $p < .05$). Multiple regression and conjunction analyses were used to identify core areas of activation predicted by accuracy across tasks; results revealed all tasks predicted activation in right medial frontal gyrus, right inferior parietal lobe, left medial temporal gyrus, bilateral posterior cingulate, extrastriate, and cerebellum. Simple regression analyses were also conducted using accuracy scores from each task to predict brain activation. Results indicated that better performance on the JLO-A task was correlated with the right precuneus and superior parietal lobe activation; on BJLO task, better performance was correlated with cerebellum activation; and on the VC, better performance was correlated with bilateral inferior parietal lobe and left cerebellum activation.

Conclusions : Findings suggest that there are significant overlaps between measures, and that behavioral performance across tasks predicts core areas of activation in areas traditionally linked to visuospatial processing. However, results also indicate that each visuospatial task places demands on somewhat different brain regions, suggesting that each is tapping somewhat distinct processes.

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*

A.M. BARRETT & C.E. CRAVER-LEMLEY. "Not What You See, But How You Say It." Spatial Bias in Young and Aged Subjects.

Objective: Healthy subjects may demonstrate leftward bias performing visual-spatial tasks. Young participants may also be left-biased when making a drawing to depict the syntactic action of a sentence, placing the sentence subject leftward of the sentence object on the page—a spatial-syntactic, implicit task. A leftward visual-spatial bias may decrease with aging, but in a previous study of Korean subjects, Barrett et al. (2002) noted age differences in spatial-syntactic leftward bias. We wished to investigate this in Western young and aged people.

Participants and Methods : We assessed both horizontal and radial (near-far) visual spatial, and spatial-syntactic bias, in healthy young ($n = 60$) and aged ($n = 60$) participants by assessing line bisection (visuospatial, explicit), placement of house/tree/person drawings (visuospatial, implicit), and position of subject and object in a drawing depicting 3 dictated sentences (spatial-syntactic, implicit).

Results : Aged subjects lacked leftward explicit horizontal bias (line bisection mean 0.8 mm leftward, $p = 0.17$, n.s.) and young subjects lacked implicit far bias (picture placement mean 3.2 mm leftward, $p = 0.22$, n.s.) but otherwise both groups demonstrated left and far bias on explicit (young: 2.6 mm leftward, 3.8 mm far, both $p < 0.001$; aged: 2.4 mm far, $p < 0.001$) and implicit tasks (young: 5.0 mm leftward, $p = 0.025$; aged: 8.2 mm left-

ward, 5.6 mm far; both $p < 0.005$). Both horizontal and radial visual spatial bias were smaller in magnitude in aged participants when explicitly ($p = 0.008$; $p = 0.048$), but not implicitly assessed. Implicit far bias, though task-dependent, was greater overall in aged subjects ($p = 0.006$). Although both aged ($p = 0.003$) and young ($p < 0.001$) subjects had left bias on the implicit, spatial-syntactic, drawing placement task, we observed less left bias in aged than in young subjects ($p = 0.045$).

Conclusions : These results may be consistent with relatively less dominance of right, as contrasted with left hemisphere, dorsal spatial systems in aging. 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*

THURSDAY MORNING, FEBRUARY 2, 2006

Symposium 4

9:00–10:30 a.m.

The Complementary Impact of Functional Imaging and Lesion Analysis in Neuropsychology

S. RAO. The Relative Sensitivity of Neuropsychological and fMRI Measures for Identifying Early Impairment in Frontostriatal Circuits.

During the past decade, we have developed a series of functional MRI activation tasks in healthy control subjects that probe specific frontostriatal circuits associated with time reproduction, time perception, and motor sequencing. More recently, we have applied these activation tasks to gain a better understanding of the frontostriatal circuits that underlie the neurobehavioral deficits in Parkinson's and Huntington's disease. Data will be presented comparing the relative sensitivity of neuropsychological and fMRI measures in identifying the early stages of neurodegeneration, assessing symptomatic and neuroprotective treatment efficacy, and measuring disease progression. Finally, the complementary roles of neuropsychological and fMRI measures for assessing basal ganglia diseases will be discussed.

Correspondence: *Kathleen Y. Haaland, Ph.D., NM VA Healthcare System, Research Service (151), 1501 San Pedro SE, Albuquerque, NM 87108. E-mail: khaaland@unm.edu*

D. TRANEL. Neural Correlates of Lexical Retrieval as Revealed by PET and Lesion Approaches.

We have used a combination of functional imaging (mainly PET) and lesion studies to investigate the neural correlates of retrieving words for various conceptual (e.g., persons, landmarks, animals, tools) and grammatical (e.g., nouns, verbs, prepositions) categories. Neuropsychological observations in patients with lesions provided much of the initial impetus for this work, and the PET approach solidified lesion findings, revealed new facts, and prompted important unanswered questions. By now, a decade of such studies has witnessed many iterations of lively cross-fertilization between lesion work and PET work. Our studies have revealed important new insights about knowledge retrieval systems in left temporal and left frontal regions, and these in turn have furnished clues about designing rehabilitation programs for brain-injured patients.

Correspondence: *Kathleen Y. Haaland, Ph.D., NM VA Healthcare System, Research Service (151), 1501 San Pedro SE, Albuquerque, NM 87108. E-mail: khaaland@unm.edu*

L. FELLOWS. Using Literature Citations to Assess the Impact of Functional Neuroimaging and Lesion Studies on Cognitive Neuroscience.

Over the last several years, functional neuroimaging has risen in prominence relative to the lesion studies that formed the historical core of work in cognitive neuroscience. Given that lesion studies can (in principle) provide evidence for necessity claims, while functional neuroimaging studies cannot, one might expect that lesion studies would nonetheless continue to have greater scientific impact. In a recent bibliometric study of the effect of method used on a paper's impact, we found quite the contrary. Functional neuroimaging studies were cited three times more often than lesion studies throughout the time span we examined. The causes and implications of this striking trend will be discussed.

Correspondence: *Kathleen Y. Haaland, Ph.D., NM VA Healthcare System, Research Service (151), 1501 San Pedro SE, Albuquerque, NM 87108. E-mail: khaaland@unm.edu*

A. CHATTERJEE. The Inferential Logic of Lesion and Functional Neuroimaging Methods.

Lesion and functional neuroimaging studies contribute complementary and converging evidence to our understanding of brain-behavior relationships. Imaging studies, despite their scientific impact, are sometimes criticized for being simple-minded neo-phrenology and being limited in their correlative nature. By contrast, lesion studies lend themselves to causal inferences about the relationship of brain and behavior. Paradoxically, lesion studies have focused mostly on the functional rather than the neural architecture of cognition and more recent analytic techniques suggest that functional imaging is coming of age, and can approach questions not addressed easily by other methods. Newer structural mapping techniques adapted from advances in imaging methods are poised to contribute to the power of lesion studies.

Correspondence: *Kathleen Y. Haaland, Ph.D., NM VA Healthcare System, Research Service (151), 1501 San Pedro SE, Albuquerque, NM 87108. E-mail: khaaland@unm.edu*

K.Y. HAALAND, A.K. CHATTERJEE, D. TRANEL, R. STEPHEN & L. FELLOWS. The Complementary Impact of Functional Imaging and Lesion Analysis in Neuropsychology.

Symposium Description : Historically, our understanding of brain-behavior relationships has been most strongly influenced by behavioral studies of brain damaged patients. More recently, the advent of functional imaging has allowed us to identify multiple parallel circuits that support complex cognitive functions. Lesion studies and functional imaging studies have distinct advantages and disadvantages, and the pur-

pose of this symposium is to argue that many questions can be best answered by using both approaches. Kathleen Haaland will moderate the session and provide a historical context. Daniel Tranel and Stephen Rao will summarize their work, which attacks the same question in somewhat different ways by using both methods. They will argue that both approaches provide better specification of the neural systems critical for specific cognitive operations. Lesley Fellows will discuss the higher impact of functional imaging studies relative to lesion studies based upon literature citations, and Anjan Chatterjee will discuss these issues in the context of their conceptual impact on neuropsychology.

Correspondence: *Kathleen Y. Haaland, Ph.D., NM VA Healthcare System, Research Service (151), 1501 San Pedro SE, Albuquerque, NM 87108. E-mail: khaaland@unm.edu*

Poster Session 2/9:00–10:30 a.m.

Assessment/Psychometrics

R.J. SPENCER, P.P. GIGGEY, S. RICE, L. KATZEL & S.R. WALDSTEIN. Incremental Validity Associated with Administration of the Full Interference Trial of Golden's Stroop Color-Word Test.

Objective: The Stroop Color-Word Test (SCWT; Golden, 1978) assesses processing speed and executive function. The interference trial (IT), which requires identifying the ink-color of color names (e.g., RED) that are printed in incongruent colors, is typically discontinued after 45 seconds. Here, we examined the incremental validity of completing all 100 IT stimulus items in predicting performance on the Trail Making Test, a similar measure of processing speed and executive function.

Participants and Methods : Participants were 127 stroke- and dementia-free, community-dwelling older adults enrolled in a study of cardiovascular risk factors, brain, and cognition (63% male; mean age = 66 years).

Results : After controlling for age, speed of performance (in # items/second) at 45 seconds (SCWT-IT1) and from 45 seconds to completion of 100 items (SCWT-IT2) were significantly correlated with one another ($r = 0.70$, $p < .001$), and with Trails A (r 's = -0.39 and -0.44) and Trails B (r 's = -0.34 and -0.41), respectively. Principal components analysis was used to derive a linear combination of Trails A and B. Hierarchical regression with the resultant Trails factor score (TFS) as criterion indicated age (step-1) explained 13% of TFS variance and SCWT-IT1 (step-2) explained an additional 16%. SCWT-IT2 (step-3) contributed another 6% (for a total of 35% explained variance), yet attenuated variance explained by SCWT-IT1 to nonsignificance. In the final model, age, SCWT-IT1, and SCWT-IT2 uniquely explained 4%, 1.2% and 5.9% of TFS variance, respectively.

Conclusions : These findings suggest that administration of the longer version of the SCWT-IT provides incremental construct validity, which may justify extra administration time.

Correspondence: *Paul P. Giggey, M.A., Laboratory of Personality and Cognition, National Institute on Aging, Gerontology Research Center 5600 Nathan Shock Drive, Baltimore, MD 21224-6825. E-mail: pgigge1@umbc.edu*

P.P. GIGGEY, M.H. KABAT, R.J. SPENCER & R.L. KANE. Linear and Nonlinear Practice Effects in Observed on Timed Measures in Healthy Men: Findings from The Depleted Uranium Study.

Objective: Delineating practice effects from genuine neurocognitive change poses continuing challenges for clinicians and researchers interpreting repeated assessment data. The current investigation examined the longitudinal relations of baseline age and length of follow-up on performance on Trails-A, Trails-B and Digit Symbol-Coding across multiple assessments.

Participants and Methods : Participants, 29 male veterans (ages 22–45 at baseline; 70% Caucasian), generally healthy, community-dwelling volunteers, were examined at approximately two-year intervals as part of a prospective investigation of the effects of depleted uranium exposure. A mixed model approach was used to account for differences in time between follow-up assessments. Separate mixed-effects regression analyses were conducted for each of the three timed measures, using the predictors urinary uranium level (UUL), WAIS full-scale IQ (FSIQ), Beck Depression Inventory (BDI), age, time of follow-up (Interval), and Interval squared. A backward elimination approach involving 3 iterations was used, starting with all main effects and 2-way interactions.

Results : Results indicated that Interval and its quadratic term were the only significant effects in the final reduced models. Plots generated from final models yielded contrasting effects of time on performance. Trails-A performance improved dramatically at first (47 seconds at baseline to 23 seconds by the third administration), then dramatically deteriorated, exhibiting a U-shaped relationship with time. Trails-B performance worsened over the first 2 administrations and improving thereafter, and Digit-Symbol-Coding performance exhibited more subtle improvement over the first 2 administrations, but deteriorated thereafter.

Conclusions : These results suggest that complex, nonlinear interactions exist among the specific test administered and performance on any future administration.

Correspondence: *Paul P. Giggey, M.A., Laboratory of Personality and Cognition, National Institute on Aging, Gerontology Research Center 5600 Nathan Shock Drive, Baltimore, MD 21224-6825. E-mail: pgigge1@umbc.edu*

R.C. CHAN, M.Y. GUO, Z.J. XIE & X.B. ZOU. Psychometric properties and discriminative validity of the Chinese version of the Test of Everyday Attention for Children: An exploratory study in children with ADHD and healthy controls.

Objective: The present study was to validate the Chinese version of the Test of Everyday Attention for Children (C-TEAch). In particular, it aimed to study the test-retest reliability, constructive validity and the discriminative validity of this test.

Participants and Methods : For study I, a sample of 20 healthy primary school children took part for the test-retest and construct validity part. The C-TEAch as well as a comprehensive set of tests of attention were administered to all participants. They had the retest of the C-TEAch one month later. For study II, 22 children with ADHD and 22 healthy controls matched in gender, age and IQ were recruited. All received the same set of tests as in study I.

Results : For study I, most of the subtest got impressive test-retest reliability and the reliability improved significantly when these collapsed into three attentional factors. For study II, the ADHD group performed significantly worse than the healthy controls in 5 subtests out of a total of 9 in the C-TEAch ($p < 0.05$).

Conclusions : The findings suggest that the C-TEAch subtests have impressive test-retest and construct validity. Moreover, the majority of the subtests are able to discriminate out those children with ADHD from the healthy controls in terms of sustained attention, divided attention, and attentional switching.

Correspondence: *Raymond C. Chan, Ph.D., Psychology, Sun Yat-Sen University, NA, Guangzhou 510275, China. E-mail: rckchan2003@yahoo.com.hk*

J.R. CRAWFORD & P.H. GARTHWAITE. Regression Equations in Neuropsychology: Methods for Comparing Predicted and Obtained Scores.

Objective: In contrast to the standard use of regression (in which an individual's score on the dependent variable is unknown), neuropsychologists are often interested in comparing a predicted score with a known obtained score. Examples include comparing a patient's obtained

score on a neuropsychological test with her/his predicted score based on demographic variables (in order to detect a deficit) or comparing score at retest with the score predicted from earlier testing (to assess whether there has been a change in neuropsychological functioning). The objectives of the present study were to develop methods for drawing inferences concerning the discrepancy between predicted and obtained scores.

Participants and Methods : The methods are derived from statistical theory and are evaluated using Monte Carlo simulation.

Results : Methods are obtained for testing for a statistically significant discrepancy between a patient's predicted and obtained scores (through extending upon an observation made by Crawford & Howell, 1998). The method also simultaneously provides a point estimate of the percentage of the (healthy) control population that would exhibit a larger discrepancy. In addition, extending upon earlier work by Crawford & Garthwaite (2002), a method of obtaining accompanying confidence limits on this percentage is presented. Monte Carlo simulations confirm the validity of the methods and demonstrate that alternative (but commonly used) approaches provoke inflation of the Type I error rate. Computer programs that implement the methods are described and made available. The presentation of these methods will be non-technical and will use examples drawn from clinical research and practice.

Conclusions : In neuropsychological research and practice it is often necessary to compare a patient's obtained score with that predicted by a regression equation. The present methods improve upon existing methods, can be used with new or existing (i.e. published) equations, and can be applied rapidly using the accompanying programs.

Correspondence: *John R. Crawford, PhD, Psychology, Aberdeen University, King's College, Aberdeen AB24 2UB, United Kingdom. E-mail: j.crawford@abdn.ac.uk*

J. SUHR & J. NAMITZ. Diagnosis Threat and Neuropsychological Performance in Pregnancy.

Objective: It is a common stereotype that women experience cognitive decline during pregnancy. Empirical evidence for such decline is mixed at best. Though many physiological causes have been suggested for pregnancy-associated cognitive decline, none have been supported in existing literature. We examined whether negative expectations (termed diagnosis threat in previous work) contribute to poorer cognitive performance in pregnancy. We hypothesized that pregnant women exposed to diagnosis threat would perform worse on neuropsychological tests than women not exposed to diagnosis threat.

Participants and Methods : Women in their third trimester of pregnancy were randomly assigned to one of two groups: 1) diagnosis threat, who were told the specific purpose of the study was to examine neuropsychological performance in pregnancy, or 2) controls, who were told the purpose of the study was to examine pregnancy and birth-related pain expectations, but who completed the same neuropsychological tests as the diagnosis threat group. The test battery included a word list learning task (using pregnancy- and birth-associated words), a semantic fluency task (boy's names from the DKEFS), and the Working Memory Index subtests of the WAIS-III.

Results : The two groups were not different in age, education, or self-reported symptoms of depression, pain, fatigue, or amount of sleep. Pregnant women exposed to diagnosis threat performed significantly worse than controls on list learning and semantic fluency tasks; groups did not differ on working memory.

Conclusions : Results further support prior findings of the effect of negative expectations on neuropsychological performance and emphasize the importance of considering a patient's premorbid expectations when interpreting test results.

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

A. CALENS & T.B. ATCHISON. Effects of Altering Instructions and Administration of the Matrix Reasoning Task on the Wechsler Adult Intelligence Scale- Third Edition.

Objective: The purpose of this study was to examine the effect of changes in instruction and administration procedures on the MRT of the WAIS-III. First clarification of existing instructions to explicitly state no time limit for the MRT task was employed (Knight, 2003). The second category was the effect of time limits on the MRT. A relatively short limit (e.g. 20 seconds) and more moderate limit (e.g. 60 seconds) were employed.

Participants and Methods : Participants were 112 students enrolled in general psychology courses, 63.9% were female. The average age was 20.03 (SD=3.6 range 18 - 33). Mean IQ scores were: verbal: 105.22, performance: 104.62, and full-scale IQ: 105.53. No group differences were observed on either age or IQ. Two participants were excluded on the basis of poor effort.

Results : There was no significant difference in the mean correct responses between the explicit instructions condition and the control or between the 60-second condition and control conditions. Participants in the 20-second condition achieved significantly fewer correct responses than the controls. Furthermore, no significant differences in correlation coefficients were found between matrix reasoning and the three measures of IQ when a time limit was added.

Conclusions : Neither a moderate time limit (60 sec.) nor explicit instructions appear to effect score or internal relationships for MRT in this sample. Use of time limits to control administration time on the MRT in clinical samples is not advised. However, the current results indicate studies in clinical samples could be useful.

Correspondence: *Timothy B. Atchison, Ph.D., Behavioral Sciences, West Texas A&M University, P.O. 60876, Canyon, TX 79016-0001. E-mail: tatchison@mail.utamu.edu*

J. SUHR & B. SPICKARD. Exploration of the Diagnosis Threat Effect in a Chronic Pain Population.

Objective: Prior research has demonstrated that individuals with a history of head injury exposed to negative stereotypes about neuropsychological consequences of head injury perform more poorly on tests than similar individuals not exposed to negative stereotypes, an effect we call "diagnosis threat" (Suhr & Gunstad, 2002, 2005). The present study continued to explore diagnosis threat, using a chronic pain population. We hypothesized that individuals with chronic pain exposed to diagnosis threat would perform worse on neuropsychological tests relative to matched individuals not exposed to diagnosis threat.

Participants and Methods : Individuals with a history of chronic headaches were randomly assigned to receive either neutral instructions (controls, n=18) or to have attention called to research suggesting negative cognitive effects of chronic pain (diagnosis threat, n=20). Groups were not different in age, education, gender, or headache history. Individuals performing poorly on an effort measure (Word Memory Test; WMT) were excluded, n=2 controls. Depression was measured at baseline, while ratings of state anxiety were completed after the neuropsychological battery, which included WMT, Complex Figure Test (CFT), Trailmaking Test, and several subtests of WAIS-III.

Results : Consistent with previous studies, diagnosis threat group performed worse on delayed memory, but was not different in general intellect, attention/ working memory, psychomotor speed, or executive functioning, relative to controls. Anxiety and depression were not related to performance. Effort as assessed by WMT was related to CFT recall in the control group only.

Conclusions : Results provide further support for the diagnosis threat effect, but offer little support for psychological state or effort as explanatory factors.

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

M. HISCOCK, J. CAROSELLI, K.M. MILLER & C.E. DAVIS. Why Do University Students Perform Poorly on the Iowa Gambling Task?

Objective: Numerous clinical studies have shown that the Iowa Gambling Task (GT) is sensitive to various disorders that entail impaired integration of emotion and cognition. Nonetheless, many university students also perform poorly on the GT. In two previous studies with large samples of undergraduates, we found that only 30-35% of students made advantageous choices on more than 50 of 100 trials. In the present study we examined the basis for poor performance in university students by manipulating the information that subjects receive and the complexity of the task.

Participants and Methods : Seventy-two university students were administered either (1) a standard GT, (2) a GT that included an explicit warning about penalties, or (3) a simplified GT that involved only 3 card decks instead of the usual 4 decks. Twenty-four undergraduates (12 males, 12 females) were assigned randomly to each condition.

Results : Overall, 36% of the participants made advantageous selections on more than half of the trials. Experimental condition did not have a significant effect on deck selection. Within the simplified condition, however, performance varied according to the deck that had been eliminated, $p < .001$. When one of the two advantageous decks was eliminated, the percentage of participants making advantageous choices on the majority of trials was 17%. In contrast, when one of the two disadvantageous decks was eliminated, 75% of participants made advantageous choices on at least half of the trials.

Conclusions : The poor performance of university students on the GT cannot be attributed either to insufficient awareness of penalties or to excessive task complexity. This conclusion is consistent with subjective reports collected in a recent study by Maia and McClelland. Deck selections are influenced strongly, however, by the relative number of advantageous and disadvantageous decks. This availability effect seems to reflect students' failure to implement a consistent strategy for maximizing their cumulative winnings.

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

N. CARLOZZI & M.D. HORNER. Factor Analysis of the Repeatable Battery for the Assessment of Neuropsychological Status.

Objective: The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) is a screening measure consisting of 12 subtests that create five Index Scores: Immediate Memory (List Learning, Story Memory), Visuospatial/Constructional (Figure Copy, Line Orientation), Language (Picture Naming, Semantic Fluency), Attention (Digit Span, Coding), and Delayed Memory (List Recall, List Recognition, Story Recall, Figure Recall). We examined the factor structure of the RBANS to determine if it reflects the five Index Scores.

Participants and Methods : 102 consecutive referrals to a VAMC Memory Disorders Clinic were administered the RBANS during standard clinical evaluation. The 12 individual subtests of the RBANS were subjected to a principal factor analysis extraction with an oblique rotation.

Results : Results yielded two factors; the first accounted for more than 50% of the variance, while the second accounted for only 9%, suggesting that the data would be better conceptualized as a unidimensional construct. A second factor analysis was then conducted forcing five factors; the factors included (1) verbal memory (Story Memory, List Recognition, List Recall); (2) visuospatial and visual-motor tasks (Figure Copy, Line Orientation, Coding); (3) attention (Digit Span); (4) memory and verbal fluency (List Learning, List Recall, Figure Recall, Semantic Fluency); and (5) no easily discernible pattern (Picture Naming, List Recognition).

Conclusions : These findings do not support the domains described by the RBANS Index Scores, which might not truly reflect discrete cognitive domains despite their face validity. Therefore, clinicians might place more emphasis on the Total Score and individual subtest scores than the Index Scores during interpretation.

Correspondence: *Noelle Carlozzi, M.S., Oklahoma State University, 306 White Church Lane, Summerville, SC 29485. E-mail: carlozzi@musc.edu*

L. SHERIDAN, H.E. FITZGERALD, K.M. ADAMS, J.T. NIGG, M.M. MARTEL, L.I. PUTTLER, M.M. WONG & R.A. ZUCKER. Symbol Digit Modalities Test: Normative Data in non-clinical adults.

Objective: Despite widespread use of the Symbol Digit Modalities Test (SDMT; Smith, 1968; 1982) in clinical settings, there has been a paucity of available adult normative data for this instrument. Our purpose here was two-fold: to present normative data from a community based, non-clinical adult sample, and to identify if and which demographic variables had an impact on performance.

Participants and Methods : Data were taken from the Michigan Longitudinal Study (Zucker et al., 2000), a prospective, community-based study of high-risk families: for these analyses, only adults from the matched control sample were used ($N = 238$; 165 females, 73 males).

Results : Descriptive statistics are presented to provide normative data for a non-clinical adult sample by gender, age range and years of education. Bivariate correlations suggested some relationship between demographic and SDMT variables for women; specifically between years of education and written and oral scores ($r_s = .23$ and $.25$, $p_s < .05$, respectively). In other words, as women's years of education increased, both their written and oral SDMT scores increased. These correlations were not significant for men. However, a MANOVA examining the relative influence of demographic variables (i.e., age, sex, education, income) indicated that performance was not significantly affected by any of the demographic variables (all F_s (2, 208) < 3.64 ; $p_s > .05$).

Conclusions : Although the literature does point to age differences in SDMT performance, the age range of our sample might not have been a long enough span to examine such effects, as might be found in a geriatric sample. These results suggest that, within the age range studied, the SDMT is a robust neuropsychological screening measure that is not significantly affected by age, sex, education or income. Future research should investigate this issue using a broader age range.

Correspondence: *Laura Sheridan, M.A., Psychology, MSU, 4660 S. Hagadorn Rd., Ste 620, East Lansing, MI 48823. E-mail: sherid41@msu.edu*

F. IRANI SIVASEGARAN, E. MAMIKONYAN, S. LIPPA, T. SWIRSKY-SACCHETTI & S.M. PLATEK. Assessing the Self through the Self/Other Word Association Test (S/O WAT).

Objective: To introduce and evaluate the clinical utility of a quick, categorical fluency measure of self (Self/Other Word Association Test - S/O WAT) in neuropsychological evaluations

Participants and Methods : A sample of 48 outpatients (mild traumatic brain injury, dementia and other neurological conditions) referred to a private neuropsychology clinic completed the WAIS and MCMI as part of a larger neuropsychological battery. Participants were also administered the S/O WAT which measures the quality and quantity of word production related to self and a familiar 'other' within restricted search conditions.

Results : Irrespective of clinical condition, patients were significantly more likely to list words describing 'others' than themselves; particularly negative words for self and positive or neutral words for 'other'. Most words were verbal descriptors, personality traits or physical descriptors. Patients were more likely to refer to themselves with concrete words and 'other' with abstract words. The greater the level of depression the more likely patients were to describe themselves using negative words. Word length of both self and 'other' words was negatively correlated with verbal IQ, where higher verbal IQs were associated with shorter words.

Conclusions : The clinical utility of including a measure of self/other word production in neuropsychological evaluations is highlighted here. For instance, the quality of words used to describe oneself and 'others' is related to level of depression and verbal IQ. Variables such as type of word, word valence and concreteness can also provide additional insights about patients metacognitive representations of self and others. Correspondence: *Farzin Irani Sivasegaran, MS, Psychology, Drexel University, 107 Victoria court, Malvern, PA 19355. E-mail: fi24@drexel.edu*

C.M. DEVENEY, S. NAJMI, K.R. LISSA, A.M. HOLLIS & M.G. O'CONNOR. Neuropsychological Predictors of On-Road Driving Performance.

Objective: Studies have shown that the Trail Making Tests (A & B) predict driving competence in elders with and without dementia. These tests provide valuable information regarding aspects of attention and visual scanning critical for driving and they are easy to administer. However, they are of less value in the assessment of patients with limited intellectual resources or for whom English is not a primary language. In these cases, the Color Trails Test might be a reasonable alternative. The goal of the current study is to examine the utility of the Color Trails Test in the prediction of driving performance.

Participants and Methods : Participants (n=22) were referred for driving evaluations through the DriveWise program at Beth Israel Deaconess Medical Center. Participants varied with respect to cognitive abilities, age, and medical status. A brief set of neuropsychological tests was administered followed by a road-test.

Results : Preliminary findings indicated a marginal correlation between Color Trails-2 completion-time and road-test outcome ($r=.37, p=.09$). The trend towards significance was noteworthy given the small sample size. The correlation between Color Trails-1 completion-time and road-test outcome was weaker ($r=.27, p=.23$). Road-test outcome correlated significantly with Trails-A ($r=.43, p<.05$) and Trails-B ($r=.45, p<.05$) but not with the Boston Naming Test, the Stroop Test and the Logical Memory Test.

Conclusions : The Color Trails Test may be a valid predictor of on-road driving performance. Further studies should examine whether the Color Trails Test is more useful than Trails A & B in the prediction of driving performance with non-native English speakers.

Correspondence: *Margaret G. O'Connor, Ph.D., Neurology, Beth Israel Deaconess Medical Center, 330 Brookline Avenue, Boston, MA 02115. E-mail: moconnor@bidmc.harvard.edu*

A.L. JEFFERSON, S. WONG, T.S. GRACER, A. OZONOFF, S. LEVENSON, R.C. GREEN & R.A. STERN. Performance on the 30-item even version of the Boston Naming Test (BNT): Comparing normal control participants (NC) to those with mild cognitive impairment (MCI) and Alzheimer's disease (AD).

Objective: Abbreviated neuropsychological protocols are increasing secondary to time-constraint provisions within healthcare delivery. In response to this trend, we present geriatric performances for the BNT 30-item even version for participants of several diagnostic categories.

Participants and Methods : This study utilized data from the BU-ADC registry. Participants (n=436, ages 55-102) were diagnosed as NC (n=214), MCI (n=155), or AD (n=67) by multidisciplinary team consensus based on a comprehensive neurodiagnostic evaluation. Neuropsychological assessment included the BNT 30-item even version.

Results : An ANOVA yielded a significant main effect for diagnosis ($F(2, 430)=63.84, p=.001$). Post-hoc comparisons indicated that the NC group ($M=28.67, SD=1.77$) outperformed both MCI ($M=26.07, SD=4.38$) and AD ($M=21.78, SD=5.06$) groups and the MCI group outperformed the AD group. Normative data generated for the NC participants revealed a significant between-group difference for gender (males $M=29.05, SD=1.69$; females $M=28.44, SD=1.76$) and race (Caucasian $M=28.81, SD=1.65$; African American $M=27.48, SD=2.08$). The dis-

parity noted in the latter analysis remained after adjusting for education level ($F(1, 215)=9.85, p=.002$) as well as a proxy measure of education quality (WRAT-3 Reading subtest ($F(1, 212)=6.51, p=.01$)). Additional ANOVAs for the NC group yielded null findings for age ($F(3, 215)=2.33, ns$) but significant differences for education level ($F(6, 212)=4.86, p=.001$).

Conclusions : As expected, performance on the 30-item even version of the BNT differs among NC, MCI, and AD participants. Geriatric normative data suggest gender, race, and education are all associated with naming performance. Therefore, these variables should be considered when interpreting geriatric performances on the BNT 30-item even version. Further examination is needed to elucidate the mechanism behind these findings, particularly with respect to the gender and racial discrepancies.

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*

J.F. MCLACHLAN. Development of a Culture Fair Cognitive Screening Test Battery.

Objective: A cognitive screening battery, developed for minimal language usage, was administered to 130 examinees in the course of investigation of personal injury claims.

Participants and Methods : Half were seen for psychological assessment and half for neuropsychological evaluation. For the total sample, 65% did not speak English as their first language (ESL) and only 31.5% were born in Canada. The immigrants had been resident in Canada for 2 to 47 years. Participants were of varied heritage - 42% Caucasian, 32% Asian, 17% Black and 8.5% of other origin. Twenty persons required a professional interpreter. The 80 women and 50 men had a mean of 12.7 years of education and were from 17 to 68 years old.

Results : Results indicated WRAT-3 Reading, a marker for language familiarity not used to determine cognitive performance, to be the only subtest to reflect substantive effects of multicultural variables. Estimation, object memory, Five Digit Test and Letter Alternation Test performances were not affected by birth in Canada, ESL status and Reading. Birthplace, ESL, Reading and interpreter use had minimal impact on subtests of attention and Mental Control with variance between .05 and .21% accounted for on these combined cultural and language measures. Time in Canada was not significantly correlated with the cognitive tests (but was modestly related to Reading). Overall, the effects of different cultural and language background appeared to be minimal.

Conclusions : It was concluded that, although preliminary in nature, the study found that neurocognitive function could be evaluated in an acceptable manner in a multicultural society.

Correspondence: *John F. McLachlan, Ph.D., Independent Practice, 1405 - 2 Carlton Street, Toronto, ON M5B 1J3, Canada. E-mail: johnmclachlan@sympatico.ca*

C. DILANDRO & L. THOMPSON. California Older Adult Stroop Test (COAST): Additional Psychometric Properties.

Objective: The COAST is a modified Stroop test designed for use with older adults developed by Pachana, Marcopulos, Yoash-Gantz and Thompson (1995). Unlike other Stroop tests, the COAST contains only yellow, red, and green stimuli eliminating the possibility of impaired performance due to difficulty distinguishing between green and blue stimuli. The purpose of this poster is to provide additional psychometric data for a healthy older adult population.

Participants and Methods : A healthy community based sample of 103 men and women between the ages of 30 and 85 were recruited as

part of a larger study. Participants were administered a neuropsychological battery that consisted of: the COAST, Dementia Rating Scale, California Verbal Learning Test, Visual Reproduction I and II subtest, National American Adult Reading Test, Trail Making Test, Verbal Fluency Test.

Results : A correlational research design was chosen to examine the relationship between the COAST completion times and other measures to examine validity. Discriminant validity correlations with the visual scanning and attention measure ranged from .252 to .433 ($p < .001$). Discriminant validity correlations with a verbal fluency task ranged from -.208 to -.478 ($p < .001$). Convergent validity correlations yielded non-significant findings. Age was found to impact performance.

Conclusions : Adequate discriminant validity was established. Convergent validity was not obtained. The sociodemographic findings are consistent with Pachana, et al. (2004) thereby providing additional support for this measure as a potentially reliable assessment measure of selective attention and cognitive flexibility in older adults. Future research should aim to obtain psychometric and normative data in clinical samples.

Correspondence: Caryn DiLandro, MS, Pacific Graduate School of Psychology, 3036 Mountain Dr, Fremont, CA 94555. E-mail: cdilandro@comcast.net

F. MORENO-MARTINEZ, S. CANAMON & M. GONI. Presentation and preliminary results of Semantic Battery Nombela. A new instrument to evaluate semantic categorial impairment.

Objective: The study of categorical dissociations between the domains of living thing (LT) and nonliving thing (NLT) is highly relevant to the investigation of the organization and functioning of semantic memory, as well as its possible brain localization. Semantic batteries are one of the best tools for studying these matters. These instruments use different semantic tasks, but elaborated with the same items, in order to get convergent evidence from them. We present a new instrument: the Semantic Battery Nombela, which is intended to enrich Spanish neuropsychological assessment since, to our knowledge, there are not many Spanish instruments to evaluate specifically semantic memory impairments, with the exception of the semantic battery, EMSDA (Peraíta, et al., 2000). Battery Nombela includes both semantic and non-semantic tasks. Its purpose is to evaluate semantic system, as well as lexical, phonological and viso-perceptual processing.

Participants and Methods : We present preliminary results of five tasks of the battery (semantic category fluency, oral naming of color photographs, matching photographs by spoken word, category sorting, and object decision), gathered from 31 participants: 15 Alzheimer's (AD) patients, and 16 healthy elderly controls.

Results : Result from ANOVAs showed a semantic impairment of AD patients in all the tasks, but we did not find living-nonliving dissociation in all of them.

Conclusions : Our preliminary results suggest that Battery Nombela is a good instrument to evaluate semantic impairment in AD patients. At present, we are analyzing the results gathered from the rest of the tasks, we are increasing our original AD sample, and we are planning new studies with other neurological patients.

Correspondence: Francisco Javier Moreno-Martinez, PhD, Psicología Básica I, U.N.E.D., C/ Juan del Rosal, n[º] 10, Madrid 28040, Spain. E-mail: fjmoreno@bec.uned.es

D. WILLIAMSON, G.L. IVERSON, M.T. ROPACKI & K. REILLY. How do the NAB Decision Rules work in a Clinical Sample?

Objective: The Screening Module of the Neuropsychological Assessment Battery (NAB; White & Stern, 2003) can be used in a sequential assessment paradigm. Specifically, if a patient scores high or very low on a particular domain, then follow-up testing in that domain might not be necessary. The purpose of this study was to evaluate the follow-up testing decision rules for the NAB Screening Module.

Participants and Methods : This retrospective study included 37 patients from the neuropsychological clinic of author KR. Patients were drawn from a larger, consecutive sample and were included in this study if they had (a) clear evidence of neurological disease or injury and (b) performed in the valid range on a sensitive symptom validity test (WMT).

Results : Some additional testing was recommended for 97% of patients. The modal number of full modules recommended for additional testing was 4 (42% of sample). Only 19% were recommended to receive all 5 of the main modules, and 39% were recommended to receive 3 or fewer modules. The decision rules resulted in a recommendation for additional testing as follows: Attention = 48.6%, Language = 86.5%, Memory = 77.8%, Spatial = 75.7%, and Executive Functions = 66.7%.

Conclusions : This is the first independent exploration of the sequential testing paradigm for the NAB. In this sample, the recommendations for follow-up testing varied substantially from that presented in the test manual in a number of respects.

Correspondence: David Williamson, Ph.D., Ortho McNeil Janssen Scientific Affairs, Johnson & Johnson, 704 Providence Estates Dr W, Mobile, AL 36695. E-mail: dj.williamson@alumni.duke.edu

F.W. BYLSMA, M. MYERS-PAGORIA, A.A. PICA & T.N. SCHIRMER. The Clinical Utility of the 15/30-item Boston Naming Test Shortform in a TBI Sample.

Objective: This study was undertaken to examine the clinical utility of the 15/30-item shortform (Graves et al., 2004) of the Boston Naming Test (BNT; Kaplan, Goodglass & Weintraub, 1983) in individuals with brain injuries.

Participants and Methods : Archival data from 41 post acute TBI patients were used; 20 patients had been administered the 60-item BNT and 21 had been administered the 15/30-item BNT short form, according to published procedures. Eight people had been administered both versions about 1 year apart. There were no group differences in demographic characteristics or injury type & location. Prorated 60-item scores were obtained by doubling the 15/30-item shortform score. The 60-item version protocols were re-scored according to the 15/30-item scoring procedure to yield an extracted 15/30-item shortform score and doubled to yield a prorated 60-item score.

Results : Pearson correlations were computed between the actual and extracted/prorated 60-item BNT scores. Mean 60-item actual and prorated/extracted scores were contrasted using t-tests. Scores were examined for concordance of naming-deficit severity classification (e.g., average, mild, moderate, or severe) based upon normative data from the 60-item version. The 15/30-item BNT shortform typically yields prorated 60-item scores that are lower ($p < .05$) than the 60-item version by an average of about 4 points. However, there were strong correlations between 60-item version scores and extracted/prorated 60-item scores (all $r_s > 0.92$, $p < .01$). The two versions yield generally equivalent severity classification of naming deficits in this group of individuals with acquired brain injuries.

Conclusions : The 15/30-item BNT shortform holds promise as a valid indicator of confrontational naming abilities while also affording the clinician a significant savings in administration & scoring time. Additional research with a greater number of subjects and other clinical populations is required, and is ongoing at this time, to determine if these findings generalize.

Correspondence: Frederick W. Bylsma, Ph.D., Neuropsychological Services, PC, 180 North Michigan Avenue, Suite 2210, Chicago, IL 60601. E-mail: nps_pc@sbcglobal.net

D. BARRY & B.J. WILSON. In Search of an Efficient and Accurate Measure of Organic Brain Dysfunction: A Modified Average Impairment Rating.

Objective: Neuropsychologists in inpatient settings are still asked to diagnose organic brain dysfunction in patients with cognitive impairments,

requiring brief test batteries that are sensitive to organic impairment. In order to shorten the required test protocol, this study investigated the effect of excluding the Category Test from a modified version of Russell's Average Impairment Rating (AIR) already shown to be sensitive to organic cognitive dysfunction. We predicted that excluding the Category Test would make the AIR less sensitive to organic impairment.

Participants and Methods : Participants were 26 patients, 13 with acquired brain injuries, and 13 with psychiatric conditions, who completed the Halstead-Reitan Battery. The AIR was computed for each patient using the Booklet Category Test, TPT Total Time, TPT Memory, TPT Location, Seashore Rhythm Test, Speech Perception Test, Finger Tapping, Trails B, and WAIS-III Coding. The AIR was then recalculated excluding the Category Test.

Results : The two sets of AIR scores were compared using paired sample *t*-tests. The mean AIR score was 1.55 with the Category Test and 1.50 without [$t(25) = 2.025, p = .027$ (one-tailed)]. Nevertheless, only one patient's AIR changed from impaired to unimpaired when the Category Test was excluded ($p = 1.00$; McNemar Test, binomial distribution used). Analyzing the groups separately revealed a significantly lower AIR in the brain injury group but not the psychiatric disorder group with the Category Test excluded.

Conclusions : Although these findings suggest that calculating an AIR without the Category Test may make it slightly less sensitive to organic impairment, in most cases both versions will provide the same classification. Correspondence: *Danielle Barry, Ph.D., Psychiatry, Geisinger Medical Center, 100 North Academy Avenue, 13-35, Danville, PA 17821. E-mail: dbarry1@geisinger.edu*

M. DANIEL, T.N. CAROTHERS & K. BROCKWOOD. Ecological Validity of Neuropsychological Tests For Predicting Navigational Ability.

Objective: Performance on neuropsychological tests is often used as a basis to predict an individual's ability to function independently in everyday activities. However, there is limited empirical evidence regarding how accurately neuropsychological tests predict real-world abilities. The purpose of the present study was to determine if performance on neuropsychological measures discriminate between patients who can and those who cannot navigate their environment.

Participants and Methods : Participants were 278 inpatients at an acute rehabilitation facility (161 males and 117 females). 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 and only neuropsychological measures of visual-spatial processing (Rey-Osterreith Complex Figure Test copy) and delayed verbal memory (Logical Memory II of the Wechsler Memory Scale - R/III) were significant predictors of navigational ability.

Conclusions : Based on neuropsychological test performance, the likelihood of predicting that a patient is able to navigate their environment when in fact they cannot is low (i.e., < 5%); in contrast, the likelihood of concluding a patient cannot navigate when in fact they can is relatively high (approximately 60%). These results suggest neuropsychological measures of visual-spatial processing and delayed verbal memory are sensitive in identifying patients who can successfully navigate their environment; however, they are not very specific.

Correspondence: *Tracy N. Carothers, MS, Pacific University, 20756 SW Kinnaman Rd, Aloha, OR 97007. E-mail: tcarothers@pacificu.edu*

S.L. CARTER & T.L. WILE. CVLT-II Performance in a Neurovascular Sample: Relationship to Other Neuropsychological Domains.

Objective: Little new validity research has been published on the second version of the California Verbal Learning Test (CVLT-II), despite

common clinical use. This study investigated the validity of the CVLT-II in a neurovascular sample by examining its relationship to performance in other neuropsychological domains. CVLT-II performance was hypothesized to relate to measures of IQ and language, but not to attention, psychomotor speed, or problem-solving.

Participants and Methods : Data was obtained from 45 individuals (51% women; *M* age 50.0 years, *SD* 10.8; *M* education 14.3 years, *SD* 3.2) with various neurovascular conditions, primarily stroke (36% right, 29% left, 27% bilateral), that completed a clinical neuropsychological assessment. Tests included the CVLT-II, Wechsler IQ, Digit Span, BNT, COWA, Animal Fluency, Trails, and WCST. Pearson correlation coefficients were used to examine the strength of the relationships between CVLT-II performance and other test scores. Test scores representing each neuropsychological domain were entered as predictors into regression equations with three representative CVLT-II measures (Total Recall Trials 1-5, Long Delay Free Recall, and Total Recognition Discriminability) as the dependent variables.

Results : CVLT-II scores were significantly correlated with FSIQ, Animal Fluency, BNT, Trails, and WCST. In regression analyses, after accounting for FSIQ and age, only Animal Fluency was a significant predictor of CVLT-II performance but it explained little additional variance.

Conclusions : Although CVLT-II performance was modestly correlated with measures of naming, psychomotor speed, and problem-solving, performance in these domains did not predict CVLT-II scores. Word retrieval for a semantic category significantly predicted CVLT-II performance, but added little after accounting for FSIQ and age. Discriminant validity of the CVLT-II in a neurovascular sample was largely supported.

Correspondence: *Sherri Carter, Ph.D., Psychology, QEII Health Sciences Centre, 1341 Summer Street, Halifax, NS B3H 4K4, Canada. E-mail: sherri.carter@cdha.nshealth.ca*

J.F. MCLACHLAN. A Culture Fair Cognitive Screening Test Battery: Effects of Emotional Status and Symptom Magnification.

Objective: Cognitive screening was previously shown to be minimally affected by cultural and language background. Performance on this battery was substantially affected by response to symptom validity tests (SVT) which is also found on more extensive neurocognitive evaluation. However, the finding of interest was that none of the multicultural or language variables was correlated with performance on SVT.

Participants and Methods : This fourth component of the study examined the impact of emotional status and symptom magnification on the original 130 individuals who had sustained personal injuries, half seen for psychological assessment and half for neuropsychological evaluation.

Results : The Depression, Anxiety and Cognitions Status (DACS), previously found related to neurocognitive functioning (McLachlan, 2003, *Brain and Cognition*, 51, 240-243) was administered. Its validity scale was correlated .40 ($p < .001$) with SVT discussed in a previous report and with 13 of the 18 cognitive screening subtests in the present analysis. Partial correlations of the major DACS scales and the cognitive subtests (controlling for validity) revealed modest relationships between emotional and cognitive functioning. These reflected the effects of depression, anxiety and pain. However, there was no relationship between emotional status (including symptom magnification) and birthplace outside the country, ESL status, using an interpreter, or the number of years living in Canada. The one exception was that good coping was related to use of an interpreter.

Conclusions : The cognitive screening procedure appears affected by emotional dysfunction as is extended neuropsychological testing. However, in this cognitive screening study, the multicultural and language variables were not affected by emotional dysfunction or symptom magnification.

Correspondence: *John F. McLachlan, Ph.D., Independent Practice, 1405 - 2 Carlton Street, Toronto, ON M5B 1J3, Canada. E-mail: johnmclachlan@sympatico.ca*

G.L. IVERSON, D. WILLIAMSON, M. ROPACKI & K. REILLY. Frequency of Abnormal Scores on the Neuropsychological Assessment Battery (NAB) Screening Module in a Mixed Neurological Sample.

Objective: Time, money, and setting often preclude the administration of a comprehensive neuropsychological evaluation. The purpose of this retrospective, descriptive study was to present domain and primary subtest score information for the Neuropsychological Assessment Battery Screening Module (NAB; White & Stern, 2003) in a mixed sample of patients with known neurological conditions.

Participants and Methods : Participants were 37 patients of mixed neurological etiologies. Patients were included in this study if they had (a) clear evidence of neurological disease or injury and (b) performed in the valid range on a sensitive effort test (WMT).

Results : Patients demonstrated performance decrements most consistently on the Attention and Executive Functions domains (Numbers and Letters and Word Generation subtests, respectively). The rate at which patients obtained normal scores across a range of subtests was somewhat surprising, particularly given that the scores are corrected for age and education. Tables depicting the results of a variety of cutoffs for individual tests and combinations of tests will be presented to inform clinical practice.

Conclusions : Using the NAB Screener as a stand-alone assessment tool in this sample yielded results somewhat inconsistent with those published in the test manual, particularly with regards to the proportion of these neurological patients obtaining scores within the normal range for age and education.

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*

T.M. ATKINSON, A. MALFER, J. CANNING, L. LONG, K. BUCK, O. BEATON, W. LANGUEDOC & J.P. RYAN. Construct Validity and Order Effects in Variants of Sequencing-Shifting Tests.

Objective: Alternate versions of one of the most widely used neuropsychological instruments, the Trail Making Test (TMT), have recently been developed. The present study examined the construct validity of three instruments, the Trail Making Test of the Delis Kaplan Executive Function System (DK-TMT), the Comprehensive Trail Making Test (CTMT), and the Connections Task (CT). The purpose of the study was to determine whether the three tests could be used interchangeably in longitudinal research to measure the same hypothetical constructs while minimizing practice effects. It is predicted that these tests would demonstrate factorial invariance across testing groups with no influence of order of presentation.

Participants and Methods : Over a three week period the tests were administered to 168 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 indicate that the DK-TMT, CTMT and CT measure the same constructs, sequencing and switching, and can be used interchangeably in longitudinal research without discernable practice effects.

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*

M. DICKINSON & M. HISCOCK. The Flynn Effect in Neuropsychological Assessment.

Objective: It is well documented that IQ scores have risen substantially since the implementation of intelligence testing. This phenomenon is

known as the Flynn effect. Examination of different subtests of the Wechsler Adult Intelligence Scales have shown that the Flynn effect influences these subtests differentially, with performance subtests evidencing a larger Flynn effect than verbal subtests. Therefore, it is reasonable to suspect that the Flynn effect is also present in certain neuropsychological tests.

Participants and Methods : Normative studies spanning several decades were selected for the purpose of examining changes in performance from one generation to the next. Norms were selected for the Symbol Digit Modalities Test (SDMT), Trail Making Test (TMT), Grooved Pegboard (GP), Finger Tapping (FT), and the Boston Naming Test (BNT). When age ranges of the respective samples did not match, interpolated age values were calculated to allow more accurate comparisons.

Results : Analyses revealed differences in scores across generations for the TMT, with younger generations performing significantly better on this measure. Analyses of the SDMT were suggestive of superior performance in younger generations, but not definitive due to the scarcity of normative data. Finally, the Flynn effect was not present in normative studies of FT, GP, and BNT.

Conclusions : Preliminary analyses revealed that the Flynn effect is present in neuropsychological tests thought to measure more fluid abilities and not present in those that measure more crystallized abilities. These results support the conclusion that the Flynn effect is a widespread phenomenon that occurs in both intelligence and neuropsychological assessment. In addition, the lack of the Flynn effect in FT, a test of motor speed and a sensitive indicator of cerebral damage, contradicts the hypothesis that the Flynn effect is based on biological changes across generations.

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

J. DENMAN & S. SAUTTER. Efficacy of a Telecommunications Memory Clinic.

Objective: Telecommunications may be a viable option worthy of exploration for the purpose of broadening clinical practice as well as availability of services for neuropsychology. This paper attempts to establish efficacy for this type of clinical service where not much has been established. It is hypothesized that there would be no between-group differences on measures of knowledge and satisfaction but differences on measures of experience.

Participants and Methods : A double blind study is implemented to 103 adults born on or before 1964. A doubly-multivariate analysis of variance is performed on two measures: experience and knowledge using both a pre-test and post-test. Experience represents the participant's reaction to the video equipment; knowledge represents the participant's ability to receive education during the interview. Three conditions form the between-subjects IV: experimental, control, and sham. All three groups receive a neuropsychological interview followed by assessment from a test technician. The experimental group is interviewed via teleconferencing equipment, while the other two are face to face. The within-subjects IV treated multivariately is the pre-test and post-test. N= 36 for the experimental and control group and N=31 for the sham group.

Results : Results of evaluation of assumptions of doubly-multivariate analysis of variance are satisfactory. No significant effect is found on condition by time interaction, multivariate $F(4, 198) = .961, p > .05$. Neither knowledge nor experience scores are significantly influenced by condition. A one-way ANOVA is calculated comparing satisfaction scores of participants from three different conditions (experimental, control, sham). No significant differences are found ($F(2, 100) = 1.3, p > .05$).

Conclusions : There is no statistically significant differences in neuropsychological services delivered from a remote site via teleconferencing equipment and services rendered face to face according to three self-report measures of knowledge, experience, and satisfaction.

Correspondence: *Jonathan Denman, M.A., Regent University, 1000 Regent University Dr., Virginia Beach, VA 23464. E-mail: jondenman@yahoo.com*

T.D. VANNORSDALL, M. ASSAF, G.D. PEARLSON & D.J. SCHRETLEN. Demographic and Neuropsychological Correlates of Iowa Gambling Task Performance in Healthy Adults.

Objective: The Iowa Gambling Task (IGT) has demonstrated sensitivity to impaired decision-making in patients with orbitofrontal lesions. However, many of its basic psychometric properties remain unclear. In this study we aimed first to examine whether IGT performance depends on specific demographic characteristics, and then to determine whether it correlates more highly with performance on measures of executive functioning than on other cognitive tests.

Participants and Methods : Participants were 141 healthy adults enrolled in the Johns Hopkins Aging, Brain, and Cognition Study of normal aging. Participants completed a comprehensive battery of neuropsychological tests, and non-age-corrected scores were used for all analyses.

Results : IGT performance was significantly associated with race and education, but not with sex or age. Contrary to our hypothesis, IGT performance did not correlate more strongly with measures of executive functioning than with most other neuropsychological tests. In fact, IGT performance correlated most strongly with the sum of WAIS-R non-age-corrected scaled scores ($r = 0.403, p > 0.001$). After accounting for demographic factors and intelligence, none of the executive functioning tasks were associated with IGT performance. Participants in the upper half of the WAIS-R distribution outperformed those in the lower half on all but the first of five 20-trial blocks on the IGT.

Conclusions : These findings do not refute the possibility that orbitofrontal circuits mediate performance on the IGT, but they suggest that the latter depends, at least partly, on general intellectual functioning. Researchers should take this into account when interpreting the neuroanatomic specificity of IGT performance.

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*

E. RYAN, D. BYRD, M. RIVERA MINDT & S. MORCELLO. Assessing Premorbid Intellectual Performance Among HIV+ Participants with Low Literacy.

Objective: The WRAT-3 Reading test is frequently used to estimate premorbid intellectual functioning. For individuals who have received a poor quality of education and have subsequent low literacy, the WRAT-3 may be an inappropriate test as it could underestimate IQ. To identify possible alternative measures for estimating IQ among individuals with low literacy, we studied performance on a nonverbal intellectual functioning test, the General Assessment Measure for Adults (GAMA).

Participants and Methods : Participants ($N=95$; 44% African American, 32% non-Hispanic White, and 24% Hispanic) with advanced HIV completed the GAMA, the WRAT-3, and a comprehensive NP battery.

Results : Among participants, 2% had < an 8th grade education whereas 38% had < an 8th grade reading level (mean education = 11.2 years, $sd = 2.4$). The GAMA and the WRAT-3 were significantly correlated ($r = .498, p < .01$). Using stepwise regression, the GAMA was a significant predictor of global NP functioning ($F_{1,93} = 63.82, p < .001$) whereas the WRAT-3 was not. Participants scoring in the lowest quartile of WRAT-3 scores had significantly less education than the other groups ($M=10.25$ years, $sd=2.29$; $F=26.42, df=3, p < .001$) and their GAMA score was significantly higher than their WRAT-3 score ($M = 84.1$ vs. $M = 66.8$, respectively; $t=-6.34, df=23, p < .001$). In contrast, participants in the highest quartile (mean education = 15.6 years, $sd=1.6$) had GAMA scores that were significantly lower than their WRAT-3 scores ($M = 99.0$ vs. $M = 112.6$; $t=-5.47, df=21, p < .001$).

Conclusions : Although the GAMA functions differently among high and low literacy groups, it appears to have adequate criterion validity for predicting global NP functioning.

Correspondence: *Elizabeth Ryan, Box 1134 - MHBB, Mount Sinai School of Medicine, One Guatve Levy Place, New York, NY 10029-6574. E-mail: elizabeth.ryan@mssm.edu*

S. SISCO & D. NYENHUIS. Stability of Proxy Ratings on the Frontal Systems Behavior Scale.

Objective: To evaluate the stability of proxy respondents' ratings of pre-stroke cognitive function using the FrSBe scale over three years. In particular, to examine whether ratings of pre-stroke function vary over time as a factor of the a) proxy's demographic characteristics, b) patient's initial post-stroke cognitive status, or c) change in patient's cognitive status in the years following stroke. Across all time-points, ratings of pre-stroke function are expected to remain constant.

Participants and Methods : Proxy ratings of pre-stroke and post-stroke cognitive function were collected using the Frontal Systems Behavior Scale at three time-points: baseline (3-6 months following stroke), 1 year following stroke, and 2 years following stroke. Neuropsychological measures of cognitive function were collected for patients at all three time-points; proxy demographic information was also collected.

Results : Analysis of variance showed no significant variation among ratings of pre-stroke function across years ($F(2, 118) = .76, p = .47$). Subsequent analyses revealed that changes in pre-stroke ratings do not correlate with proxy age ($r = -.14, p = .43$), education ($r = 0.077, p = .66$), or depressive status at baseline ($r = -.09, p = .43$). Changes in pre-stroke ratings are also unrelated to the patient's cognitive status immediately following stroke ($r = -.08, p = .55$), and do not correlate with change in the patient's cognitive status after two years following stroke ($r = .16, p = .22$). Estimates of test-retest reliability support the validity of these findings ($r[BL-Year 2] = .65, p < .001$).

Conclusions : Ratings of pre-injury cognitive function using the FrSBe scale are stable across three years, supporting proxy reports as a reliable retrospective measure of cognitive status.

Correspondence: *Shannon Sisco, B. A., Neurology and Rehabilitation, University of Illinois-Chicago, 1645 W. Jackson #400, Chicago, IL 60612. E-mail: ssisco@uic.edu*

R. LANGE, A. KILGOUR & J. LEBLANC. Clinical Validation of the Estimate of Premorbid Ability for Canadians (EPAC).

Objective: Recently, Lange, Schoenberg, Woodward, and Brickell (2005) developed the Estimate of Premorbid Ability for Canadians (EPAC). The EPAC consists of a series of regression equations, developed using the Canadian WAIS-III standardisation sample, which combines demographic variables and subtest performance to estimate WAIS-III FSIQ, VIQ, and PIQ scores. The purpose of this study is to examine the clinical utility of the EPAC algorithms as a means for estimating premorbid IQ scores in a mixed clinical sample.

Participants and Methods : Participants were 80 patients with mixed neurological diagnoses (i.e., traumatic brain injury, CVD/stroke, multiple sclerosis, seizure disorder, and tumour) and a sub-sample of 80 demographically matched participants from the Canadian WAIS-III standardization sample. EPAC scores were calculated using all possible equations (i.e., 11 equations for FSIQ and 2 equations each for VIQ and PIQ).

Results : As expected, there were significant between-group differences for obtained IQ scores ($p < .002$), but not for EPAC scores. There were significant within-group differences between EPAC scores and obtained IQ scores in the clinical sample ($p < .001$), but not in the healthy controls. The majority of the healthy control sample had obtained IQ scores that fell within 2 SEE's of EPAC scores (i.e., 95% CI). A higher portion of the clinical sample had EPAC scores that fell >2 SEE's of WAIS-III IQ scores when compared to healthy controls.

Conclusions : These results suggest that the EPAC algorithms are useful for estimating premorbid intellectual functioning; however, they are not without limitations. Recommendations for clinical use and future research directions are proposed.

Correspondence: *Rael Lange, Ph.D., Neuropsychology and Psychology, Riverview Hospital, Riverview Hospital - North Lawn, 2301 Lougheed Highway, Coquitlam, BC V3C 4J2, Canada. E-mail: rlange@bcmhs.bc.ca*

T. MCHUGH, J. WERTHEIMER & N. FICHTENBERG. Sensitivity and Specificity of the Memory Subtests of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Objective: There is a paucity of literature regarding the independent use of subtests within Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) as supplements to longer assessment batteries. A preliminary investigation of the memory subtests was conducted to assess their sensitivity to memory complaints, comparing rate of impaired performances on RBANS memory subtests to components of the CVLT-II and Benton Visual Retention Test (BVRT).

Participants and Methods : Performance scores from memory subtests of the RBANS and corresponding subtests of the CVLT-II and BVRT were collected from 43 moderate to severe TBI participants (with GCS <12) and 39 non-TBI memory-complaint participants.

Results : Analysis of sensitivity and specificity was undertaken when cutting scores were uniformly held at 85 (one SD below the mean). Sensitivity of RBANS List Learning (.60) was similar to CVLT-II Trials 1-5 (.65). Sensitivity for RBANS List Recall (.72) was comparable to CVLT-II SDFR (.61) and CVLT-II LDFR (.71). RBANS Figure Recall (.67) was slightly more sensitive than BVRT (.59).

Overall agreement greater than one SD below the mean for RBANS List Learning and CVLT-II Trials 1-5 was 77%. RBANS List Recall and CVLT-II SDFR shared 81% of variance. RBANS List Recall and CVLT-II LDFR agreed at 81%. Specificity between RBANS Figure Recall and BVRT was 61%.

Conclusions : The RBANS subtest scores may augment more comprehensive examinations such as the CVLT-II and BVRT in batteries for TBI and memory complaint samples. The RBANS subtests in the memory domain demonstrate comparable sensitivity and specificity such that a clinical picture may be captured succinctly with these efficient measures. Correspondence: *Tara McHugh, MA, University of Windsor, Chrysler Hall South, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: mchugh@uwindsor.ca*

M.J. BORGOS, L.A. RABIN, H.S. PIXLEY & A.J. SAYKIN. Practices and Perspectives Regarding the Assessment of Judgment Skills: A Survey of Clinical Neuropsychologists.

Objective: Judgment ability is an important aspect of cognitive and real-world functioning that is commonly assessed during neuropsychological evaluations with varied clinical populations. Despite the significance of this cognitive domain, few statistically sound and clinically useful tests of judgment have been developed. This study utilized a brief, on-line survey to examine neuropsychologists' practices and perspectives regarding available judgment instruments.

Participants and Methods : Potential participants included randomly selected members of the International Neuropsychological Society (INS) and the National Academy of Neuropsychology (NAN).

Results : Respondents ($n = 285$) reported incorporating the following (rank ordered) issues in assessments of judgment: safety, ability to adequately perform activities of daily living, medical/health decision making, financial decision making/problem solving, social/ethical problem solving, and legal decision making. A majority of respondents reported often or always assessing the construct of judgment when conducting evaluations of traumatic brain injury (88%), dementia (87%), and adult psychiatric disorders (69%). The top-ranked instruments used to assess

judgment were the WAIS-III Comprehension subtest and the Wisconsin Card Sorting Test. Although 61% of respondents were slightly confident and 23% were very confident in their ability to assess a patient's everyday judgment skills with their current measures, 87% endorsed a need for additional/improved standardized measures.

Conclusions : Overall results indicate use of varied assessment techniques to evaluate judgment in clinical populations and suggest the need for improved measures of this important cognitive domain.

Correspondence: *Marlana J. Borgos, Ph.D., Psychiatry, 468 Kingstown Road, Unit 4, Wakefield, RI 02879. E-mail: mborgos@gmail.com*

S. MCDONALD, C. BORNHOFEN, D. SHUM, E. LONG, J.C. SAUNDERS & K. NEULINGER. Assessing Social Perception Can Be A Reliable And Valid Exercise: A Psychometric Study Of The Awareness of Social Inference Test (TASIT).

Objective: Deficits in social perception are prevalent following many brain disorders but reliable and valid instruments for their assessment are few. TASIT fill this gaps, assessing recognition of the emotions, thoughts and intentions of others, and the ability to understand non-literal conversational meanings such as sarcasm. According to previous research TASIT is straightforward for normal speakers producing scores 84% or above on all parts. Conversely, people with severe traumatic brain injuries (TBI) do poorly in patterns that correlate with real world social performance suggesting the test is sensitive and valid. Nonetheless, construct validity and reliability of TASIT is difficult to demonstrate in normal speakers because of the restricted range of scores. As a solution we examine the psychometric qualities of TASIT based on a sample of adults with TBI.

Participants and Methods : Validity and reliability was established by assessing subsets of a sample of 105 adults with severe TBI on repeated administrations of TASIT as well as a range of standard neuropsychological measures.

Results : Convergent validity was established via significant correlations between TASIT and face processing (Benton face recognition), speed of information processing (WAISIII SS and Trails), working memory (Digit Span, Letter Number Sequencing), concept formation (WAISIII Similarities) and socially relevant learning tasks (Logical Memory I and II). Divergent validity was established via a lack of correlation with non-social problem solving (Rey Figure, COWAT, WCST) and memory (Verbal paired associates, Rey recall). Reliability for Parts 1-3 of TASIT was also acceptable. Alternate forms of TASIT achieved reliability coefficients ($N=38$) ranging from .833 (Part 1) and .780 (Part 3) to .531 (Part 2). Test-retest reliability for Form A ($N=32$) ranged from .887 (Part 3) and .883 (Part 2) to .737 (Part 1).

Conclusions : From this, TASIT appears to be a reliable and valid measure of social perception for the TBI population.

Correspondence: *Skye McDonald, PhD, School of Psychology, University of NSW, UNSW, Sydney, NSW 2052, Australia. E-mail: s.mcdonald@unsw.edu.au*

A. DAVIS, A.W. SHUNK & R.S. DEAN. Standardized Sensory Acuity and Subcortical Motor Differences between Individuals with ADHD and TBI.

Objective: Individuals with ADHD and TBI often present with similar cognitive and academic profiles. This is especially true for individuals who have experienced a mild TBI. The current study investigated visual and auditory sensory acuity and subcortical motor deficits that have demonstrated to load on a subcortical/primitive skills factor in an attempt to provide neuropsychologists with methodology for differential diagnosis.

Participants and Methods : The present study examined the differences in the sensory-motor functioning of 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 : By analyzing a MANOVA, the change in the combined dependent variable of the 7 variables of the DWSMB was significantly related to diagnosis, Wilks' Lambda = .816, $F(7, 72) = 2.32$, $p = .034$. Subsequent univariate tests found no significant differences on the visual acuity tasks, but significant differences were found on the auditory acuity tasks. Strong and salient differences were found between the two groups on the subcortical motor tasks. Results indicated that individuals diagnosed with ADHD performed consistently better than individuals diagnosed with TBI.

Conclusions : Individuals with a TBI tend to suffer more diffuse damage than is expressed in developmental ADHD and this difference was reflected in this study in terms of more severe subcortical impairment. The results will be discussed in terms of differential diagnosis and pragmatic usage for interventions.

Correspondence: *Andrew Davis, Ph.D., Ball State University, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

N. PASTOREK, M. BRIERE, J. MOLD, J. SCOTT & R. ADAMS. Change in Raw Score Performance across Age Ranges of Community-Dwelling Older Adults on Longitudinally-Administered Memory Subtests of the RBANS.

Objective: Several factors other than true cognitive ability influence the performance of individuals on longitudinal neuropsychological assessments including practice effects, procedural familiarity, and individual performance variability, which potentially affect the performance of the individual on follow up examination. In older adults, however, normal age-related decline in cognitive functioning likely attenuates practice effects and test sophistication effects. In the current study, we examined the pattern of performance of healthy older adults who completed three assessments with the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) over a two year period.

Participants and Methods : The sample of 289 healthy older adults was stratified into four age groups to examine the possibility that the effects of repeated administrations varied with age. Repeated measures analysis of variance (ANOVA) was used to examine the performance of the stratified sample on five RBANS subtests of learning and memory, cognitive functions that are known to be especially sensitive to normal aging.

Results : Overall, two of the five subtests (i.e. List Recall and Figure Recall) showed a significant improvement in scores from the first to third assessment. In addition, Story Memory scores decreased slightly from the first to second assessment, and then rebounded to baseline levels at the third assessment. Figure Recall scores improved significantly from the first to second assessment and decreased slightly at the third assessment but remained slightly above the baseline assessment.

Conclusions : Despite statistical significance, the previously described changes over longitudinal assessments of the older adults on the RBANS were very modest with respect to raw scores.

Correspondence: *Nicholas Pastorek, Ph.D., Psychiatry and Behavioral Medicine, University of Oklahoma Health Sciences Center, 400 S Squires Landing Blvd, Apt M4, Stillwater, OK 74074. E-mail: nick_pastorek@yahoo.com*

T. NEAL, A.S. DAVIS, B.M. DICKERSON & R.S. DEAN. Pathognomic Gender Differences in Sensory and Motor Performance in Children.

Objective: Structural gender differences are observed in cerebral lateralization and neuroimaging studies, and functional higher-order cogni-

tive processing differences are well stated in the literature. Additionally, gender differences have been associated with different levels of performance in visual-spatial and motor tasks. The purpose of this study was to investigate gender differences in sensory-motor functioning using a new standardized battery, the Dean-Woodcock Sensory-Motor Battery (DWSMB). Since the DWSMB was primarily designed to identify pathognomic signs in cortical and subcortical sensory-motor skills, the authors hypothesized there should be no significant differences between male and female children.

Participants and Methods : A Multivariate Analysis of Variance (MANOVA) evaluated main effects of gender for the eighteen subtests that comprise the DWSMB. Nine subtests measure visual, auditory, or tactile perception and nine subtests measure motor functioning. Participants (N=602) were children (Mean Age=10.24 years; SD=3.59 years). All participants were administered the entire DWSMB as part of a comprehensive neuropsychological test battery.

Results : By analyzing MANOVA results, the change in the combined dependent variable of the 18 variables of the DWSMB was significantly related to gender, Wilks' Lambda=.847, $F(35, 566)=2.93$, $p=.000$. Subsequent univariate tests indicated significant main effects for gender for Finger Tapping and Grip Strength.

Conclusions : As expected, the only significant differences related to gender were for the two subtests with separate normative samples. Gender differences on these two motor tests correspond with previous empirical evidence related to differences in performance. 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*

R.J. SPENCER, P.P. GIGGEY, S. RICE, L.I. KATZEL & S.R. WALDSTEIN. Psychometric Limitations of the Mini Mental State Examination in Older, Non-Demented Adults.

Objective: The Mini Mental State Examination (MMSE) is perhaps the most commonly used neurocognitive instrument. While developed as a dementia screening tool, the MMSE is often used as a research instrument assessing minor cognitive dysfunction.

Participants and Methods : We examined psychometric characteristics of the MMSE in 132 stroke- and dementia-free, community-dwelling older adults (64% male; mean age = 66.4; education = 16.2) enrolled in a study of cardiovascular risk factors, brain, and cognition. Participants were free of major medical (except hypertension), neurological, and psychiatric disease and engaged in neuropsychological assessment.

Results : Results at time one indicated mean MMSE scores of 28.8 (SD = 1.3; range = 22-30). With the exception of serial 7s and three-word recall, all items were passed by > 85% of the sample. After controlling for age and education, serial 7s correlated between $r = 0.11$ and -0.28 with tasks of mental tracking (Trails B, Backward Digit Span, Backward Word Span). Word recall scores correlated between $r = 0.03$ and 0.13 with memory measures (Logical Memory, Visual Reproductions). Test-retest correlation was $r = 0.46$ ($p < .001$) in a subset of 69 individuals for whom MMSE was administered twice. Regarding test-retest reliability of MMSE subtests, serial 7s correlated $r = 0.54$ ($p < .001$) between administrations; word recall scores were not significantly correlated.

Conclusions : Overall, MMSE scores exhibited ceiling effects, poor test-retest reliability, and individual MMSE items demonstrated poor construct validity. These findings support a growing body of literature suggesting that the MMSE has major limitations as a measure of cognitive function in healthy older adults.

Correspondence: *Paul P. Giggey, M.A., Laboratory of Personality and Cognition, National Institute on Aging, Gerontology Research Center 5600 Nathan Shock Drive, Baltimore, MD 21224-6825. E-mail: pgigge1@umbc.edu*

M.A. FEARING, L. GRANDE, T. PERKINS, W. MILBERG & R. MCGLINCHEY. The Cabinet Memory Test: "What is it?" and "Where did you put it?"

Objective: Ecologically valid assessments of the executive function system are few, perhaps in part due to the multiple constructs that encompass this domain. The goal of the current study was to examine the validity of a new test, the Cabinet Memory Test (CMT), designed as a relatively ecologically valid task to assess immediate and delayed memory for object and object location information. Our rationale was that failure in these abilities are a common complaint older individuals in their daily lives and that the generation of an objects' name and coupled location information are functions associated with working memory and executive function. Concurrent validity was assessed by comparing performance on the CMT with established tests of memory and executive functioning.

Participants and Methods : The Cabinet Memory Test was designed to assess two important aspects of nonverbal memory: memory for discrete objects and the spatial context in which they were encountered. Photographs of common objects served as stimuli and participants underwent an encoding procedure followed by an immediate and delayed recall of object and location information. Twenty-eight participants were examined and ranged in age from 56 to 83.

Results : Performance on the CMT was significantly correlated with executive function performance as revealed by the Trail Making B test and the Test of Everyday Attention. In addition, CMT performance was correlated with memory performance on subtests of the Wechsler Memory Scale-III.

Conclusions : These results provide preliminary support for the usefulness of the CMT in assessing executive functioning and memory performance in older adults.

Correspondence: *Michael A. Fearing, Brigham Young University, 1001 SWKT Tower, Provo, UT 84602. E-mail: mfearing@charter.net*

S. RANE, M. DICKINSON, V. GARZA, J.S. CAROSELLI & M. HISCOCK. Development of a Non-Manual Trail Making Test: Construct and Discriminant Validity.

Objective: A computerized non-manual Trail Making Test (NMTMT) is being developed for two purposes: (1) to meet the need for a trail-making test that can be used with patients whose motor functioning is compromised, and (2) to improve our understanding of the skills measured by the standard Trail Making Test (TMT). In our previous study, we found that, although TMT and NMTMT scores are not strongly correlated with each other, scores on both tests show similar patterns of association with other test scores. In this report, we describe additional characteristics of the NMTMT. We place special emphasis on determining whether either trail-making test is associated with tests of memory, cognitive ability, or motor speed.

Participants and Methods : Forty-one university students completed the TMT, the NMTMT, the Rey Auditory-Verbal Learning Test (AVLT), Raven's Progressive Matrices (RPM) and a test of finger-tapping speed (FT). Participants completed tests in counterbalanced orders.

Results : Parts A and B the NMTMT were both executed more slowly than the TMT, $p < .0001$. Correlations between TMT and NMTMT scores were .32 for both Part A and Part B, $p < .05$. In contrast, correlations between Part A and Part B of the same test exceeded $r = .60$. No significant correlations were found between either TMT or NMTMT scores and scores from tests of memory, cognitive ability, or motor speed. Multiple regression analyses showed that no combination of scores from other tests predicted TMT or NMTMT performance.

Conclusions : Again we find that the NMTMT is more difficult than the traditional paper-and-pencil TMT. Scores from Parts A and B of the NMTMT are correlated only moderately with corresponding scores from the TMT. Performance on both tests is independent of verbal memory, cognitive ability, and motor speed. When the results of our previous study are considered, it appears that both trail-making tests—though modestly correlated with each other—have similar patterns of construct and discriminant validity.

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

S. DAWES, P.A. SUAREZ, C.Y. CASEY, M. CHERNER, T.D. MARCOTTE, I. GRANT, R.K. HEATON & H. GROUP. Examination of Cognitive Profiles in an HIV positive sample.

Objective: Based upon prior findings with group means, a "prototypical pattern" of neuropsychological (NP) results with HIV infection has emerged; impaired executive functioning, motor, and learning, with intact retention. We examined a large NP database (N=556) to determine how many patterns are commonly seen among individuals with HIV infection.

Participants and Methods : Factor analysis of a comprehensive NP battery identified 5 component factors: verbal memory (VeM), visual memory (ViM), speed/attention (SA), executive function (EF) and Motor (M). These factor scores were submitted to hierarchical cluster analysis (HCA), to determine the number of clusters, and K-Means analysis (KMA), to define final cluster membership, based on Lange's (2000) method.

Results : HCA indicated that a 5-cluster solution was most appropriate. The clusters are based upon relative strengths and weaknesses (independent of level of performance) from the KMA final solution. Cluster 1: no strengths or weaknesses; 2: Strength-SA & M, Weakness-VeM & ViM; 3: no strengths, weakness in EF; 4: Strength-VeM & ViM, Weakness- SA, M, EF; 5: Strength-VeM. When the sample was divided into NP-impaired (n=296) and NP-normal (n=260) participants, 85% of the impaired group were fairly evenly distributed among clusters 1, 4 and 5, whereas 76% of non-impaired were in clusters 1 & 2.

Conclusions : We found 5 independent patterns, of NP performance associated with HIV infection. Three of which were quite common among NP-impaired individuals.

Correspondence: *Sharron E. Dawes, PhD, Psychiatry, UCSD, 150 W Washington St, San Diego, CA 92103. E-mail: sedawes@ucsd.edu*

S.E. DAWES, P.A. SUAREZ, M. CHERNER, I. GRANT, R.K. HEATON & H. GROUP. Preliminary Normative Data for the Patient's Assessment of Own Functioning Inventory.

Objective: Patient's Assessment of Own Functioning Inventory (PAOFI) (Chelune et al, 1986), is a self-report measure of subjective complaints, covering 5 neuropsychological (NP) content areas (memory, language, motor, sensation and cognitive abilities). Scores for the 33-item 6-point Likert scale generate subscale and total subjective complaint scores. Although the PAOFI is utilized in clinical settings normative data on this measure are lacking. The goals of the study were to generate preliminary norms for and to correlate the subjective complaints with depression and NP performance.

Participants and Methods : The study included 181 healthy participants with no recent alcohol or drug dependence or history of neurologic or psychiatric disorders (Xage= 36.0 (sd=11.5); Xeduc=13.7 (sd=2.4); 36% Female; 69% Caucasian). We obtained a summary measure of NP impairment (Global Deficit Score; GDS) and the Beck Depression Inventory (BDI).

Results : Correlations between BDI and all PAOFI scales were highly significant ($\rho = .40-.55$, $p < .01$) but their total scores were not related to GDS ($\rho = .04$, $p = .61$; $\rho = .01$, $p = .86$ respectively). Mean total PAOFI complaint score was 3.9 (sd=2.3), however these scores differed significantly ($p < .05$), when participants were analyzed by depressed mood (D; BDI ≥ 10 ; n=41) versus non-depressed mood (ND; BDI < 10 ; n=140). Respective means were 9.1 (sd=8.5) and 2.2 (sd=2.8); therefore, separate cut-scores were generated for each group.

Conclusions : PAOFI complaints appear to be closely associated with depressed mood in this sample, and therefore separate normative standards are required for those with and without depression. Further studies should determine sensitivity of the PAOFI using these cut-offs in clinical groups with and without depression.

Correspondence: *Sharron E. Dawes, PhD, Psychiatry, UCSD, 150 W Washington St, San Diego, CA 92103. E-mail: sedawes@ucsd.edu*

J. CHOI, T. HERLANDS, J. FISZDON & A. MEDALIA. The Psychometric Development of the Memory for Everyday Tasks (MET): A Functional Performance-based Memory Test for use in Neurocognitive Research.

Objective: This study reports the preliminary development of a performance-based functional memory test for adults. Methods to assess functional ability are needed to assess efficacy of interventions aimed at improving functioning. The Memory for Everyday Tasks (MET) is a 10-minute in vivo test that measures memory for common daily tasks relevant to managing symptoms and applying for employment.

Participants and Methods : Participants included 18 normal adults and 8 outpatients with schizophrenia. Following initial testing for clarity, cultural sensitivity, and face validity, 25 items in the Memory for Wellness Tasks and 6 items in the Memory for Work Tasks were selected for psychometric testing. Subsequent phases provided data on principle component analysis (orthogonal rotation), item communalities, item or subscale redundancy, reliability, and validity.

Results : Test of internal consistency were within acceptable ranges for items and subscales (Cronbach's alpha = .74 to .69). Exploratory factor analysis indicated 2 distinct factors (delayed verbal recall, list learning), capturing 77% of the total variance. Construct, discriminate, and concurrent validity was supported as the MET was moderately related to multiple measures of memory (Pearson product-moment correlations = 0.60 to 0.81) while unrelated to other cognitive domains. Stepwise multiple regression indicated performance on memory tests predicted more than one third of the variance on the MET total score ($R^2 = 0.34$).

Conclusions : The MET is a brief memory test that provides valuable feedback on memory skills for everyday tasks. Recruitment of subjects is ongoing, and so preliminary evidence for predictive validity, inter-rater reliability, diagnostic differentiation, and factorial invariance in a replication study will also be discussed.

Correspondence: *Jimmy Choi, PsyD, Psychiatry, Yale University School of Medicine, 950 Campbell Ave, 116-B, West Haven, CT 06516. E-mail: jimmy.choi@yale.edu*

C.R. AINSWORTH. Prediction of Health and Safety Functioning from Neuropsychological Measures.

Objective: There is limited data to support the ecological validity of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) in determining independent functioning of the elderly. The purpose of the study was to compare the RBANS to the Clock Draw Test (CDT) and Mini-Mental Status Exam (MMSE; Folstein, Folstein, & McHugh, 1975) in predicting health and safety functioning in elderly persons with suspected memory impairment.

Participants and Methods : Data collection was retrospective for 69 elderly patients undergoing neuropsychological assessment for suspected memory impairment. Data was collected on the brief neuropsychological screens-CDT, MMSE, and RBANS and the criterion- Health and Safety Scale (HSS) of the Independent Living Scales (ILS; Loeb, 1996), a performance-based measure, which evaluates competence of the elderly to independently manage common emergencies and health situations.

Results : Multiple regression analysis (stepwise) indicated that the combination of CDT and MMSE explained 26% of the variance in health and safety functioning. Analysis of the RBANS revealed Language and

Immediate Memory domains as significant predictors, explaining 24% of HSS variance. Secondary multiple regression analyses determined that RBANS Semantic Fluency and Story Memory represented the cognitive functions most closely associated with health and safety judgment, accounting for 33% of the variance.

Conclusions : The results support the ecological validity of the RBANS as compared to the CDT and MMSE brief screening measures. By accounting for more variance than the combination of the CDT and MMSE, Semantic Fluency and Story Memory warrant particular attention when evaluating the health and safety skills necessary for independent living in memory-disordered elderly.

Correspondence: *Courtenay R. Ainsworth, MS, Illinois Institute of Technology, 4831 N Hermitage, Frnt 3A, Chicago, IL 60640. E-mail: croucke3@excite.com*

M.C. DUX, J.L. WOODARD, A.A. PICA & D.M. CHARLES. Differentiating Cognitive Components of Processing Speed: A Strategy for Enhancing Detection of Concussion Related Deficits.

Objective: The purpose of this study was to utilize a task decomposition approach to identify cognitive components underlying several processing speed measures that may be affected following concussion. Specifically, we assessed the relative influences of measures of motor speed and perceptual comparison speed on four complex measures of processing speed.

Participants and Methods : 88 (72 male, 16 female) ethnically diverse high school athletes completed a group-administered paper-and-pencil battery of measures as part of baseline testing for a concussion surveillance study. Measures included measures of motor speed (SD copy) and simple (XO Comparison) and complex verbal (Letter Comparison) and nonverbal (Pattern Comparison) perceptual speed developed by Salt-house, in addition to WAIS-III Digit Symbol Coding (DSC) and Symbol Search (SS), PSU Cancellation Test, and a speeded Arithmetic Test.

Results : Hierarchical multiple regressions were computed separately with each of the four indexes of processing speed (PSU Symbol Cancellation Test, speeded Arithmetic, DSC and SS) entered as the dependent variable and the four decomposition tasks (SD Copy, and XO, Letter, and Pattern Comparison) entered as predictors on separate steps. These four tasks accounted for 31% (PSU Cancellation), 40% (speeded Arithmetic), 41% (DSC) and 49% (SS) of the variance in their respective criterion measures. Additionally, regressions revealed relative contributions of each task to the four processing speed measures: PSU Cancellation (Pattern Comparison-5%, $p < .017$), speeded Arithmetic (Letter Comparison-9.6%, $p < .001$), DSC (Pattern Comparison-8.2%, $p < .001$), SS (XO Comparison and Pattern Comparison-30.5% combined, $p < .001$).

Conclusions : The results of these regression analyses provide better insight into the cognitive components involved in processing speed measures, which are commonly sensitive to concussion.

Correspondence: *Maira C. Dux, B.S., Rosalind Franklin University of Medicine and Science, 4845 N. Claremont, Chicago, IL 60625. E-mail: maira.dux@rfums.org*

O. PEDRAZA, J.A. LUCAS, G.E. SMITH, N.R. GRAFF-RADFORD, T.J. FERMAN, R.C. PETERSEN & R.J. IVNIK. Reliable Change on the Dementia Rating Scale-2.

Objective: The Mattis Dementia Rating Scale-2 (DRS) is frequently used to provide a relatively brief assessment of global cognitive functioning in older adults. Normative data for the DRS have been previously published as part of Mayo's Older American and Older African American Normative Studies (MOANS and MOAANS, respectively). The goal of the present study was to provide reliable change data to determine whether a person's test-retest difference in DRS total raw score represents a statistically significant change.

Participants and Methods : Participants included 626 Caucasian older adults (age range = 60-100 years, $M = 78.6$, $SD = 6.3$) recruited as

part of Mayo's ongoing studies of normal aging. All participants were deemed cognitively normal at baseline and follow-up testing, and reported no family history of dementia. Test-retest interval ranged from 10 to 24 months ($M = 16$, $SD = 3$). The Reliable Change Index (RCI) was used to estimate a 90% confidence interval adjusted for mean practice effect.

Results : Mean baseline DRS total score was 136.02 ($SD = 5.8$) and follow-up score was 137.37 ($SD = 5.1$). Test-retest reliability coefficient was .59. Standard error of the difference was 4.94. Across three age groups, a decline of 6 points or more for those aged 60-74, 7 points or more for those aged 75-84, and 9 points or more for those 85 and older represented reliable change.

Conclusions : These results may be useful for neuropsychologists when determining whether test-retest change in DRS scores over a 10-24 month interval constitutes chance fluctuation or a reliable decline.

Correspondence: *Otto Pedraza, Ph.D., Psychiatry and Psychology, Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL 32225. E-mail: otto.pedraza@mayo.edu*

S.M. MEYER, L.R. KINGERY, G. PEARLSON & D.J. SCHRETLEN. Combining Word-Reading and Demographics to Predict Neuropsychological Test Performance.

Objective: Clinicians routinely estimate a patient's premorbid abilities to assess current cognitive functioning. Word-reading tests (e.g., NART-R) and demographic characteristics are two of the most common methods employed to estimate a patient's premorbid IQ, which is then used to estimate a patient's premorbid functioning in cognitive domains other than IQ. Previously, we found that NART-R performance in healthy adults correlates highly with verbal and full-scale IQ, but correlations with other neuropsychological tests are significantly weaker and explain, on average, only 9% of the variance in test scores. The aim of this study was to investigate the degree to which a combination of NART-R performance and demographic characteristics can accurately predict cognitive test performance.

Participants and Methods : In a sample of 333 healthy adults, NART-R IQ, age, sex, race, and education were submitted to regression analyses to predict performance on 26 test scores derived from 16 cognitive tests.

Results : Results indicated that age was a significant predictor of 26 scores, while the NART-R predicted 22, race predicted 10, education predicted 7, and sex predicted 5. Multiple R s ranged from .33 to .65 with a mean of .50. Adjusted R^2 s ranged from .10 to .41 with a mean of .25.

Conclusions : These results show that considerably more variance is explained in cognitive test scores by the combination of NART-R IQ and demographics than the NART-R alone, enabling a clinician to more accurately estimate a patient's premorbid cognitive functioning in domains other than IQ.

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*

T.L. VICTOR & K.B. BOONE. Using Multiple Measures of Effort.

Objective: Detecting suspect effort in neuropsychological assessment is imperative, as examinees may feign when there is incentive to do so, compromising the validity of test results. Using multiple measures of effort theoretically increases predictive accuracy; however, the extent to which this is true depends on test error rates and the extent to which the individual measures are correlated with one another. While previous studies have relied on discriminant function analyses to address this question, this does not deal with the inherent problem of multicollinearity. The field currently lacks adequate guidelines for using multiple measures of effort.

Participants and Methods : A total of 212 patients (excluding cases of mental retardation or dementia) referred for outpatient neuropsychological

evaluation underwent a comprehensive test battery that included nine different measures of effort, including the Rey 15-Item Test, the Dot Counting Test, Reliable Digit Span, the b Test, the Finger Tapping Test, among others. Noncredible performance was identified by failure on two or more independent effort tests in the presence of documented motive to feign.

Results : Logistical regression analyses revealed the extent to which multiple (versus single) measures of suspect effort increase power to predict noncredible effort, as well as each measure's ability to demonstrate incremental validity, revealing the most efficient test combinations. In addition, analysis of false positive errors revealed the questionable validity of using standard cutoffs in individuals with borderline IQ or for whom English is a second language.

Conclusions : These results are discussed in light of their clear clinical utility and in guiding future research.

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. The Validity of Using Effort Tests in a Mentally Retarded or Learning Disabled Population: A Case Example.

Objective: There are many external incentives for feigning on psychological tests. In the case of learning disability (LD), it can lead to special accommodations in the classroom. In the case of mental retardation, the stakes are much higher, as successful feigning is potentially now a matter of life or death with the 2002 Supreme Court decision in Atkins vs. Virginia ruling that the execution of persons with mental retardation is unconstitutional. Unfortunately, there is little established validity for using our current effort indicators with persons who are LD and/or MR, as this special clinical population is typically not found in validation samples.

Participants and Methods : In our clinical practice, we had the unique opportunity to investigate the faking strategies used by a learning disabled patient with borderline intellectual functioning, as there existed ample evidence that the young man clearly faked cognitive deficits on Time 1 and then put forth adequate effort on Time 2.

Results : Comparison of the patient's performance revealed that when exerting his best effort, this patient was able to pass eight commonly used effort indices. His only failure was on the Rey Word Recognition Test, likely reflecting his history of learning disability. Observations regarding how this individual chose to fake were also informative.

Conclusions : With recognized limits of generalizability, these findings suggest that the use of effort tests relying heavily on reading ability may be inappropriate for use with this population. The results are discussed in light of the need for replication in a larger sample and the examination of how our effort tests behave in these clinical populations.

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*

Child - Assessment

W.L. LOPEZ, A. BYARS, P.S. FASTENAU, S. PEDERSON & H. MINNICH. Design Copy Trial for the Wide Range Assessment of Memory and Learning.

Objective: Constructional tasks are often used to assess visual memory, thereby confounding visual memory and constructional ability. The Design Memory (DM) subtest of the Wide Range Assessment of Memory and Learning (WRAML) attempts to measure visual memory through the drawing of shapes from memory, but it fails to provide a way to identify potential problems with constructional ability. The Design Copy Trial (DCT) was created to help identify constructional deficits that may hinder children's performances on DM.

Participants and Methods : In this study, a group of healthy children (N=148) ages 6-17 years and a group of children with new-onset seizures (N=252) ages 6-14 years were administered the DCT as part of a larger battery of tests.

Results : Reliability of the DCT was supported with strong inter-judge agreement (ICC=0.93) and moderate internal consistency ($\alpha=.0.76$). Test-retest reliability was demonstrated in the Healthy Group ($r=0.10$, $p=.57$), but not in the Seizure Group ($r=0.59$, $p<0.00$). In the Healthy Group, the DCT showed convergent validity with the Beery Developmental Test of Visual Motor Integration (VMI) ($r=0.46$, $p<0.00$) and smaller correlations (divergent validity) with the WRAML verbal learning ($r=0.38$, $p<0.00$) and story memory ($r=0.18$, $p<0.03$) subtests. In the Seizure Group, DCT correlated highly with VMI ($r=0.45$, $p<0.00$) but also with WRAML verbal learning ($r=0.55$, $p<0.00$) and story memory ($r=.54$, $p<0.00$) subtests.

Conclusions : Overall the DCT was found to be a reliable and valid measure in the screening of constructional deficits that may affect performance on the DM subtest of the WRAML. Limitations of this study and implications for future research are discussed.

Correspondence: *Wendi L. Lopez, PsyD, Psychiatry, University of Oklahoma Health Sciences Center, PO box 26901, G. Rainey Williams Pavilion, Oklahoma City, OK 73190. E-mail: wllopez@current.net*

S.S. HAUKENES & A.J. LUNDERVOLD. Behavior Rating Inventory of Executive function: Profiles among children with ADHD.

Objective: The Behavior Rating Inventory of Executive function (BRIEF), developed, validated and standardized to be used as part of a neuropsychological assessment, gives important information about executive function in everyday life. Studies have described patterns that differentiate between diagnostic groups, with elevation on the subscales Inhibition and Working Memory as characteristic of children with Attention Deficits Hyperactivity Disorder (ADHD). In the present study we explore BRIEF results in a Norwegian sample of children with ADHD.

Participants and Methods : BRIEF was filled in by parents of 31 children with a definite ADHD diagnosis (KiddieSads-PL) and 205 controls participating in the third stage of the Bergen Child Study. Mean subscores in the control and ADHD group and the frequency of ADHD children with high scores according to the norms (i.e. $T>64$) are reported.

Results : The ADHD group obtained significantly higher scores ($p=0.000$) on all subscales and composite scores than controls, with the highest mean scores on the Working Memory and Plan/Organize subscales ($T=69$) and lowest on the Organization of Materials subscale ($T=58$). Most ADHD children showed high scores on the Plan/Organize (74%), Working Memory (68%), Shift (68%) and Monitor (61%) subscales and 61% on the composite scores. Twelve children obtained high-scores on less than three subscales, twelve children on three to six subscales, three children on seven subscales and four children on all subscales.

Conclusions : The parent version of BRIEF confirmed executive dysfunctions among children with ADHD. All subscores were elevated, but the symptom patterns were heterogeneous within the ADHD group.

Correspondence: *Astri J. Lundervold, PhD, Dep. of Biological and Medical Psychology, University of Bergen, Jonas Lies vei 91, Bergen 5009, Norway. E-mail: astri.lundervold@psych.uib.no*

J.L. GUAY. Utility of the CPT-II in Differentiating ADHD and Dyslexia.

Objective: This study explored the utility of the CPT-II in differentiating between ADHD and dyslexia by examining differences between ADHD, dyslexia, and comorbid groups on five CPT-II measures. Gen-

eral hypotheses were that ADHD groups would perform similarly on CPT measures, that all groups would perform similarly on measures of inattention and response time, and that ADHD groups would perform significantly worse than the dyslexia group on response inhibition and response time consistency measures.

Participants and Methods : The study sample was comprised of 89 children, diagnosed with ADHD, dyslexia, or comorbid ADHD and dyslexia. There were no group differences for age, gender, or nonverbal IQ. Diagnosis was made with a comprehensive assessment, based on DSM-IV-TR criteria. The main dependent variables were CPT-II T-scores for omissions, commissions, HRT, HRT SE, and HRT ISI. ANOVA was used for data analysis.

Results : There were no significant differences on CPT-II omissions, HRT, or commissions. On HRT SE, the comorbid group performed significantly worse than the dyslexia group. On average, the comorbid group performed more poorly than the ADHD group and the ADHD group performed more poorly than the dyslexia group on four of five CPT-II measures. The comorbid group had the highest percentage of impaired scores on both omissions and HRT SE (43%), compared to the ADHD group (19%) and the dyslexia group (4%).

Conclusions : Overall, the results suggest that the comorbid group in this sample demonstrated core deficits of both ADHD and dyslexia, with deficits combining in an additive manner. Specific CPT-II measures (HRT SE and omissions) provided some differentiation between the comorbid and dyslexia groups. While the CPT-II continues to be limited by poor sensitivity, it may provide some diagnostic clarity when determining comorbidity of dyslexia and ADHD.

Correspondence: *Julie L. Guay, M.A., Illinois School of Professional Psychology, 1336 Stonegate Drive, Downingtown, PA 19335. E-mail: jguay@ameritech.net*

S. ADOLFSDOTTIR, L. SORENSEN & A.J. LUNDERVOLD. Attention Network Test reveals characteristic patterns of dysfunction among children with ADHD.

Objective: The Attention Network Test (ANT) gives measures of several components of attention/executive functions. In the present study we ask if the test can reveal characteristic deficits among children with Attention Deficit Hyperactivity Disorder (ADHD).

Participants and Methods : 267 children (8-11 yrs) who participated in the third phase of the Bergen Child Study were included. All children performed the child version of ANT, downloaded from Jim Fans homepage. All parents and children were interviewed according to KiddieSADS-PL. Most children obtained no diagnosis ($n=125$), 60 children obtained a possible or definite ADHD diagnosis (definite=35 children) and 82 children a possible or definite other diagnosis (definite = 57 children).

Results : Significant differences (ANOVA) between the three groups (no diagnosis, possible or definite ADHD, possible or definite other diagnoses) were found on the Hit RT Std Error and error measures (wrong reactions). Children with a definite ADHD showed significantly longer reaction time (RT) on the measure of the alerting network, more signs of impulsivity (wrong responses) and reduced vigilance (Hit RT Block change) compared to children without any diagnosis as well as compared to children with other definite diagnoses. No significant differences were revealed between the group with no diagnosis and the group with definite other diagnoses.

Conclusions : Characteristic dysfunctions of attention were revealed by the ANT in the group of children with a definite ADHD diagnosis. The alerting network seemed to be primarily affected, and the children showed symptoms of impulsivity and reduced vigilance.

Correspondence: *Astri J. Lundervold, PhD, Dep. of Biological and Medical Psychology, University of Bergen, Jonas Lies vei 91, Bergen 5009, Norway. E-mail: astri.lundervold@psych.uib.no*

A.M. NAGLE, D.E. EVERHART, T.W. DURHAM, S.L. MCCAMMON & M. WALKER. Cognitive dissimulation strategies in children: Examination of forced choice recognition memory and verbal learning and memory.

Objective: This study was designed to study examine cognitive dissimulation strategies among children on two psychological measures, the Test of Memory Malingering (TOMM) and the Hopkins Verbal Learning Test- Revised (HVLTR).

Participants and Methods : Thirty-five children ages 6 to 12 years were asked to complete two alternate forms of the HVLTR, once with the instruction to feign cognitive impairment and once instructed to do their best. They were also asked to complete the TOMM during the experiment. Performance was compared across conditions.

Results : Children told to do their best and children told to feign cognitive impairment performed comparably to adult norms on the Test of Memory Malingering, obtaining a score of 45 or above on Trial 2. No significant differences were observed between groups on the TOMM. Regarding the HVLTR, children who were initially told to perform their best during the first administration of the HVLTR and then told to feign impairment during the second administration recalled significantly fewer words across trials ($p < .05$) during the second administration of the HVLTR.

Conclusions : These results suggest that children between the ages of 6 and 12 perform similarly to adults on the TOMM, even when asked to pretend that they have a brain injury. In contrast, when initially told to perform their best on the HVLTR, children were capable of producing a decline in learning performance on a subsequent administration in which they were instructed to fake. This study provides preliminary data concerning the strategies that children may use to fake cognitive impairment when instructed.

Correspondence: *D. E. Everhart, PhD, Psychology, East Carolina University, Dept of Psychology, Rawl Building, Greenville, NC 27858. E-mail: everhartd@mail.ecu.edu*

A. DAVIS, W. FINCH, R.S. DEAN & R. WOODCOCK. The Canonical Relationship between Sensory-Motor Skills and Academic Achievement in Children with ADHD.

Objective: Recent research has indicated that sensory-motor deficits are prevalent in children with ADHD, especially in the area of complex motor skills. Despite these salient deficits, combined with the ubiquitous frequency of the disorder, traditional neuropsychological measures are often lacking in their ability to discriminate and differentiate children with ADHD from normals. However, recent research regarding a new comprehensive neuropsychological measure, the Dean-Woodcock Neuropsychological Assessment System (DWNAS) has shown promise in differentiating between children with and without ADHD and differentiating among ADHD subtypes. However, there is a paucity of research regarding the link between sensory-motor skills and higher order processing skills, such as reading, writing, and mathematics.

Participants and Methods : 118 children (mean age = 11.78 years) were administered the Dean-Woodcock Sensory Motor Battery (DWSMB) and selected subtests from the Woodcock-Johnson Tests of Achievement. The DWSMB consists of 18 subtests which assess cortical sensory-motor skills and subcortical motor skills.

Results : One primary sensory-motor construct variable emerged with highly significant canonical correlations with academic achievement. The sensory-motor construct variable correlated with the academic achievement construct variable with a value of .92, which accounted for 86% of the variance. The Wilks' Lambda was strongly significant ($p = .0001$). Post-hoc analysis revealed that complex motor skills had the highest degree of correlation with the sensory-motor construct.

Conclusions : Classic complex motor tests such as Palm Writing and Clock Construction had the strongest correlation with the academic achievement variable. Since most children with ADHD struggle academically, assessment of sensory-motor skills should be part of a battery of assessment for these children.

Correspondence: *Andrew Davis, Ph.D., Ball State University, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

C.L. TRASK, S. PROVENCAL & K. HAWASH. Late Onset of Cognitive Regression in an Eight-Year-Old Girl.

Objective: Regression, or loss of previously acquired skills, is a rare phenomenon in childhood. This case study reflects the difficulty in differential diagnosis between Landau-Kleffner Syndrome, Childhood Disintegrative Disorder, and Childhood Onset Schizophrenia.

Participants and Methods : This is a case presentation of an eight-year-old girl with a history of mild developmental delay who demonstrated marked regression over the past year. She exhibited a loss of self-care skills, including independent toileting, increasing unresponsiveness to verbal stimuli, and loss of cognitive skills. Family history is significant for distant family members with epilepsy and paranoid schizophrenia. Multiple MRI and EEG studies were completed and portions of neuropsychological testing were videotaped.

Results : Neuropsychological assessment was notable for fluent expressive speech unrelated to external events, but an inability to respond and follow verbal directions. Joint attention behaviors were also markedly impaired, but no auditory hallucinations or delusions were observed. Neurological work-up has not yielded any explanation for the deterioration in functioning. MRI's show stable and non-progressive delayed myelination in the periventricular region. EEG studies have not captured any frank epileptiform activity, although nonspecific findings of generalized slowing and rare frontal sharp waves are noted.

Conclusions : EEG findings are not diagnostic of Landau-Kleffner Syndrome or other epileptic disorder. There is also no clear evidence of hallucinations or delusions to support a diagnosis of Childhood Onset Schizophrenia. The age of onset of regression is inconsistent with autism, although limited engagement with external stimuli and marked deficits in joint attention are common features. This case might be best conceptualized as Childhood Disintegrative Disorder.

Correspondence: *Christine L. Trask, Ph.D., Neuropsychology, Rhode Island/Hasbro Children's Hospitals, 593 Eddy Street, POB 430, Providence, RI 02903. E-mail: ctrask@lifespan.org*

M.A. MATSON, M. MAHONE, T. HAY, W.R. KATES & A. HORSKA. Behavioral and Neuroanatomic Correlates of Parent Ratings of Working Memory in Typically Developing Children.

Objective: Ecological validity of executive function (EF) measures in children has been questioned because of the inconsistent relationship between performance-based laboratory tests and caregiver ratings of these same behaviors (Mahone et al., 2002). There has been limited research examining relationships among regional brain volumes, behavioral measures of EF and parent ratings of function.

Participants and Methods : The present study examined the association among neuroanatomic structures, parent ratings, and performance-based measures of working memory in 36 typically developing children ages 6-18 (19 males). High-resolution three-dimensional MRI was performed at 1.5 T. BrainImage was used for visualization, processing and quantification of MRI data. Isolated brain tissue was subdivided using the revised Talairach atlas into cerebral lobes, subcortical regions, and cerebellum, and was segmented to delineate and measure lobar volumes of gray, white, and ventricular compartments using a constrained fuzzy algorithm.

Results : Parent ratings on the Working Memory scale of the Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000) were significantly correlated with the performance-based measure of working memory (i.e., Woodcock Johnson-III Auditory Working Memory) (r

= -0.48); as well as left ($r = -0.49$), and right ($r = -0.41$) frontal gray matter volumes, and left ($r = -0.45$) and right ($r = -0.55$) cerebellar gray matter volumes (all $p < 0.05$). BRIEF Working Memory ratings were not correlated with spatial perception skills, or with left or right temporal, parietal, or occipital lobe gray matter volumes.

Conclusions : These results provide initial convergent and discriminant validity of the BRIEF Working Memory scale using both behavioral and neuroanatomic correlates.

Correspondence: *Mark Mahone, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

D. BEEBE, M. RIS, J. LOYDEN, J. BAILIE, S.R. DANIELS & R. AMIN. Children's Sleep is Associated with Aspects of Attention, Executive, and Scholastic Functioning.

Objective: There is evidence that inadequate or poor quality sleep in children is associated with daytime deficits. However, research in this area has been limited by potentially biased samples or restricted assessments. We examined this association using multidimensional assessments of sleep and daytime functioning in children who had not been referred for clinical sleep or behavioral evaluation.

Participants and Methods : Seventy-nine 10-16-year old children from an ongoing study participated (age = 12.4 ± 1.7 years; 43% Caucasian; 53% African American; 68% female); 57 from a weight management clinic and 22 demographically-matched controls. Sleep evaluations included parent and child questionnaires, 1-week objective assessment at home (actigraphy), and polysomnography. Parents completed the BRIEF, parents and children reported academic grades, and children underwent cognitive screening, with age-normed measures empirically grouped into three factors: (1) vigilance (Gordon CPT), (2) Tower of London, and (3) working memory and executive efficiency (L/N Sequencing, Verbal Fluency, TEACH Creature Counting and Map Mission).

Results : Spearman correlations were conducted. Poor vigilance was associated with shorter sleep and increased sleep disruption on actigraphy and hypoxia on polysomnography. Performance on the other two cognitive factors was uncorrelated with sleep variables. On the BRIEF, problems with behavior regulation were uncorrelated with sleep, but poor metacognition was associated with parent- and child-reported sleepiness. Poor grades were associated with sleep-disordered breathing, parent- and child-reported sleepiness, and short sleep time across sources.

Conclusions : Sleep is indeed related to daytime functioning. Because sleep problems are common in children with neurological conditions, pediatric neuropsychologists should familiarize themselves with sleep assessment and intervention techniques.

Correspondence: *Dean Beebe, Ph.D., Psychology, Cincinnati Children's Hospital Medical Center, MLC 3015, 3333 Burnet Avenue, Cincinnati, OH 45229. E-mail: dean.beebe@cchmc.org*

J. CHANDLEE, J. RADCLIFFE & L. TUESDAY HEATHFIELD. Developmental Changes in Attention Performance and Their Relationship to Behavior and School Problems.

Objective: Assessing children's attention capacities over time may provide information about the contribution of early or persistent difficulties in attentional functioning in relation to later or generalized problems with behavior and learning. The purpose of this study is to gain insight into the developmental timetable of attention functions in school-aged children, and to determine the extent to which developmental performance on attention tasks is related to ecologically meaningful outcomes (i.e., behavioral adjustment and school functioning).

Participants and Methods : Participants were 90 children from the Treatment of Lead-Exposed Children's Study, 1994-2003, who completed the NEPSY attention/executive tasks at age 5 and 7 years and had been evaluated for behavior and learning problems by a parent and teacher with the BASC at age 7 years.

Results : As hypothesized, children's performance improved on all tasks between age 5 and 7 years and the rate of change differed across tasks. Results of multiple regression analysis supported the ecological validity of the NEPSY tasks in predicting behavior and school learning problems after controlling for IQ. Specifically, performance on the Auditory Attention task at age 5 and 7 years was a significant predictor of teacher rated behavior problems and school learning difficulties. Performance on the Tower task at age 7 years significantly predicted parent ratings of behavior problems at home.

Conclusions : These findings support the association of the NEPSY attention/executive tasks with ecologically meaningful ratings of behavioral adjustment and learning problems across a two year span. Such findings have implications for early identification and intervention.

Correspondence: *Jeanette Chandlee, M.A., Drexel University, 13 Martins Road, Newtown Square, PA 19073. E-mail: jmc29@drexel.edu*

A. MAERLENDER, J. CRAWFORD & E. ABEL. An Exploratory Study of the Relationship of Parenting Behaviors to Children's Executive Functioning.

Objective: This study examines a version of Baumrind's parenting theory to determine whether parenting behaviors predict childhood executive functions. Previous research has suggested that children of authoritative parents are more likely to demonstrate greater social competence, fewer adjustment problems, fewer behavior problems and better academic performance. While many studies suggest a relationship between parenting and child behavior, little research exists which examines the relationship between parenting style and childhood executive function.

Participants and Methods : Two parent questionnaires, the Parent-Child Relationship Inventory (PCRI) and the Behavior Rating Inventory of Executive Function (BRIEF) were collected from mothers of children referred for neuropsychological evaluation ($N=32$). Regression analyses were used to test hypotheses regarding the influence of parenting behaviors on measures of behavioral regulation (BRI) and metacognitive processes (MI).

Results : Limit Setting accounted for significant variance in both BRI ($R^2 = .475, p = .000$) and MI ($R^2 = .298, p = .002$). Intercorrelations showed that maternal Autonomy ratings were strongly related to BRI and Communication was related to MI. No other parenting behaviors showed significant relationships to executive ratings.

Conclusions : Consistent with Baumrind's theory of parenting, limit-setting behavior, parental communication and facilitation of autonomy appeared to be important variables in the development of children's executive processes, with limit-setting the most predictive. Further research is needed to confirm the direction of causality and to examine the effects of different types of parenting behaviors on executive functions, with the goal of optimizing parenting strategies and interventions related to the development of self-regulatory and metacognitive problem solving skills.

Correspondence: *Art Maerlender, PhD, Psychiatry, Dartmouth Medical School, DHMC, 1 Medical Center Dr., Lebanon, NH 03756. E-mail: art.maerlender@dartmouth.edu*

E. NELSON & A. HEFFELFINGER. Language Functioning Differentially Associated with Parent and Teacher Reports of Behavior Problems in Preschool Children.

Objective: Language delays have been found to be associated with behavior problems in young children, but it is unclear whether both teacher and parent reports of a child's behavior are actually related to language functioning. Understanding these relationships is important to the interpretation of behavior reports in clinical assessments. In this study, lower language abilities are hypothesized to be associated with both higher parent and teacher reports of behavior problems.

Participants and Methods : Fifty-eight clinic-referred preschool children [mean age=50.8 months (SD=14.6); 43 boys, 15 girls] who have language, behavioral, or pervasive developmental disorders, completed assessments including language and parent and teacher report of behavior.

Results : ANCOVA was completed with behavior report as the independent variable, language as the dependent variable, and age, ethnicity, and gender as covariates. Language functioning is significantly related to parent report of externalizing behavior ($F=4.8$, $p=.03$), but is not significantly associated with teacher report of externalizing behavior ($F=.28$, $p=.60$).

Conclusions : These results suggest that if parents report that a child has externalizing behaviors, it is essential to investigate whether there are associated language problems. On the other hand, the externalizing behaviors observed by teachers may not be related to language problems. Findings from the current study contribute knowledge that will aid in facilitating feedback and education for parents and teachers of children with known with language difficulties who may experience stress and exhibit behavior problems in home and school milieus.

Correspondence: *Elizabeth Nelson, Ph.D., Neuropsychology, Medical College of Wisconsin, 9200 West Wisconsin Avenue, Milwaukee, WI 53226. E-mail: enelson@neuroscience.mcu.edu*

E.L. WODKA, S.H. MOSTOFSKY, C. PRAHME, J.C. GIDLEY LARSON, M.B. DENCKLA & M. MAHONE. Discriminant Value of Executive Function Measures in Children with ADHD.

Objective: To examine the predictive power of executive function measures in discriminating children with ADHD from typically developing controls.

Participants and Methods : Eighty-seven children (34 ADHD, 53 controls) ages 8-16 completed the D-KEFS Trail Making, Verbal Fluency, Color-Word Interference, and Tower Tests as part of a larger study. Children with ADHD were screened for Reading Disability and comorbid psychiatric conditions, and were removed from stimulant medication.

Results : There were no significant group differences in age, IQ, SES, or gender distribution. Relative to controls, children with ADHD had significantly poorer performance on the Color-Word Interference Test (Color Naming, Inhibition, and Inhibition Switching Conditions, and Combined Naming and Reading Composite), and the Verbal Fluency Test (Condition 3: Category Switching Total Correct Responses and Total Switching Accuracy). There were no significant group differences on Primary, Combined, Contrast, or Error Analysis variables of the Trail Making Test, or on Primary or Optional Measures of the Tower Test. In order to examine relative contribution of the four tests to prediction of group membership (ADHD versus control), the Primary Measures from each were entered into a stepwise linear discriminant function analysis (DFA). The function was highly significant ($p = .001$), but only Color-Word Interference Inhibition Condition contributed significantly to group discrimination. Seventy percent of the sample was correctly classified using cutoffs produced by this DFA.

Conclusions : Measures of response inhibition appear to effectively discriminate children with ADHD from controls. In contrast, measures of other executive functions may be less useful in making this discrimination.

Correspondence: *Mark Mahone, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

J. JANUSZ, G.A. GIOIA, T. DIVER & M. NATALE. Frequency of Post-Concussion Symptom Report in a Pediatric Sample.

Objective: Certain cognitive, behavioral/emotional, and somatic symptoms seen after a mild traumatic brain injury (mTBI) are also common among children who have not sustained an mTBI. This study describes the frequency of common post-concussive symptoms in a non-injured pediatric population.

Participants and Methods : 47 boys and 55 girls (age 5 to 18 years) and 72 parents completed a Post-Concussion Symptom Inventory. Children age 5 to 7 years rated symptoms on a 3-point Likert scale; children older than 8 years and parents rated symptoms on a 7-point Likert scale. The 12 items common to all measures were analyzed. The percentage of children and parents rating the symptom as a moderate or greater problem was calculated.

Results : Few symptoms were endorsed by parents; no symptom was rated as more than a moderate problem by greater than 10% of the sample. Similar results were seen for children age 5 to 7, although 12% of the sample rated noise sensitivity as a moderate or greater problem. In contrast, symptoms were reported more frequently by children age 8 to 18. Fatigue was the most common symptom, endorsed by 36% of the sample. Somatic symptoms (light sensitivity, nausea, headache) were endorsed by 11-27% of the sample. Attention and memory problems were reported by 13-23% and emotional symptoms (sadness, nervousness, irritability) were endorsed by 18-22% of children and adolescents.

Conclusions : Differences were noted in the frequency of symptom endorsement between parents and children, with children older than 8 years endorsing more difficulties during day-to-day activities than their parents. These findings suggest that parents and children may perceive symptoms differently. Alternatively, children may interpret questions differently than adults. This study highlights the importance of obtaining symptom report from various sources. Also, given the high percentage of certain symptoms reported in a non-injured population, it is important to obtain pre-injury ratings of symptoms following a concussion. Correspondence: *Jennifer Janusz, Psy.D., Pediatric Neuropsychology, Children's National Medical Center, 111 Michigan Ave., NW, Suite 1200, Washington, DC 20010. E-mail: jjanusz@cnmc.org*

G.A. GIOIA, J. JANUSZ, T. DIVER, M. NATALE, S. ANDERSON, M. DIPINTO, J. OSGOOD, C. JOHNSON, I. SYLVESTER, M. FLEISCHER & P. ISQUITH. Initial Development of the Pediatric version of the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) Battery.

Objective: Currently, there are no computerized repeatable measures designed to assess and track mild traumatic brain injury (mTBI) in young children. We report on the initial development of a pediatric version of the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT) battery.

Participants and Methods : 34 boys and 40 girls aged 5 to 12 years were administered a 10-subtest pediatric version of ImPACT, a computer-based battery measuring several aspects of attention, memory, processing speed, and reaction time. Two alternate forms were developed and administered (Form 1, $n=41$, Form 2, $n=33$).

Results : Examination of gender and age effects revealed no gender differences but large, significant main effects for age on 9 of 10 subtest accuracy scores and 20 of 20 subtest response speed and consistency scores, $p<.001$. Developmental trends showed consistent linear improvement in performance on all tasks with increasing age, particularly for response speed and consistency. Split-half reliabilities were adequate across the battery (range 0.70-0.93). Examination of the two alternate forms revealed equivalence on 9 of 10 subtests. Eighty-nine percent of participants rated the subtests as fun and easily understood.

Conclusions : Initial evaluation suggests that the pediatric version of ImPACT was readily understood and enjoyable for children, and demonstrated adequate psychometric properties including internal reliability, equivalence of alternate forms and no gender differences but expected developmental trends across the 5-12 year age span. With further development, the measure may provide an easily administered and reliable method for evaluating and tracking effects of mTBI in young children. 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*

T. DIVER, G.A. GIOIA & J. JANUSZ. Initial Evidence of Differentiated Memory Based on Exploratory Factor Analysis of the Pediatric Version of ImPACT.

Objective: Deficits in various aspects of memory (e.g., working memory, memory storage and retrieval) have been documented in adolescents following a mild traumatic brain injury. We examined the preliminary construct validity of the memory tasks of a newly developed pediatric version of the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT).

Participants and Methods : Principal factor analysis was used as the exploratory method with oblique rotation (Promax). Criterion for inclusion of a scale on a factor was set at a loading greater than .30. Two- and three-factor solutions were examined for 72 (33 boys) healthy 5 to 12 year olds. Memory subtests included 1) a picture recognition memory task consisting of 2 presentation trials and a delay trial, 2) a design memory task consisting of 2 presentation trials and a delay trial, 3) a memory for spatial location task with interference, 4) a memory for colors task with interference, and 5) a symbol-digit matching memory task. **Results :** A three-factor model was retained as the best-fitting model, accounting for 71% of the variance. Factor one is defined by explicit learning of semantic pictures, factor two by explicit learning of geometric designs and factor 3 by tasks of working memory. The three factors were modestly correlated with each other.

Conclusions : A three-factor structure of memory (2 explicit, 1 working memory) was identified, providing initial evidence for differentiated memory tasks within the pediatric version of ImPACT.

Correspondence: *Tanya Diver, doctorate, Neuropsychology Program, Children's National Medical Center, 14S01 Physician's Lane, Suite 173, Rockville, MD 20850. E-mail: tdiver@cnmc.org*

G.A. GIOIA, P.K. ISQUITH, R.M. ROTH, C.J. JOHNSON, J. JANUSZ, T. DIVER, S. ANDERSON, M. DIPINTO, J. OSGOOD & I. SYLVESTER. Initial Development of a Computer-Administered Working Memory and Inhibitory Control Battery for Children.

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 : 25 boys and 44 girls aged 5 to 18 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 : Split-half reliabilities for subtests were strong (0.89-0.94). An age by gender 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 5 to 18 year age spectrum. Continued normative development and validation with clinical samples is planned.

Correspondence: *Gerard A. Gioia, Ph.D., Pediatric Neuropsychology, Children's National Medical Center, 14S01 Physician's Lane, Suite 173, Rockville, DC 20850. E-mail: ggioia@cnmc.org*

M. DI PINTO, G. GIOIA, J. JANUSZ, T. DIVER, J. OSGOOD, S. ANDERSON, C. JOHNSON & P. ISQUITH. Performance on Working Memory Versus Episodic Memory Tasks in a New Computerized Pediatric Assessment Tool: A Developmental Study.

Objective: Working memory (WM) and episodic memory (EM) are two aspects of cognitive function typically measured in neuropsychological evaluations and thought sensitive to developmental changes and disorder. We examined children's performance on selected WM and EM tasks in a recently developed computerized battery designed to assess memory, attention, and executive function (Pediatric ImPACT).

Participants and Methods : Performance accuracy on two visual working memory and two episodic memory tasks was measured in a sample of 72 normal children aged 5-12 years. All four tasks were visually presented and required recognition of order or placement (WM) or recognition of meaningful pictures or abstract designs (EM).

Results : A repeated measures ANOVA with task type (WM versus EM) as the within subjects variable and age as a covariate revealed a substantial main effect for task type, $\eta^2 = .571$, $p < .001$, and a moderate interaction with age, $\eta^2 = .293$, $p < .001$. Performance accuracy on WM tasks was consistently lower than on EM tasks. This effect varied with age depending on task demands, with EM performance starting and remaining relatively strong but WM performance increasing across the age spectrum.

Conclusions : The stronger age trend for WM tasks suggests that working memory development may be more protracted than episodic memory in children. The WM tasks in the pediatric version of ImPACT were also more demanding than the EM tasks, regardless of age. These results may be limited, however, by possible ceiling effects of the recognition EM tasks. Computer administered batteries such as the pediatric version of ImPACT may facilitate examination of developmental trends in aspects of memory and executive function.

Correspondence: *Marcos Di Pinto, M.S., The Children's National Medical Center, 111 Michigan Ave., N.W., Washington, D.C., DC 20010-2970. E-mail: Mdipinto@cnmc.org*

Poster Session 3/10:45 a.m.–12:15 p.m.

Cognitive Neuroscience

R.A. LILLIE, J.W. TANAKA, D. DROUCKER, V. BHARADIA & S. LIVINGSTONE. "You Look Familiar": Impact of Face Familiarity on the N250 ERP Component.

Objective: What remains elusive in our understanding of human face perception is a link between early perceptual processing and overt recognition. Previous studies using event-related potentials (ERPs) suggest that a negative deflection occurring in posterior channels 250 ms following stimulus presentation (N250 component) may be modulated by prior familiarity. The current project extended earlier work by testing familiarity effects for the participant's own face and a newly learned face. **Participants and Methods :** ERPs were recorded for 12 adults (mean age = 31.25 years) while passively viewing faces in 3 conditions: participant's own face, an experimental target face, and unfamiliar faces. These conditions allowed a comparison between a previously-familiar face (own), an experimentally-familiar face (target), and unfamiliar, non-target faces. Data from posterior channels (PO7, PO8) were analyzed.

Results : Results included an N250 component (mean latency = 270msec) that was reliably different for all conditions with the following pattern of deflections: own face > target face > unfamiliar, non-target faces. A smaller and earlier P2 component in response to one's own face was also detected. Controlling for effects at P2, the N250 retained a trend toward a reliable pattern of negative deflections for the 3 face conditions.

Conclusions : These findings indicate that the P2 and N250 may represent early perceptual markers of facial recognition that are impacted by prior learning. Importantly, they may provide a means of linking rapid, covert processing of familiar faces to later-occurring covert recognition. Implications for understanding facial recognition in normal and clinical samples will be discussed.

Correspondence: *Rema A. Lillie, MSc, Psychology, University of Victoria, Psychology, University of Victoria, PO Box 3050 STN CSC, Victoria, BC V8W3P5, Canada. E-mail: rlillie@uvic.ca*

M.J. LARSON, K.J. THOMAS, D.E. NAGEL, D.A. STIGGE-KAUFMAN, N.K. DIXIT & W.M. PERLSTEIN. Task-Irrelevant Facial Fear Distractors Impair Working Memory.

Objective: Evidence suggests that threat-related signals are rapidly processed by specialized emotion mechanisms in the brain that prioritize attention toward threatening stimuli, including fearful facial expressions. We developed a novel cognitive-affective task to test the hypothesis that fearful, relative to neutral, facial expression distractors would disproportionately capture attention and impair prefrontally-mediated active maintenance of goal representations in working memory (WM) when most needed.

Participants and Methods : Healthy participants performed a delayed matching-to-sample task with low and high WM loads. Memory cues comprised one or three geometric forms; probes comprised a single geometric form to which participants signified via forced choice a cue match or non-match. Early in the 12.5-s cue-probe delay interval a 750-ms duration task-irrelevant fearful or neutral face distractor was presented. Memory probe error rates and reaction times (RTs) were examined for evidence of load-related distractor interference effects on WM.

Results : Probe RTs were significantly longer under high- than low-load conditions ($p < .0001$) and distractor valence significantly modulated load-related RTs ($p = .0015$): Relative to neutral face distractors, RTs following fearful faces were significantly slowed at the high load ($p = .002$), and showed a tendency toward facilitation at the low load ($p = .08$). Error rates were greater at high- than low-load conditions ($p < .015$), but were unaffected by distractor valence.

Conclusions : Task-irrelevant fearful face distractors robustly and specifically interfered with the active maintenance of goal representations in WM. The pattern of behavioral results suggests that WM-related cortical structures may be taken “off-line” following disproportionate attentional capture by threat-related distractors, thereby disrupting processing priorities in WM.

Correspondence: *William M. Perlstein, Ph.D., Clinical and Health Psychology, University of Florida, HSC Box 100165, Gainesville, FL 32610. E-mail: wmp@grove.ufl.edu*

K.S. GIOVANELLO & M. VERFAELLIE. Conceptual Priming in Semantic Dementia: A Window into the Cognitive and Neural Basis of Conceptual Implicit Memory.

Objective: The study examined the impact of impairment in semantic memory on conceptual repetition priming by means of the longitudinal study of a patient with semantic dementia.

Participants and Methods : ST, a 65 year-old right-handed man with 18 years of education, presented with a five-year history of slowly progressive word finding difficulty. An MRI performed in 2001 demonstrated atrophy that extended from the temporal pole anteriorly to the occipito-temporal junction posteriorly. Since the time of his presentation, ST's semantic deficits have become progressively more pervasive. Patient ST and 10 age and education-matched controls performed an abstract/concrete verification task and a verb generation task. In both of these tasks, performance during a test phase was compared for stimuli previously processed in a study phase and stimuli first seen in the test phase. ST was tested in four consecutive years.

Results : In both tasks, control subjects showed priming, as indicated by faster responses to studied than to baseline stimuli. ST showed intact priming that was of normal magnitude in the first two years of testing, but failed to show priming in the subsequent two years of testing, despite still being able to perform the task quite accurately.

Conclusions : This pattern of results is interpreted with reference to the differential decline of item-specific and superordinate knowledge. The absence of conceptual priming in ST at a more advanced stage of semantic decline also has implications for our understanding of the neural basis of conceptual repetition priming. Our results suggest that anterior and middle temporal areas play a critical role in conceptual priming.

Correspondence: *Kelly S. Giovanello, PHD., Psychology, Harvard University, William James Hall 860, 33 Kirkland Street, Cambridge, MA 02138. E-mail: kgio@nmr.mgh.harvard.edu*

M.A. KUMAR, A. SHEPARD, S. STEVENS & J.P. KEENAN. The Neural Correlates of Self-deception.

Objective: Recent investigations have suggested that frontal, cingulate and parietal areas are critical for deceptive behavior. The cortical underpinnings of self-deception remain elusive. Evidence from confabulatory patients indicates that midline regions, particularly frontal, may be necessary for self-deception. We therefore hypothesized that midline cingulate regions may be important for self-deceptive behavior.

Participants and Methods : To investigate this possibility, we examined 10 participants employing Transcranial Magnetic Stimulation (TMS) in a ‘virtual lesion’ design. TMS was delivered to the anterior region of the anterior cingulate cortex (aACC), the posterior region of the anterior cingulate cortex (pACC), the precuneus (PC). During TMS delivery, participants were presented with a series of adjectives which were either positive, negative, or neutral. This task was chosen as participants have a tendency to self-enhance (i.e., they tend to over-attribute positive descriptors to themselves).

Results : All active TMS (aACC, pACC, and PC) was compared to sham TMS (90 degree orientation delivered over CZ). It was found that TMS delivered to midline cingulate regions disrupted the self-enhancement effect. The nature of the effect indicated both reaction time and categorical attributions were altered.

Conclusions : Both aACC and pACC contribute to self-enhancement and likely self-deception in general. Further research (e.g., fMRI) should be conducted to verify this conclusion.

Correspondence: *Julian P. Keenan, PhD, Psychology, Montclair State University, 219 Dickson Hall, Upper Montclair, NJ 07043. E-mail: selfawareness@prodigy.net*

V. TROIANI, R.C. MURRAY, M. WORK & M. GROSSMAN. From Nonword to Verb: an fMRI Investigation of Verb Acquisition in Healthy Young Adults.

Objective: To determine areas of cortical activation during learning of a novel verb through BOLD fMRI.

Participants and Methods : Participants included 20 right-handed, English-speakers (mean age=23.5 years, mean education=15 years). Subjects first completed a lexical decision task where their knowledge of the very infrequent English verb, *lour*, was assessed. Participants unfamiliar with this verb learned its meaning through a picture story. Following the story, subjects judged grammaticality of sentences containing known words, pseudowords, and *lour*. BOLD fMRI monitored brain activation. An event-related design acquired data for each serially-presented phrase of a sentence. Images were registered, normalized in Talairach space, smoothed, and analyzed with a random effects model and a region of interest analysis. A 20 voxel threshold at $p < .05$ (corrected for multiple comparisons) was used.

Results : Initial SPM analysis showed significant peaks of activation for the isolated verb phrase. Temporal-parietal activation was predominantly in the left hemisphere for known verbs, right hemisphere for pseudo-verbs, and bilateral for *lour*. A region of interest analysis revealed that known verbs activated more left temporal-parietal cortex (299 voxels; $p < 0.001$) than pseudo-verbs (0 voxels; $p < 0.001$). Pseudo-verbs activated more right temporal-parietal cortex (340 voxels; $p < 0.001$) than known words (216 voxels; $p = 0.002$). *Lour* invoked more left temporal-parietal activation (127 voxels; $p = 0.018$) than pseudo-verbs and more right temporal-parietal activation (321 voxels; $p < 0.001$) than known verbs.

Conclusions : Verb acquisition depends in part on bilateral temporal-parietal activation that becomes increasingly lateralized to the left hemisphere as the verb becomes more familiar.

Correspondence: *Vanessa Troiani, Bachelor of Science, Neurology, University of Pennsylvania, 3 West Gates, 3400 Spruce St., Philadelphia, PA 19104. E-mail: troiani@mail.med.upenn.edu*

S. NEGASH, B.F. BOEVE, Y.E. GEDA, G.E. SMITH, D.S. KNOPMAN, R.J. IVNIK, D.V. HOWARD, J.H. HOWARD, JR. & R.C. PETERSEN. Implicit Learning of Sequential Regularities and Spatial Contexts in Corticobasal Syndrome Patients.

Objective: To investigate implicit learning systems in patients diagnosed with the corticobasal syndrome (CBS), and to determine whether some forms of implicit learning are impaired, while others remain relatively preserved, when CBS patients are compared to healthy controls. To date, no studies of implicit learning in CBS have been reported.

Participants and Methods : We recruited five CBS patients enrolled in the Mayo Alzheimer's Disease Research Center (ADRC) and 5 healthy age- and gender-matched controls. Participants completed two different paradigms of implicit learning — contextual cueing and sequence learning. In the former, people were asked to locate and identify a target item presented among a display of distractors. In the later, predictable events alternated with random, unpredictable ones in an Alternating Serial Reaction Time (ASRT) task.

Results : For each task, the difference in performance between frequently occurring and infrequently occurring events (trial type effect) was analyzed on the response time and accuracy measures. The data were submitted to a 2 (Group) \times 2 (Trial Type) \times 5 (epoch) mixed design ANOVA with repeated measures on the epoch and trial type factors. Results revealed reduced trial type effects in CBS patients compared to controls, particularly on the ASRT task. Explicit measures (post-experimental interview and recognition tests) revealed learning was implicit and had occurred without awareness of the regularity.

Conclusions : CBS patients have impairments in implicit learning, particularly in learning of sequential regularities, which rely on the integrity of fronto-striatal circuits. These findings provide further support for the fronto-striatal dysfunction and relative integrity of the medial temporal lobe in CBS.

Correspondence: *Selam Negash, Ph.D., ADRC, Mayo Clinic, 200 First Street SW, Rochester, MN 55905. E-mail: negash.selamawit@mayo.edu*

R. BRAESE, K.J. MILLER, J. KIM, A. KAPLAN & G.W. SMALL. GSS and Cognition: An Examination of 5 Neurocognitive Profiles.

Objective: Gerstmann-Sträussler-Scheinker disease (GSS) is a rare neurodegenerative disorder that is associated with mutations of the prion protein gene. The disease is often characterized by cerebellar dysfunction and cognitive decline. GSS differs from the other human prion diseases by earlier onset, longer duration, and the presence of multiple amyloid plaques, similar to Alzheimer's disease. Greater disease duration allows greater opportunity for GSS to be studied. Objectives are to review the current literature and provide a progressive neurocognitive profile.

Participants and Methods : Five individuals who tested positively for the genetic mutation that causes GSS were recruited from a counterpart research program at Indiana University Medical Center. Neuropsychological test results from these patients represented various points on a continuum of cognitive decline ranging asymptomatic to gross cognitive impairment.

Results : Three clinical stages of disease progression were identified: asymptomatic, moderate symptomatology, and severe symptomatology. In the asymptomatic patients, there were slight declines in visual spatial functioning, visual memory, and delayed verbal memory. The patient with moderate symptomatology demonstrated declines in verbal memory with notable impairment in a selective reminding task. The patients with severe symptomatology demonstrated gross decline with the exception of relatively intact attention, concentration, recognition, and intact ability to learn through repetition.

Conclusions : The neuropsychological profiles presented suggest a disease course beginning with declines in verbal memory then progressing into gross impairment across almost all domains including: psychomotor functioning, visual spatial functioning, language, executive functioning, and verbal and visual memory. However, they possessed an awareness of themselves and their functioning that is atypical of other dementing diseases.

Correspondence: *Rob Braese, MA, Fuller Theological Seminary, 79 E. Highland Ave., Apt. G, Sierra Madre, CA 91024. E-mail: rbraese@hotmail.com*

J.R. ABEL, S.T. RIMRODT, M.A. MOHAMED, L.E. CUTTING & P.B. BARKER. Magnetic Resonance Spectroscopic Imaging and NF-1: Correlates to Cognitive Function.

Objective: Neurofibromatosis type I (NF-1), with an incidence of approximately 1 in 3,000 to 4,000 births, is the most frequent autosomal dominant neurocutaneous disorder. Cognitive impairments and learning disabilities, specifically visuospatial deficits, are commonly reported in children with NF-1. Prior metabolic imaging studies have indicated abnormalities in the thalamus in NF-1; however, the relationship of these findings to learning disability and cognition has not been investigated previously.

Participants and Methods : The present study examined children, ages 7 to 15 years, with ($n=13$) and without NF-1 ($n=15$), using proton magnetic resonance spectroscopic imaging. Participants also underwent a battery of neuropsychological testing. Spectra from the thalamus were evaluated bilaterally and ratios of metabolite peaks were calculated.

Results : Consistent with previous findings, participants with NF-1 showed significantly lower N-acetylaspartate/choline (NAA/Cho) and NAA/creatine (Cr) ratios in both the left and right thalamus ($p < 0.05$) compared to controls. There were no differences in Cho/Cr ratios between patients and controls. Correlation analyses revealed significant positive relationships between Judgment of Line Orientation (JLO) scores and both NAA/Cho and NAA/Cr ratios ($r = 0.383$, $p < 0.05$ and $r = 0.512$, $p < 0.05$ respectively).

Conclusions : Reductions in the NAA/Cho and NAA/Cr ratios are consistent with thalamic neuro-axonal damage or dysfunction. The significant correlations between JLO scores and metabolite ratios suggest that impairment in visuospatial processing in NF-1 subjects may be due to or associated with abnormal thalamic neuronal function.

Correspondence: *Jessica R. Abel, B.S. Neuroscience, Developmental Cognitive, Kennedy Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: abelj@kennedykrieger.org*

Y. SUCHY. Bad, Ugly, or Just Different: The Meaning of Outliers.

Objective: Removal of outliers is a common practice in behavioral research. However, outlying values may sometimes represent a pattern of

performance that is of clinical or theoretical interest. To test this notion, the present study examined whether cognitive performance profile (i.e., not just the level) of outliers reliably differed from that of non-outliers. Positive results would suggest that outlying data may contain meaningful information.

Participants and Methods : Four different tasks that test the speed of cognitive switching between left- and right-hemisphere activities were administered to four samples of college students (N=187). Participants were divided into two groups: "Normal" (baseline response latencies within 2 s.d. of the group mean; n=161), and "slow" (more than 2 s.d. above the mean; n=26). Past research has shown that switching from right- to left-hemisphere activity is faster than switching in the opposite direction. The profile of these switching response latencies was compared for the slow and normal groups.

Results : Repeated measures analysis of variance (ANOVA) using Group (normal vs. slow) and Task (1 through 4) as the between-subjects factors and Switch Type (right-to-left vs. left-to-right) as the within-subjects factor yielded an interaction between Switch Type and Group, $F(1, 179) = 12.40, p = .001$, with normal group showing the expected profile of switching latencies and slow group showing a reversed profile. There was no interaction with Task, showing that results were repeatable across samples and studies. Examination of individual cases confirmed that slow participants were twice as likely as normal participants to exhibit the reversed profile ($p = .006$).

Conclusions : These results show that outlying participants may in some cases represent a relatively homogeneous group, characterized by cognitive anomalies that may be responsible for their aberrant performance. Such participants' data should be examined, rather than removed, as they may provide useful clinical and theoretical information.

Correspondence: *Yana Suchy, Ph.D., Psychology, University of Utah, 380 S. 1530 E. Rm. 502, Salt Lake City, UT 84112. E-mail: yana.suchy@psych.utah.edu*

G.G. BROWN, T. TURNER, R. NOTESTINE, A. GAMST & J. SAWYER. Latent Working Memory Dissociations in Lateralized Brain Disease.

Objective: To determine whether a parametric model of working memory (WM) can reveal interesting patterns of neuropsychological deficit that are not apparent from conventional analyses of the data.

Participants and Methods : We fit a three-parameter, working memory model to individual subject data obtained from the Continuous Paired Associates Tests (CPAT), a WM test that involves the maintenance of information over alternating test and study trials. Psychometrically matched verbal and figural forms of the CPAT were administered to 15 patients with focal left hemispheric lesions, 15 patients with focal right hemispheric lesions, and 15 healthy volunteers matched to the two patient groups on education and age.

Results : We predicted a double dissociation involving lesioned hemisphere and test form. In published results we failed to find a double dissociation; both brain-damaged groups were more impaired on the figural form of the CPAT than on the verbal form. Nonetheless, a significant interaction between test form and group was observed for the model's displacement parameter, which is related to the number of items an individual can actively maintain in WM from trial to trial, $F(2, 42) = 3.82, p = 0.03$. An inspection of means revealed the predicted double dissociation. Additionally, both lesion groups were more impaired on the model's Figural attentional parameter than the Verbal attentional parameter, $F(2, 42) = 6.22, p = 0.004$.

Conclusions : Model-based analyses reflected a double dissociation in the WM displacement parameter, related to WM span, not detected by conventional data analyses. Moreover, parametric analyses suggested that the greater sensitivity of the Figural CPAT to brain lesions was due to its sensitivity to attentional abnormalities.

Correspondence: *Gregory G. Brown, Ph.D., Psychology, VASDHS, MC116B, 3350 La Jolla Village Dr, San Diego, CA 92129. E-mail: gbrown@ucsd.edu*

D. MILOVAN, G. LEONARD & M. AUBE. Cognitive Profiles of Patients with Unilateral Migraines.

Objective: Differences in cognition between patients with migraines and healthy control subjects have been documented by several researchers, principally in the areas of attention, memory, and motor function. Patients with aura are more often reported to have interference with normal cognitive functioning and are thought to have a more severe neurological condition than patients without aura.

Participants and Methods : Our study compared the cognitive profiles of 35 patients, recruited at the Montreal Neurological Hospital, and diagnosed with hemispheric migraines with- (MA) and without aura (MO) to that of 12 normal control subjects (NC). Diagnosis was made according to the International Headache Society guidelines by a neurologist. An extensive neuropsychological battery was administered to each participant.

Results : Examination of the data revealed a negative correlation for migraine patients on measures of overall cognitive ability, simple attention, verbal memory, executive and motor function. The MA patients' performance was significantly lower than that of NC on a General Cognitive Index ($MD = 5.31, p < 0.01$). Consistent with previous reports, MA patients obtained significantly lower Verbal IQ ratings than MO patients ($MD = 12.74, p < 0.05$) and NC ($MD = 24.43, p < 0.001$). Significant correlations were found between patients with left and right sided migraine (M_{Right} ; left - M_{Left}) and neuropsychological measures. Compared to NC, M_{Right} was associated with poorer motor skills ($MD = 11.49, p < 0.05$) and reduced delayed auditory memory ($MD = 2.82, p < 0.05$). M_{Left} correlated with significantly reduced immediate auditory memory ($MD = 2.65, p < 0.05$).

Conclusions : Thus, presence of aura and hemisphere lateralization of the migraine headache can affect the cognitive profiles of patients with migraine.

Correspondence: *Denise Milovan, Ph.D., Neuropsychology/Cognitive Neuroscience Unit, Montreal Neurological Institute, 3801 University, Montreal, QC H3B1A2, Canada. E-mail: dmilovan@bic.mni.mcgill.ca*

S.T. LEWYCKY, L.S. JAKOBSON, A.R. KILGOUR & B.M. STOESZ. Effects of Music Training on Verbal and Visual Memory.

Objective: In two previous studies, Chan and colleagues (Chan, Ho, & Cheung, 1998; Ho, Cheung, & Chan, 2003) presented evidence that verbal, but not visual, memory is enhanced in musicians relative to non-musicians. Both of these studies, however, involved Asian participants from Hong Kong. The first goal of the present study was to determine if this result could be replicated in a North American population. In addition, the study was extended to allow for an investigation of whether the verbal memory advantage previously described for musicians could be attributed to group differences in the use of particular encoding strategies during the learning of word lists.

Participants and Methods : Participants included 19 individuals with formal music training and 24 without such training. The groups were matched in terms of age and parental education levels. Each participant completed the California Verbal Learning Test 11 (CVLT-11; Delis, Kaplan, Kramer, & Ober, 2000) and the Rey Visual Design Learning Test (RVDLT; Graves & Sarazin, 1985; Rey, 1964).

Results : As expected, analysis of variance revealed group differences, favouring musicians, on the test of verbal memory. Musicians, moreover, achieved significantly higher semantic clustering scores than non-musicians, suggesting that this recall advantage was related to the use of a semantic encoding strategy. Unexpectedly, musicians also showed superior learning and memory of visual designs, contradicting previous reports.

Conclusions : These results add to the literature indicating that music training is associated with non-musical cognitive benefits and extends our previous knowledge to suggest that music training enhances both verbal and visual memory.

Correspondence: *Samantha T. Lewycky, B.A. (Hons.), Psychology, University of Manitoba, 190 Dysart Rd., P404 Duff Roblin, Winnipeg, MB R3T2N2, Canada. E-mail: lewycky@cc.umanitoba.ca*

C.R. SHELBY, E. MURRAY & J.P. KEENAN. Self-enhancement Modulated via Transcranial Magnetic Stimulation (TMS).

Objective: The self-enhancement effect is well documented and it takes on two,

somewhat independent forms. In the first (self insight theory), a person enhances his attributes when compared to how others describe him (e.g., thinking one is funny when his peers do not think he is funny). The second form (social comparison theory) relates to a person over-estimating his abilities in comparison to how he rates others (e.g., a person may think he is funnier than all of his friends). Both types of self-enhancement are typical in normal populations. Employing Transcranial Magnetic Stimulation (TMS), we examined the neural correlates of self-enhancement in both domains.

Participants and Methods : Five subjects that were well acquainted with each other were tested using an adjective design. In this task, subjects rated themselves and the other four participants. Ratings were made during TMS delivery to 6 different cortical regions (5 active and 1 sham). TMS was delivered at various timings to lateral parietal and midline cingulate regions.

Results : Using multivariate ANOVA, it was found that both types of deception were disrupted with TMS. TMS delivered to cingulate regions disrupted self-enhancement.

Conclusions : These data support our previous findings that self-enhancement is mediated, at least in part, via cingulate areas. Further, these data extend previous findings by examining both types of enhancement. Correspondence: *Cleo R. Shelby, Montclair State University, 1312 Clifton Ave, Apt. C, Clifton, NJ 07012. E-mail: shelbyc1@mail.montclair.edu*

B.M. STOESZ, L.S. JAKOBSON, A.R. KILGOUR & S.T. LEWYCKY. Evidence For a Local Processing Advantage in Musicians.

Objective: Individuals can show a strength in processing the details of complex stimuli (local processing) or in forming a gestalt or holistic representation (global processing). The present study examined the impact of extensive music training on processing style, using three tests that tap into local processing ability.

Participants and Methods : In Experiment 1, 22 musicians and 16 nonmusicians completed the Group Embedded Figures Test (GEFT; Ellis, 1996). In Experiment 2, 24 musicians and 19 nonmusicians completed the Block Design test (Wechsler, 1997), and a drawing task based on Mottron et al. (1999) involving the copying of drawings of physically possible and impossible objects.

Results : Analysis of variance (ANOVA) tests revealed that musicians outperformed nonmusicians on the GEFT and Block Design. Additional ANOVAs showed that, although both groups copied the possible figures more quickly and accurately than the impossible figures, musicians' copies were more accurate than nonmusicians' and less affected by the objects' physical plausibility (a global feature).

Conclusions : Together, the findings suggest that music training is related to a strength in local processing.

Correspondence: *Brenda M. Stoesz, B.Ed, B.Sc.H, Psychology, University of Manitoba, P404 Duff Roblin, 190 Dysart Rd., Winnipeg, MB R3T 2N2, Canada. E-mail: sbrenda@mts.net*

M. HERNANDEZ, H. AN & A. BECHARA. Development of parallel versions of the Iowa Gambling Task for repeat testing.

Objective: The Iowa Gambling Task (IGT) has been shown to be an ecologically valid and sensitive test for the detection of decision-making

impairments in several neurologic and psychiatric populations. The problem, however, is that the task cannot be administered repeatedly because of practice effects. One important issue in neuropsychological testing is having alternate versions of the task that enable repeated testing. Two new versions of the IGT have been developed for this purpose.

Participants and Methods : We developed three alternate versions of the task, which were made increasingly difficult, in order to counter the practice effect, by introducing two manipulations. First, we reduced the percentage of times that advantageous selections yielded lower initial rewards than disadvantageous selections. Second, we reduced the magnitude of increases in net gains and losses within the good and bad decks. Forty-three male, and 32 female, healthy, adult subjects, mean age = 30.3 (10.7), mean education = 16.2 (2.3), each received the three versions of the IGT in a within subjects design, with versions administered in order of increasing difficulty.

Results : Overall net scores did not differ significantly between any of the three tasks.

Conclusions : The results of this study indicate that the alternate versions of the IGT will provide a means of monitoring changes in decision-making ability across time. These new versions could be valuable for longitudinal assessment of neurological and neuropsychological patients, as well as pharmacological studies requiring assessment during on and off drug conditions.

Correspondence: *Michael Hernandez, Neuroscience, University of Iowa, 2048 9th St. Apt. 114, Coralville, IA 52241. E-mail: michael-hernandez@uiowa.edu*

E.M. MURRAY, C. SHELBY, S. CHOUDHURY, S. BLAKEMORE, T. CHARMAN & J. KEENAN. Mapping the Cortical Pathways Involved in Perspective Taking: A Perturbation Approach Using Transcranial Magnetic Stimulation.

Objective: Adopting different cognitive perspectives requires advanced cortical processing. Tasks that differ in terms of perspective taking (first person, third person) appear to activate different cortical and subcortical networks. It is unclear however, which brain areas are critical in adopting different perspectives. The current study examined cortical differences involved in perspective taking by using single-pulse Transcranial Magnetic Stimulation (TMS) to block cognitive activity during an imagined scenario task using a 'virtual lesion' design.

Participants and Methods : Ten healthy participants read a short scenario and were then asked to answer a forced choice question regarding the how they (first person) or someone else (third person) might feel. TMS was delivered to the anterior portion of the anterior cingulate cortex (aACC), posterior portion of the anterior cingulate cortex (pACC), left and right parietal (LP, RP) and sham.

Results : Repeated measures analysis of variance (ANOVA) revealed differences at midline structures, including both the aACC and pACC, lateralized parietal differences were found as well. Further, both early (300ms) and later (600ms) TMS had effects on disrupting perspective taking when compared to sham TMS.

Conclusions : These findings have implications for our understanding of how the brain processes self and other. However, the current study suggests that the interactions between timing and regions of processing may be complex in terms of perspective taking.

Correspondence: *Elizabeth M. Murray, BA, Psychology Department, Montclair State University, Dickson Hall, 1 Normal Avenue, Montclair, NJ 07043. E-mail: Liz1344@aol.com*

K.E. KING, J. SHAUGHNESSY & A.E. HERNANDEZ. Word Learning in Late and Novice Learners of German.

Objective: The neural correlates of word learning were investigated by presenting German cognates, German noncognates and English matched control words to participants while being scanned with Functional Magnetic Resonance Imaging (fMRI).

Participants and Methods : Thirteen monolingual, English speaking participants were asked to learn a list of German words and their definitions before scanning. While scanning, subjects were asked to decide if the words were living or non-living.

Results : Using SPM analysis, comparing noncognates with English words, increased activity was discovered in the right transverse temporal gyrus and in Heschl's gyrus. Similarly, an English to cognate comparison indicated activity in the right inferior lobule, transverse temporal gyrus and Heschl's gyrus. These findings may indicate that the auditory system is accessed to determine cognate status. Noncognates compared to English words resulted in increased activity in the supplementary motor area, cingulate, caudate nucleus, thalamus and basal ganglia. Comparing German words to English words, there was increased activity in the middle frontal gyrus and anterior cingulate gyrus. These areas of activation indicate that, to facilitate recognition during the early stages of word learning, indirect, motoric processes may be more important than semantic processes.

Conclusions : Overall, these results help to elucidate how the brain is able to use cross-language similarity during early stages of foreign language learning. These findings will be compared to a group of more fluent, late-learners of German to determine if any differences in neural processing exist and to help clarify how the neural processing of language changes with extended learning.

Correspondence: *Kelly E. King, Psychology, University of Houston, 126 Heyne Building, Houston, TX 77204-5022. E-mail: keking@uh.edu*

L. LONGWORTH, K. PEACH & D.L. MOLFESE. Impact of Minor Sleep Reduction on Speech Processing in Children.

Objective: Mild sleep restriction due to delayed bedtimes for children is prevalent in society today, but little is known of the neurocognitive affect of this minor sleep loss. Given this paucity of information we investigated whether sleep restriction changed the way the brain discriminates different speech sounds in young children.

Participants and Methods : Five normally developing children (3 females), mean age = 7.73 years, range 7.63-7.92 years, initially participated in an overnight polysomnographic evaluation that confirmed the absence of any sleep disturbances. Actigraphic recordings were taken for one week of normal sleep, one week of 1-hour sleep restriction (delayed bedtimes), and one week of recovery sleep. At the end of each week, auditory event-related potentials (ERPs) were recorded during an auditory perception task. ERPs were recorded using a 128-channel high-density geodesic sensor while children listened to series of speech syllables.

Results : An ANOVA on the latency of the first large negative peak (N1) indicated that the speed of brain responses to speech sounds increased by approximately 40 ms from week 1 (baseline) to weeks 2 (1 hour reduction in sleep duration) and 3 (return to normal sleep) over both left and right hemispheres, suggesting a hyper sensitivity to stimulation of long duration.

Conclusions : Even slight reductions in sleep time appear to impact the speed of processing speech by the brain, a serious consideration when placed in the context of children in America today who experience widespread sleep loss yet must be fully functional to optimize their learning experiences in school.

Correspondence: *Dennis L. Molfese, Ph.D., Psychological & Brain Sciences, University of Louisville, Life Sciences 317, Belknap Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

C. RIGHTMYER, V.J. MOLFESE, M. FERGUSON, J. BESWICK, K. PEACH, J. JACOBI-VESELS & D.L. MOLFESE. ERPs Index The Relation Between Prereading Skills And Math Abilities.

Objective: Previous research suggests that mathematical ability is related to a wide-range of cognitive abilities in school-aged children, including language ability and reading proficiency (Bull & Johnson, 1997).

Children with both reading and mathematic disabilities perform poorly on counting and sentence comprehension tasks (Siegel & Ryan, 1989; Hecht et al., 2002). To investigate further this relationship between math and reading skills, visual event-related potentials (ERPs) were recorded.

Participants and Methods : visual event-related potentials (ERPs) were recorded using a 128-channel high-density array in 9 healthy children (age 5 years) in a geometrical shape match-mismatch task. Children viewed pairs of colored figures (e.g. square and a circle) and indicated whether the shapes were the same or different by a button press. The reading abilities of children were tested using the Get Ready to Read screening tool (GRTR, Whitehurst & Lonigan, 2001).

Results : Pearson Product Moment correlations of the latency of first large negative peak (N1) and the amplitude of the second large negative peak (N2) recorded over left and right hemisphere parietal regions during the shape matching task yielded high correlations (.69 - .89, $p < .04$ to $p < .001$) with performance on the GRTR task. Children with higher reading scores displayed faster ERPs N1 latencies and larger amplitude N2 amplitudes compared to ERPs of the children with lower reading scores.

Conclusions : These results suggest a more direct link in brain processing between reading related skills such as phonological processing (GRTR) and math related abilities (decisions regarding geometrical shapes) early in development.

Correspondence: *Dennis L. Molfese, Ph.D., Psychological & Brain Sciences, University of Louisville, Life Sciences 317, Belknap Campus, Louisville, KY 40292. E-mail: dlmolfese@mac.com*

A.D. SPADONI, S.L. FRYER, L.R. FRANK & S.F. TAPERT. Adolescent Neuropsychological Performance Predicts Callosal Microstructure San Diego State University, University of California San Diego, VA San Diego Healthcare System Supported by DA15228 to Tapert.

Objective: Diffusion tensor imaging (DTI) provides indices of fractional anisotropy (FA), measuring white matter coherence, and the apparent diffusion coefficient (ADC), measuring intra/extracellular fluid circulation. We predicted that neuropsychological scores would positively relate to callosal FA, indicating organized fiber structure, and negatively relate to ADC, indicating aberrant diffusivity.

Participants and Methods : We used DTI to ascertain microstructural integrity of the corpus callosum in 18 adolescents (ages 16-18) without histories of psychiatric or substance problems. Adolescents were administered a 2.5-hour neuropsychological test battery, and FA and ADC values were calculated from hand-traced midsagittal slices of the body and splenium.

Results : Body FA positively related to Rey-Osterrieth copy ($r = .58, p = .01$) and WASI Block Design ($r = .44, p = .07$), while splenium FA related to Rey-Osterrieth copy ($r = .46, p = .06$), WAIS-III Arithmetic ($r = .44, p = .07$), WAIS-III Digit-Symbol ($r = .50, p = .04$), WASI Vocabulary ($r = .55, p = .02$) and WRAT Reading ($r = .64, p = .01$). Body ADC negatively related to Rey-Osterrieth copy ($r = -.47, p = .05$), and splenium ADC negatively related to Arithmetic ($r = -.46, p = .06$), but positively related to D-KEFS Trails motor condition ($r = 0.47, p = .05$).

Conclusions : Previous adult research has shown that higher FA and lower ADC relate to higher neuropsychological scores. This study confirmed these results in adolescents, suggesting optimal cognitive functioning may require white matter coherence and low diffusivity in the corpus callosum.

Correspondence: *Andrea D. Spadoni, B.S., The Joint Doctoral Program at University of California, San Diego and San Diego State University; 7707 Eads Ave., La Jolla, CA 92037. E-mail: aspadoni@projects.sdsu.edu*

R.L. ENGLAND & V.P. CLARK. The relationship between psychopathic traits and emotional processing using fMRI.

Objective: Using functional magnetic resonance imaging (fMRI), we examined the effects of psychopathic traits on responses of the amygdala to emotional stimuli in an abstinent stimulant addicted sample.

Participants and Methods : The 14 participants had a mean age of 33.7 years (SD=9), IQ of 98.4 (SD=16), with 9 males. The average factor 1 and 2 trait scores determined by the PCL-SV were 4.18 (SD=3.2) and 6.43 (SD=3.3), respectively. Gradient echo, echo planar BOLD fMRI images were obtained while participants viewed negative emotional stimuli where the main character was aggressive/angry (aggressive condition) or the main character was defensive/upset (defensive condition), along with a neutral stimuli baseline. The estimated percentage change in BOLD response amplitude evoked by each of the negative emotional conditions relative to the neutral condition were calculated and were subsequently correlated with psychopathic trait scores.

Results : Response amplitude for the right amygdala and adjacent structures was negatively correlated with factor 1 traits ($R^2=0.71$, $p=1.5 \times 10^{-4}$) during the defensive condition. Response amplitude for the left amygdala and adjacent structures was negatively correlated with factor 1 traits ($R^2=0.60$, $p=8.3 \times 10^{-4}$), and with factor 2 traits ($R^2=0.68$, $p=2.9 \times 10^{-4}$) during the aggressive condition. Amygdala response was not correlated with factor 2 traits during the defensive condition.

Conclusions : Our findings show that increased psychopathic traits are correlated with reduced amygdala response while viewing negative emotional stimuli. Furthermore, by analyzing the two factors of psychopathy separately, we observed differences in amygdala response to the aggressive and defensive conditions suggesting the unique contribution of each factor to the disorder.

Correspondence: *Rebecca L. England, M.S., Psychology, University of New Mexico, 1 University of New Mexico, MSC03 2220, Albuquerque, NM 87131-1161. E-mail: rengland@unm.edu*

Dementia Alzheimer's Disease

D.M. RENTZ, T.J. HUH, E.K. MORAN, J.A. BECKER, L.A. SARDINHA, K.R. DAFFNER, R.A. SPERLING & K.A. JOHNSON. Highly Intelligent Older Individuals with IQ-adjusted Memory Impairment Have Abnormal SPECT Perfusion.

Objective: To determine whether IQ-adjusted memory impairment (IQ-MCI) in highly intelligent individuals is associated with abnormal cerebral perfusion consistent with AD pathology.

Participants and Methods : Fifteen healthy, highly intelligent (IQ=127) older subjects scored in the normal range on tests of memory and executive function. Test scores were adjusted for IQ based on an IQ-adjusted method previously described (Rentz et al, *Neuropsychology* 2004; 18: 38-49). Using IQ adjustments, 8 subjects were reclassified as IQ-MCI while 7 remained in the normal range (IQ-NC). All subjects were homozygous for the APOE3 allele. Each underwent perfusion SPECT within 30 days of baseline testing and reevaluated 3 years later.

Results : IQ-MCI subjects had significantly reduced perfusion in right temporo-parietal ($Z > 3.0$; $p < 0.001$, uncorrected) and opercular frontal regions ($Z > 3.5$; $p < 0.001$, uncorrected) compared to IQ-NC. Results of the discriminant analysis comparing IQ-MCI and IQ-NC revealed that perfusion discriminant scores correctly classified 14 of 15 subjects. Upon neuropsychological follow-up, 4 of the 8 subjects with IQ-MCI converted to standard MCI. Six of the 7 subjects who were classified as normal have remained normal. One subject, who was originally classified as normal, had an abnormal SPECT at baseline and subsequently converted to AD.

Conclusions : Individuals with IQ-MCI demonstrated alterations in cerebral perfusion and subsequently converted to MCI or AD 3 years later. These findings are supportive of the hypothesis that cognitive reserve in highly intelligent individuals may obscure a significant burden of AD pathology. Adjusting for IQ may assist neuropsychologists in making an earlier diagnosis of MCI or AD in highly intelligent individuals. Correspondence: *Dorene M. Rentz, PsyD, Neurology, Brigham and Women's Hospital/ Harvard Medical School, 221 Longwood Avenue, Boston, MA 02115. E-mail: drentz@partners.org*

T.T. LINEWEAVER, D.P. SALMON, M.W. BONDI & J. COREY-BLOOM. Differential Patterns of Visuospatial Impairment in Alzheimer's Disease and Huntington's Disease.

Objective: Visuospatial skills are impaired in Alzheimer's Disease (AD) and Huntington's Disease (HD). However, studies comparing these groups have used visuospatial tests complicated by memory (disrupted by AD) or motor (disrupted by HD) components. This study evaluated dissociations in visuospatial deficits utilizing tests that minimized memory and motor demands.

Participants and Methods : Eighteen HD patients, 18 AD patients, 20 young and 20 elderly normal control (NC) subjects completed seven visuospatial tests. The NC matched their respective patient group in age, and all groups matched in education and gender. AD and HD patients did not differ in basic visual processing ability (e.g., visual matching and visuoperception).

Results : NC groups did not differ on any measure, and their scores were collapsed in further analyses. HD and AD patients performed similarly, but worse than NC, on block design, mental rotation of two-dimensional squares, and stick construction. Patient groups showed equal increases in impairment (relative to NC) when mental rotation was required on the stick construction task. Patient groups were impaired on left-right orientation and the Money Road Map Test (MRMT). However, impairment of AD, but not HD, patients increased with increasing mental rotation demands on the MRMT, whereas impairment of HD, but not AD, patients increased when mental rotation was required on left-right orientation.

Conclusions : AD and HD patients show differential deficits in complex, non-motor visuospatial processing, even when matched on basic visuoperception. Consistent with previous studies, results may reflect difficulties with interpersonal rotation secondary to frontal dysfunction in HD versus extrapersonal rotation secondary to parietal dysfunction in AD.

Correspondence: *Tara T. Lineweaver, Ph.D., Psychology, Butler University, 4600 Sunset Avenue, Indianapolis, IN 46208. E-mail: tlinewea@butler.edu*

E. MATTEAU, L. JEAN, Y. TURGEON & M. SIMARD. Clinical Utility of the Mattis Dementia Rating Scale for the Diagnosis of Mild Cognitive Impairment and Alzheimer's Disease.

Objective: Little is known about the clinical utility of the Mattis Dementia Rating Scale (MDRS) to identify subjects presenting with Mild Cognitive Impairment- Amnesic type (MCI-A). This study thus aims at determining the usefulness of the MDRS in differentiating between healthy elderly controls (HC), patients with MCI-A and Alzheimer's Disease (AD).

Participants and Methods : This is a retrospective study including data from 10 MCI-A, 23 AD and 28 HC who were assessed using a neuropsychological evaluation including the MDRS. Age- and education-corrected scaled score for the total MDRS score and age-corrected scaled scores for each MDRS subscales were calculated and compared among the three groups.

Results : Multivariate analysis of covariance, correcting for years of schooling, revealed that the performances of the three groups were significantly different on all MDRS subscales. Post hoc comparisons showed

that AD patients performed significantly worse on all subtests compared with the other groups (all p 's < .0001). MCI-A patients scored significantly lower than HC on Initiation/Perseveration (mean \pm SD scores: MCI-A, 7.9 ± 2.8 ; HC, 10.18 ± 1.6 ; $p = .005$) and on Memory subscales (mean \pm SD scores: MCI-A, 10.4 ± 3.02 ; HC, 12.25 ± 1.7 ; $p = .026$). When these two variables entered into a stepwise discriminant function analysis, an overall classification accuracy of 88.5% was demonstrated, with 89% of the HC group, 70% of the MCI-A group and 96% of the AD group being correctly classified.

Conclusions : These findings suggest that MCI and AD patients may be correctly identified using the MDRS.

Correspondence: *Erelyne Matteau, Ph.D. candidate, Université Laval, 382 #2, rue Lavigne, Quebec, QC G1R 1B4, Canada. E-mail: erelynematteau@hotmail.com*

R. ZIEGLER, G.T. WHITMAN, M.B. DICK & M. HILL. Methylmalonic Acid, Vitamin B12, and Functional Abilities in Cognitively Impaired Older Adults: Is MMA an early predictor of functional decline?

Objective: Methylmalonic acid (MMA) is a biochemically sensitive marker of vitamin B12 deficiency. The nature and extent of neuropsychological and functional deficits associated with serum MMA concentrations have not been investigated in a cognitively impaired elderly population.

Participants and Methods : Equivalent numbers of male and female patients from the University of California, Irvine, Alzheimer's Disease Research Center participated in this study. The average age and education of the sample ($N = 52$) was 77 (SD = 8.1) and 13.6 (SD = 3.2) years, respectively. All patients were mildly impaired (mean MMSE = 23/30, SD = 6.2) with a diagnosis of Mild Cognitive Impairment (11%), Cognitively Impaired Not Demented (31%) or Dementia (58%). Dependent variables included scores on a comprehensive battery of neuropsychological tests, as well as, measures of instrumental (IADLs) and basic activities of daily living (ADLs).

Results : MMA levels were inversely associated with serum vitamin B12 concentrations ($r = -.44$, $p < .001$). There were no significant associations between B12 and performance on either the neuropsychological or functional scales. In comparison, elevated MMA was associated with significant impairments in IADLs ($r = .45$, $p < .01$), ADLs ($r = .46$, $p < .001$), and executive functioning ($r = .37$, $p < .01$). After controlling for education and global cognitive status, main effects for ADLs were maintained (R -square = .55, $p < .05$).

Conclusions : Elevated serum MMA levels may provide a more sensitive indicator of deficits in cognitive and functional ability in the elderly than serum concentrations of vitamin B12. Increased MMA levels were most strongly associated with deficits in basic activities of daily living which may adversely affect independence. Practice recommendations are discussed.

Correspondence: *Raphael Ziegler, Ph.D., The Institute for Brain Aging and Dementia, University of California Irvine, 6012 Warwood Road, Lakewood, CA 90713. E-mail: psych_doc2000@yahoo.com*

D. ACHARYA, P.J. MASSMAN & R.S. DOODY. Neuropsychological and Demographic Correlates of Apraxia in a Large Cohort of Alzheimer's Patients.

Objective: This study involved investigating apraxia in patients with Alzheimer's disease (AD). It was hypothesized that there would be a relationship between apraxia and dementia severity, as well as with several measures of language ability (Boston Naming Test, category fluency and the Sequential Commands subtest). We also examined the relationship between apraxia and demographic variables (age, gender, and education).

Participants and Methods : We studied 647 participants with probable AD from the Alzheimer's Disease Clinic and Memory Disorders

Center (ADCMDC). Their mean age was 74.3 (SD=8.2), mean educational level was 13.4 years (SD=3.5) and mean MMSE was 19.8 (SD = 6.0). Only the patient data from the initial (baseline) visit were utilized. Praxis was measured using the Boston Apraxia Exam for transitive and intransitive movements to command and imitation (right and left hands).

Results : Forty-six percent of the AD patients in the sample made a significant number of praxis errors. It was found that AD patients with apraxia (who made four or more errors) were significantly older and less educated than AD patients who made no praxis errors. Women comprised 80% of the apraxia group and 60% of the no-apraxia group. There were significant correlations between praxis errors and measures of dementia severity (MMSE, ADAS and CDR). Apraxia was also strongly correlated with scores on language measures (Boston Naming Test, category fluency (animals) and the WAB Sequential Commands subtest). There were still significant differences between the apraxia and the no-apraxia groups in performances on language measures even when MMSE, education, and age were covariates.

Conclusions : Apraxia was significantly correlated with dementia severity, demographic variables and scores on several language measures. These results may indicate that the likelihood and severity of apraxia is influenced by premorbid factors and that praxis and language ability have overlapping neuroanatomical underpinnings.

Correspondence: *Deepa Acharya, M.A., Psychology, University of Houston, 1417 Anita Street, Houston, TX 77004. E-mail: deepaacharya@hotmail.com*

K.L. LANGE, G.M. PEAVY & D.P. SALMON. Preserved Appreciation of Hedonic Value in Alzheimer's Disease.

Objective: Multidisciplinary research suggests that the limbic system is involved in evaluating the affective value of a stimulus. The appreciation of affective value, or hedonic processing, has been studied in humans by assessing subjective reports of the experience of pleasure and/or displeasure. Because the limbic system is a primary site of degeneration in Alzheimer's disease (AD), we hypothesized that patients with early AD would experience altered hedonic processing.

Participants and Methods : In Experiment 1, 20 patients with probable AD (mean age=76.5; SD=6.1), 21 older adult controls (mean age=75.7; SD=8.2), and 14 young adult controls (mean age=19.6; SD=1.9) made two-choice preference decisions about music clips, pictures, and tastes that varied in pleasantness as determined by normative or pilot data. In Experiment 2, the same subjects completed a task that assessed context effects observed when the hedonic judgment of a stimulus changes after being biased by experience with similar stimuli of lesser or greater intrinsic value. Perceptual biasing was also assessed for judgment of stimulus sweetness and weight.

Results : Patients with AD showed no statistical differences from the control groups in their preference choices, and all groups showed no differences from choices predicted by normative or pilot data. AD patients showed perceptual and hedonic context effects that did not significantly differ from the context effects observed in the control groups (bias of taste pleasantness: $F(1,51)=32.73$; $p < .001$; bias of weight: $F(1,52)=128.78$; $p < .001$; bias of taste perception: $F(1,51)=12.91$; $p = .001$). The degree of bias did not differ among the AD, older adult, and young adult control groups (all p 's > .05).

Conclusions : Our findings reveal preservation of hedonic functioning in patients with AD, despite cognitive deficits including explicit memory impairment. Preserved hedonic experience is particularly remarkable given the multiple areas of neuropathology in AD, including regions putatively involved in hedonic processing.

Correspondence: *Kelly L. Lange, Ph.D., Alzheimer's Disease Research Center, University of California, San Diego, 9500 Gilman Drive, MC 0948, La Jolla, CA 92093-0948. E-mail: klange@san.rr.com*

E. TENG, P.H. LU & J.L. CUMMINGS. Facial Affect Processing Deficits in Mild Cognitive Impairment.

Objective: To examine facial affect processing in subtypes of mild cognitive impairment (MCI).

Participants and Methods : Participants were drawn from a longitudinal cohort of elderly subjects followed through the UCLA Alzheimer Disease Research Center and consisted of four groups: 69 subjects with normal cognition (N), 11 subjects with amnesic MCI (MCI-A), 12 subjects with multiple domain MCI (MCI-M), and 16 subjects with probable Alzheimer disease (AD). Subjects were tested on the facial identity and facial affect (discrimination, naming, selection, and matching) subtests of the Florida Affect Battery (FAB).

Results : Performance across the facial affect subtests of the FAB was analyzed using a three factor repeated measures ANCOVA (within factor: subtest; between factors: group and gender; covariate: age). There was a significant effect of group, with the AD group performing worse than the N and MCI-A groups and the MCI-M group performing worse than the N group; a significant group x subtest interaction, with the AD group impaired on all subtests and the MCI-M group impaired on the discrimination subtest; and a significant effect of gender, with women performing better than men. The effect of subtest, group x gender interaction, and subtest x gender interaction were not statistically significant.

Conclusions : These results confirm prior reports demonstrating impaired emotional processing in AD. They also demonstrate significant deficits in facial affect processing in subjects with multiple domain MCI, but not in subjects with amnesic MCI. Taken together, these findings suggest that facial emotion discrimination worsens with increasing cognitive impairment along the spectrum between normal aging and AD. Correspondence: *Edmond Teng, M.D., Ph.D., UCLA, 710 Westwood Plaza, RNRC 2-238, Los Angeles, CA 90095-1769. E-mail: eteng@ucla.edu*

N.K. MCDONALD, L.H. LACRITZ, L.S. HYNAN, G. ALLEN, C. MOORE, C.M. CULLUM & R. DIAZ-ARRASTIA. Neuropsychological Correlates of Leukoaraiosis and Atrophy in Alzheimer's Disease, Mild Cognitive Impairment, and Nondemented Elderly.

Objective: Leukoaraiosis (LA) has been associated with cognitive functioning in nondemented elderly (NE), while the relationship in dementia is inconsistent. This study examined associations among neuropsychological functioning, LA, and atrophy across three groups with varied levels of cognitive functioning.

Participants and Methods : MRI and neuropsychological data from 90 subjects [30 Alzheimer's disease (AD), 30 Mild Cognitive Impairment (MCI), and 30 NE] were examined. A semi-quantitative rating scale was used to assess LA, as well as atrophy, and values were correlated with demographic and neuropsychological variables.

Results : Analysis of variance showed that total LA and atrophy were more severe among subjects with AD than those with MCI and NE. Age correlated with total LA, periventricular LA, and subcortical LA ($r = .44, .40, \text{ and } .42, p < .01$, respectively). Atrophy also correlated with LA ($r = .20 \text{ to } .43$). Total LA was inversely associated with neuropsychological measures of general cognitive functioning, language, memory, and executive functioning for all subjects ($r = -.23 \text{ to } -.36$), though correlations were not significant after controlling for age and atrophy ($r = -.18 \text{ to } .03$). Furthermore, atrophy correlated more highly than LA with neuropsychological measures across subjects ($r = -.36 \text{ to } -.60$), and correlations remained significant after controlling for LA.

Conclusions : Neuropsychological impairment was more highly associated with atrophy than LA across subjects, and particularly within the AD group. This suggests that relationships between LA and neuropsychological functioning may be identifiable in normal controls, but that atrophy plays a larger role in cognition in dementia populations such as AD.

Correspondence: *Noelle K. McDonald, Ph.D., The Menninger Clinic, 9100 Westheimer Rd. #8211, Houston, TX 77063. E-mail: nmcdon25@aol.com*

M.W. HOPKINS, J. FRIED, K.S. SCHMIDT & D.J. LIBON. Comprehension Deficits in Dementia.

Objective: We sought to investigate comprehension deficits in Alzheimer's disease (AD) and vascular dementia (VaD) associated with periventricular and deep white matter alterations by administering portions of the BDAE-Complex Ideation (BDAE-CI) and BDAE-Syntax (BDAE-SyN) subtests. We predicted a double dissociation such that AD patients would obtain lower scores on the BDAE-CI subtest with poor performance on this test correlating with lower scores on tests of naming, semantic fluency, and memory. VaD patients were predicted to obtain lower scores on the BDAE-SyN subtests with poor performance correlating with lower scores on tests of working memory and executive control.

Participants and Methods : The paragraph portion of the BDAE-CI and the BDAE-SyN subtests were administered to 39 AD patients and 36 VaD patients. Using our entire sample BDAE test performance was correlated with compiled neuropsychological indices that assess working memory/ executive control (WMS-Mental Control subtest, letter fluency, clock drawing), lexical/ semantic knowledge (BNT, animal fluency), and declarative memory (Philadelphia [repeatable] Verbal Memory Test).

Results : Contrary to our prediction there was no difference on the BDAE-CI subtest. However, reduced BDAE-CI scores were marginally correlated with lower scores on tests of language and memory. Consistent with our predictions, VaD patients obtained significantly lower scores on BDAE-SyN subtests. Robust correlations were found between BDAE-SyN subtests and tests of working memory and executive control.

Conclusions : These results suggest that comprehension impairment in AD and VaD is subordinate to the memory/ language and executive control impairment which typify AD and VaD, respectively. The clinical implications of these findings merit further study.

Correspondence: *Mary W. Hopkins, Ed.D., Psychology, Mercy College, 555 Broadway, Dobbs Ferry, NY 10522. E-mail: hopscotch2000@aol.com*

N. CARLOZZI, M.T. WAGNER & A. WALKER. Dual Therapy (Donepezil/Memantine) for Alzheimer Disease in Mild Cognitive Impairment.

Objective: Aggressive dual therapy with an AChE inhibitor in combination with a NMDA receptor antagonist has, to our knowledge, never been studied as a treatment with patients in the early stages of Alzheimer disease (AD). We report on four cases of early Alzheimer disease which had been identified by neuropsychological investigation and diagnostically confirmed with a CNS tau/AB42 biomarker.

Participants and Methods : The four patients ranged in age from 48 to 75 years old. Three patients had mild cognitive impairment (MCI) and one had mild dementia according to established criteria. Each met the NINCDS/ADRDA inclusion/exclusion criteria for the diagnosis AD. A CNS biomarker confirmed the clinical diagnosis of AD (Athena AD-Mark). Each patient was titrated to a full combination dose of donepezil and memantine.

Results : No unmanageable adverse sided effects were noted. Patients were followed for a mean duration of 15.25 months. Mean initial and follow-up MMSE scores were 23.0 and 24.0, respectively. Detailed follow-up neurocognitive examinations showed no clinical progression during the psychometric surveillance period.

Conclusions : It is unlikely that a study of this type will be replicated on a large scale because of the extreme expense of such a trial and generally low potential financial yield for the pharmacological industry for agents that already have FDA approval for treatment of AD. Nevertheless, these pilot results provide promising empirical evidence of the efficacy of aggressive dual therapy in the earliest stages of AD.

Correspondence: *Noelle Carlozzi, M.S., Oklahoma State University, 306 White Church Lane, Summerville, SC 29485. E-mail: carlozzi@muscedu*

M. JUNCADILLA, M. HERNANDEZ-PARDO, M. MORAL, F. RUBIO, R. RENE & R. MIRANDA. Addenbrooke's Cognitive Exploration: spanish normative data and validity.

Objective: Extending the normative data of the previous study and to obtain new data of populations of minor risk (45-60 years). Obtaining data of reliability inter-rater and of temporary stability that complete the psychometric data of the test.

Participants and Methods : The standardization counted with 241 subjects (160 women) stratified in three groups of age (45-60 years, 61-70 years, >70 years), 64,98 years of average (DE=10,35), and three groups of schooling (0-7 years, 8-11 years and >11 years of schooling), with average of 8,69 years of schooling (DE=4,35). Were used 34 subjects to obtain the reliability interevaluators and 32 for the reliability test-retest. The group of 46 patients was extended controls of the study of Hernandez-Pardo to 74 controls and 74 patients with dementia matched to obtain the indexes of sensitivity and specificity from the augmented sample. Determination of the indexes of sensitivity, specificity and positive predictives values of the test. Analysis of the reliability interevaluators and test-retest.

Results : A table of normative data that gives us some indexes of sensitivity (0,92) and specificity (0,85) for a standard deviation below the average of every stratus is obtained. Test-retest reliability of 0,76 and reliability interevaluators of 0,99.

Conclusions : The standardization of the ECA will allow its correct clinical application as test of cognitive screening for a wide range of age (bigger of 45 years). The results on validation suggest the use of the ECA as complementary test to the MMSE in early phases of cognitive deterioration.

Correspondence: *Rubén Miranda, Graduate, Neuropsychology Unit, Hospital Universitari de Bellvitge, Feixa LLarga s/n, LHospitalet del LLobregat 08905, Spain. E-mail: mjuncadella@csub.scs.es*

T. GIOVANNETTI, N. SESTITO, D.J. LIBON, L. BRENNAN, J.E. ROSNER, E. CORLEY, T. CAMPellone, R.K. KESSLER & K. SCHMIDT. Strategic Object Placement improves Naturalistic Action in Dementia.

Objective: Naturalistic action is impaired in dementia and has been shown to be influenced by dementia severity as well as task/environmental factors, such as the presence of distractor objects. We examined whether strategic object placement would improve performance in individuals with dementia.

Participants and Methods : Twenty-one outpatients (M MMSE = 20, SD = 5.7) with mild-moderate dementia were administered the Naturalistic Action Test (NAT), which requires participants to perform three everyday tasks (e.g., toast & coffee) using objects on a table. The NAT was administered under two conditions: Standard (S-NAT) and User-Centered (U-NAT). In the U-NAT, objects were arranged in the order that they should be used. In the S-NAT, the objects were not meaningfully arranged, but were ordered according to the manual. Overall performance (NAT Score), total errors, and steps accomplished were compared across conditions using Wilcoxon Signed Ranks Tests.

Results : The overall NAT Score was significantly higher (12 vs 10, $z = 2.3$, $p = .02$) on the U-NAT, and a higher proportion of participants fell in the normal range (indicated by normative cutoffs; 24% vs 57%, $p = .02$). Accomplishment scores were higher (75% vs 65%, $z = 2.4$, $p = .02$) and error rates were lower (13.7 vs 18.9, $z = 2.7$, $p < .01$) on the U-NAT.

Conclusions : Strategic object placement significantly improves naturalistic action in individuals with dementia. Thus, the environment may be manipulated to minimize (or free) the processing resources necessary to perform everyday tasks without error. This strategy may be useful for improving everyday functioning in dementia patients.

Correspondence: *Tania Giovannetti, Ph.D., Psychology Department, Temple University, Weiss Hall, 1701 N 13th Street, Philadelphia, PA 19122. E-mail: tgio@temple.edu*

P.S. FOSTER, R.D. RHODES, B. LOHSE, B.V. SHENAL, G.P. CRUCIAN & K.M. HEILMAN. Learning in Alzheimer's and Parkinson's disease.

Objective: Classical measures of learning have utilized a difference score obtained from subtracting the number of words recalled on the first trial of a supra-span word list from the best performance of the last two trials. However, this measure fails to capture total learning capacity across trials. Further, measures of total recall confound working memory with learning-declarative memory. Hence, a new measure of learning was created by multiplying the traditional learning score by the total recall across all learning trials.

Participants and Methods : We analyzed learning on the Hopkins Verbal Learning Test (HVLT) using the traditional and the new learning score in a group of Alzheimer's (AD) and Parkinson's (PD) patients.

Results : We found that, using the traditional score, performance on the HVLT for 43 patients with AD (M = 2.19) was similar to that of normative participants (M = 3.25), with both groups demonstrating traditional learning curves. We also found that the traditional learning score for 37 AD patients (M = 2.24) was not significantly different than the score obtain from a sample of 24 PD patients (M = 2.71) with similar age and education. Using the new learning score, however, a large difference was obtained between the AD patients (M = 22.95) and the normative sample (M = 85.70), as well as between the groups of AD (M = 23.41) and PD patients (M = 52.75).

Conclusions : These results suggest that this new learning measure might better discriminate patients with impaired learning, than does either the total score or the difference score.

Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 5001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

W.G. COON, H. WESTERVELT & G. TREMONT. Odor Identification Deficits in MCI subtypes.

Objective: Mild Cognitive Impairment (MCI) has been shown to be associated with reduced odor identification performance. However, this association has not yet been examined in relation to the different subtypes of MCI. This study aims to determine if there are significant differences in odor identification performance in MCI subtypes.

Participants and Methods : The Brief Smell Identification Test (BSIT), a 12-item, 4-choice, scratch-n-sniff odor identification task, was administered to each study patient. Participants were divided into groups according to their corresponding subtype of MCI: 1) amnesic only (n=25); 2) amnesic-plus (n=51); and 3) other single- or multiple-domain (i.e. non-amnesic, n=16). Subtypes were defined by the pattern of deficits on neuropsychological examination. A sample of age-, gender-, and education-matched healthy community controls (n=26) was also assessed.

Results : Only the amnesic-plus group (M= 8.29, SD=1.74) performed significantly worse than the control group (M=9.81, SD=2.58). No other significant differences were found between groups.

Conclusions : This study demonstrates odor identification deficits in patients with amnesic-plus MCI relative to healthy controls, but not in other MCI subtypes. This may suggest that olfactory deficits in MCI are most apparent among those patients most likely to develop Alzheimer's disease. Given the relatively small differences in group mean performances, however, the clinical and diagnostic utility of these findings is questionable.

Correspondence: *William G. Coon, McGill University, POB Suite 430, 593 Eddy St., Providence, RI 02903. E-mail: wcoon@po-box.mcgill.ca*

D.A. CAHN-WEINER, J.K. JOHNSON, K. FREEMAN, J. MER-RILEES, L. QUITANIA, J.H. KRAMER & B.L. MILLER. Cognitive Predictors of Daily Functioning in Mild Cognitive Impairment.

Objective: There are few studies about functional impairment in Mild Cognitive Impairment (MCI), although this issue is identified as an im-

portant focus of research. There is also little research examining the cognitive processes that predict future functional decline in this patient group. Previous research has established a link between executive function and impairment in higher-order activities of daily living (ADLs) in dementia.

Participants and Methods : To examine the relationship between cognitive function and functional impairment in MCI, we analyzed the Functional Activities Questionnaire (FAQ) and measures of naming, visuoconstruction, memory, and executive function. Subjects included age- and education-matched MCI subjects (N=104), Alzheimer's disease (AD) patients (N=124), and normal control (NC) subjects (N=24) recruited from the University of California at San Francisco Memory and Aging Center.

Results : MCI subjects showed significantly more functional impairment than NC subjects ($p < .05$) but significantly less than AD patients ($p < .001$). In MCI subjects, correlational analyses revealed that FAQ score was significantly associated with executive function (Modified Trails; $r = -.30$, $p < .01$) and visuoconstruction (figure drawing; $r = -.34$, $p < .01$) but not with measures of verbal delayed recall or naming ($p > .10$). In a multiple regression analysis predicting FAQ, executive functioning and visuoconstruction both were significant predictors, accounting for 16% of the variance in FAQ ($p < .01$).

Conclusions : These findings are similar to those reported previously in different types of dementia linking executive dysfunction and functional impairment. Visuoconstruction has been reported as a significant predictor of ADLs in some, but not all previous studies. This finding may reflect differences between ADL measures employed or the heterogeneity of underlying etiology in the MCI group. Future studies are underway to examine the longitudinal course of functional decline in MCI and its associated cognitive correlates.

Correspondence: *Deborah A. Cahn-Weiner, Ph.D., Neurology, UCSF, 400 Parnassus Avenue, San Francisco, CA 94143-0138. E-mail: dcahn@itsa.ucsf.edu*

L. BRADFORD, L.A. KILIK, M.C. OLMSTEAD, D.J. DAY, R.W. HOPKINS, C.P. ROWS & C.R. PRINCE. Exploring Promising New Behavioural Assessment Tools for Dementia: Validation of the Kingston Standardized Behavioural Assessment (KSBA).

Objective: Dementia is a devastating neurodegenerative disease that causes multiple cognitive and behavioural symptoms. Although the cognitive symptoms, most notably memory impairment, have traditionally been the mainstay of dementia research, the behavioural symptoms, such as psychosis, aggression, and agitation, are more likely to result in institutionalization, greater financial burden and caregiver distress, and are typically more amenable to pharmacotherapy. Therefore, it is imperative that we gain a better understanding of these behavioural symptoms and develop more efficient behavioural screening measures. To this end, the newly developed Kingston Standardized Behavioural Assessment (KSBA) was validated against the widely used Neuropsychiatric Inventory (NPI). An important limitation of the NPI is its lengthy administration time and subjective retrospective reporting of frequency and severity ratings. The KSBA takes considerably less time to administer and has a simple checklist format that relies on present, objective reporting. A high, positive and significant correlation ($r > .60$) between the total scores of both instruments was predicted.

Participants and Methods : Both the KSBA and NPI are informant-based tests assessing the behavioural symptoms of dementia. The study sample consisted of 33 caregivers of dementia patients from Kingston, Ontario, Canada, and surrounding areas.

Results : Total scores on the KSBA (maximum possible score of 68) ranged from 4-37 ($M = 22.06$; $SD = 8.22$) and total scores on the NPI (maximum possible score of 148) ranged from 0-62 ($M = 19.79$; $SD = 14.00$). The correlation between KSBA and NPI total scores was high, positive, and significant as predicted ($r = 0.64$; $p < .001$).

Conclusions : These results suggest that the same behavioural information can be determined through the use of the KSBA or NPI. Given that the KSBA is a more efficient and objective test, it provides a valuable clinical alternative for assessing the behavioural symptoms of dementia.

Correspondence: *Lisa Bradford, Psychology, Queen's University, 50 Montreal Street (apt 3), Kingston, ON K7K3E8, Canada. E-mail: bradford32@hotmail.com*

J.C. ARANGO, F. CUETOS, C. VALENCIA, C. URIBE & F. LOPERA. Are Lexical-Semantic Deficits Part of the Preclinical Phase of Alzheimer's Disease?

Objective: During the past two decades considerable evidence has accumulated indicating that individuals who will develop Alzheimer's Disease (AD) have impairments in multiple cognitive domains (memory, executive functions, attention) several years before the clinical diagnosis. However, few studies have examined the presence of linguistic deficits in the preclinical phase of AD. The aim of the current study was to determine if linguistic deficits characterize the preclinical phase of AD.

Participants and Methods : The sample consisted of 20 healthy Spanish speakers from Antioquia, Colombia (South America). Ten were positive carriers of the presenilin-1 (PS1) gene mutation in chromosome 14 and 10 were non-carrier family members. These groups were similar in age, educational level, and gender. A comprehensive neurolinguistic evaluation of lexical-semantic processes was administered to both groups. The battery included tests of semantic association, verbal and phonologic fluency, naming (pictures, actions and famous faces), repetition, reading, writing, and word definition.

Results : The performances of both groups were compared using multivariate analysis of variance (MANOVA). The only two measures to differentiate the two groups were naming of famous faces ($F(1,18) = 4.75$, $p = 0.043$) and definition of words ($F(1,18) = 5.06$, $p = 0.037$).

Conclusions : Cognitive changes in semantic knowledge can be detected before the onset of AD and an early neurolinguistic evaluation may be useful in the early diagnosis of AD.

Correspondence: *Juan Arango, Ph.D., Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmrrec.org*

M. KRISHNAN, Y. CHANG, B.C. SACHS, E. LERITZ & R.M. BAUER. Clustering and Switching in Verbal Fluency Tasks in Older Individuals with Mild Cognitive Impairment and Normal Controls.

Objective: Clustering of responses based on phonetic or semantic relationships and switching between clusters are two mechanisms thought to underlie performance on tasks measuring verbal fluency, and to be impaired in individuals with Dementia of the Alzheimer's Type. The present study seeks to determine if differences exist in the usage of these mechanisms, in their inter-relationship, or in their relationship with word fluency ability, between individuals with Mild Cognitive Impairment (MCI) and normal older individuals.

Participants and Methods : Controlled Oral Word Association tests of phonetic (CFL) and semantic (animals and supermarket items) fluency were analyzed for clustering and switching in individuals with MCI ($n = 17$) and demographically matched normal controls ($n = 17$).

Results : Controls and individuals with MCI did not differ in word production, or in measures of clustering or switching in either phonetic or semantic fluency tasks. Clustering and switching were both positively associated with word fluency in both tasks for individuals with MCI, but were only associated with phonetic fluency in normal controls. Moreover, while normal controls showed the expected pattern of a negative correlation between clustering and switching, the two mechanisms were not significantly correlated in individuals with MCI.

Conclusions : Clustering and switching appear unimpaired in individuals with MCI, consistently with the lack of cortical degeneration in these

individuals. However, changes in the relationship between these mechanisms, and in their relationship with productive fluency, may point to underlying changes in the ability to retrieve and associate verbal information stored in long-term memory, as a result of neurodegenerative processes.

Correspondence: *Mohan Krishnan, M.S., Department of Clinical and Health Psychology, The University of Florida, Health Science Center, P.O. Box 100165, Gainesville, FL 32608-1508. E-mail: mkrishnan@phhp.ufl.edu*

L. HOKKANEN, T. HANNINEN, V. PULLIAINEN, J. SALO, M. SOTANIEMI & T. PIRTILÄ. CERAD Neuropsychological Battery in Finnish Primary Health Care.

Objective: In Finland (pop. 5.2 million) more than 450,000 people above 65 suffer from memory disturbances. By the end of year 2004 there were 236 trained neuropsychologists so the demand greatly exceeds the supply. A nationwide project to meet this challenge was organized in 1997. The neuropsychological battery originally developed by the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) was chosen as the recommended tool and its use was extended beyond specialized neuropsychologists. By the end of 1999 the Finnish version of the CERAD Neuropsychological Battery was completed and a training program for general psychologists, physicians and other primary health care personnel (including geriatric nurses) was launched. **Participants and Methods:** CERAD performance data of aged patients with memory disorders and dementia (n=271) including 130 cases with Alzheimer's disease (AD), 18 patients with depression only and 37 with no diagnosis at 1 year follow up was collected at memory clinics of 4 central hospital districts. Population-based data of healthy aged individuals (n=375) is also currently being analyzed.

Results: For identification of AD, delayed recall of the word list is the most crucial. In our hospital sample the savings percent (mean \pm SD) of AD patients (23.7 \pm 26.9) differed significantly from the depressives (59.4 \pm 28.3), and from those without a diagnosis (76.3 \pm 23.6), t-test $p < 0.001$ in both. Overlap is marked and reliable cut-off scores cannot be defined without the results of the population-based data.

Conclusions: The accuracy of cutoff scores, along with proper training, is crucial when CERAD battery is used by health care personnel other than neuropsychologists.

Correspondence: *Laura Hokkanen, PhD, Dept of Psychology, University of Helsinki, P.O.Box 9, Helsinki 00014, Finland. E-mail: laura.hokkanen@helsinki.fi*

R.A. JENKINS, P.J. MASSMAN, J.F. BENGE, G.M. THORNTON & R.S. DOODY. Naming Improvement with Phonemic Cues: Which Alzheimer's Patients Benefit Most?

Objective: Boston Naming Test (BNT) performance varies widely among patients with mild Alzheimer's disease (AD). While some patients are able to correctly identify additional BNT items following phonemic cueing, others exhibit no such improvement. The aim of the present study was to quantify phonemic cueing performance differences among a large sample of mild AD patients and to explore whether those who benefited from phonemic cueing also exhibited unique strengths within other neuropsychological domains.

Participants and Methods: Two hundred fifty probable AD patients completed a neuropsychological test battery at the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center. They scored in the mildly-demented range (MMSE \geq 20). We derived an index of phonemic cueing improvement (PCI) from BNT data by dividing the amount of improvement with cues by the number of items on which cues were administered. We correlated this index with demographic characteristics and performances on other neuropsychological tests. Due to distortion at the high end of the BNT score range, only patients with BNT (spontaneous + semantic cue) \leq 50 were included.

Results: Statistical analyses revealed significant correlations between PCI scores and other verbal measures (median $r = .23$), including initial-letter fluency (FAS), category fluency (Animals), and WAIS-R (Vocabulary). Although PCI scores did not correlate with years of education (or any demographic factor), they strongly correlated with AMNART scores ($r = .38$). No relationship existed between PCI scores and psycho-social measures.

Conclusions: Mild dementia patients who benefited from phonemic cueing appear to have higher premorbid verbal intellectual abilities and perhaps larger verbal cognitive reserves that can better withstand the effects of AD on semantic functioning. These patients also perform better on other neuropsychological tests of current language functioning. Correspondence: *Russell A. Jenkins, M.A., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: rajenkins@uh.edu*

S.A. ROGERS, J. DEJONG, K.J. MILLER, P. SIDDARTH, L. ER-COLI & G.W. SMALL. Preclinical Neuropsychological Markers of Alzheimer's Disease.

Objective: Much research has been moving in the direction of identifying neuropsychological markers associated with a preclinical risk for Alzheimer's disease (AD). This study examined the memory functioning and cognitive asymmetry between verbal and nonverbal memory in asymptomatic individuals who have a preclinical risk for developing AD by virtue of their family history or possession of the APOE4 genetic allele.

Participants and Methods: A total of 374 participants received APOE genetic testing and completed the Bushke Selective Reminding test, the Logical Memory subtest of the WMS-III, the Benton Visual Retention Test, and the Rey-Osterreith Complex Figure. 29% had a family history of AD, and 11% had no family history of AD; 42% were either heterozygous or homozygous for the APOE-4 genetic marker and 58% did not possess the APOE-4 allele.

Results: When controlling for demographic differences, those with APOE-4 had significantly lower scores on the total recall of the Bushke Selective Reminding test and the immediate total recall of the WMS-III Logical Memory compared to those without APOE-4, $F(1, 244) = 4.10$ and $F(1, 171) = 3.91$, $ps < .05$, respectively. Those with a family history of AD also had significant asymmetry in immediate verbal (Bushke & Logical Memory) and nonverbal memory scores (Benton & Rey-O) compared to those without a family history of AD, $F(1, 83) = 5.71$, $p < .01$.

Conclusions: Subtle declines in immediate recall of contextual and list learning, as well as cognitive asymmetry in memory performance, may be associated with a prodromal risk for AD and serve as preclinical markers for the development of AD. These markers may enhance the ability to clinically detect AD in its earliest stages and aid in prevention and treatment planning.

Correspondence: *Steven A. Rogers, Ph.D., Alzheimer's Disease Center, UCLA - Neuropsychiatric Institute, 4573 Willis Avenue, Apt. #202, Sherman Oaks, CA 91403. E-mail: SARogers@mednet.ucla.edu*

M.B. SPITZNAGEL, J. GUNSTAD, J.O. CARVALHO, L.B. BROWN, J.D. DAVIS & G. TREMONT. Impaired Awareness in Dementia Patients Predicts Caregiver Burden.

Objective: Caregiver burden is associated with several factors, including decreased independence in activities of daily living, severity of cognitive decline, and patient behavior and mood disturbance. More recent research indicates impaired awareness may also predict caregiver burden. The current study sought to investigate the contribution of awareness to caregiver burden relative to these other factors.

Participants and Methods: Participants were 44 individuals diagnosed with questionable, mild, or moderate dementia. (Clinical Dementia

Rating 0.5, 1, or 2) after neuropsychological evaluation. Caregiver burden was assessed using the Zarit Burden Interview. Predictors included the Lawton-Brody Activities of Daily Living (ADLs), MMSE (global cognition), Frontal Systems Behavior scale (behavior change), Beck Depression Inventory-II (mood disturbance), and the informant-patient discrepancy on the Cognitive Difficulties Scale (awareness).

Results : Multiple regression with forward stepwise entry revealed that awareness accounted for a significant proportion of the variance in caregiver burden. $\Delta R^2=.20$, $F(1,42)=10.48$, $p<.01$, though level of functional independence, global cognition, and patient behavioral and mood variables did not significantly contribute to caregiver burden. Correlation analyses showed awareness was significantly related to several other predictors, including a particularly strong relationship to ADLs ($r = -0.58$, $p<.001$).

Conclusions : These findings suggest that patient awareness significantly predicts burden in dementia caregivers, and that it may be a more important predictor of caregiver burden than cognitive and behavioral aspects of dementia. Further work is needed to clarify whether the relationship between awareness and burden changes from early to later stages of dementia.

Correspondence: *Mary B. Spitznagel, PhD, Psychology, Summa Hospitals, 444 N. Main St, Suite 405, Akron, OH 44310. E-mail: spitznagelm@summa-health.org*

J.M. SMERZ, D.C. OSMON & C.R. KOVACH. Relationship Between Cognitive Factors and Behavior Symptoms in Moderate to Severe Dementia.

Objective: The need-driven behavior model posits that behavior symptoms in dementia result from background and proximal factors, but empirical support is lacking for many aspects of the model including the relationship among specific cognitive and behavior symptoms. This study examined the relationship between cognitive functioning measured by the Severe Impairment Battery (SIB) and behavior symptoms measured by the Behave-AD.

Participants and Methods : Dementia patients ($N = 127$) at ten nursing homes were evaluated. All were in moderate to severe ranges of cognitive and functional impairment as measured by the MMSE and the Functional Assessment and Staging Tool (FAST). A logistic regression was conducted for each of 4 behavior symptoms, and predictor variables included nine cognitive factors from the SIB, a pain measurement, and several demographic variables.

Results : A poor score on the language subtest was a significant predictor of Acting Out (odds ratios for 1 standard deviation were 1.61 and 1.98 respectively), and a poor score on the visuospatial subtest showed a trend to predict Phobia/Paranoia (odds ratios for 1 standard deviation were 1.66 and 2.06 respectively). There were no significant predictors of Motor Restlessness or Psychological Distress/Psychotic Symptoms.

Conclusions : These results agree with and extend previous findings, suggesting that acting out may be related to the inability to communicate and that those with phobias and paranoid ideas are more likely to have poor visuospatial abilities. The need-driven behavior model was only partially supported, and the current results suggest the relationship between cognitive factors and behavior symptoms is more complex than originally proposed.

Correspondence: *Jessica M. Smerz, Ph.D., psychiatry, Cleveland Clinic, 903 Cambridge Rd., Cleveland Heights, OH 44121. E-mail: jsmerz@uwm.edu*

K.R. PETERS, G.R. HSIUNG & H.H. FELDMAN. Apolipoprotein E Genotype in Cognitively-Impaired-Not-Demented Individuals.

Objective: We previously identified five neuropsychological subgroups of Cognitively-Impaired-Not-Demented (CIND) individuals. The highest rate of converting to dementia was found in the Mem-

ory Dysfunction subgroup. The purpose of this research was to examine the apolipoprotein (ApoE) genotype carrier status, a potential risk factor for dementia, of individuals from the Memory Dysfunction subgroup relative to individuals from the four other neuropsychological subgroups.

Participants and Methods : ApoE genotype testing was performed on 46 CIND individuals at baseline who were followed over a two-year period. Based upon our previous work, these individuals were divided into two subgroups: (a) the Memory Dysfunction ("MemD") subgroup ($n=13$), and (b) a subgroup comprising individuals from the four remaining subgroups ("Other CIND"; $n=33$). Chi-square and independent t-tests were used to compare the ApoE genotype (presence of at least one $e4$ allele), rate of conversion to dementia, and demographic variables of these two subgroups.

Results : The proportion of subjects with at least one $e4$ allele was significantly greater in the "MemD" subgroup (76.9%) than the "Other CIND" subgroup (33.3%), $p=.008$. The two-year conversion rate to dementia was also greater in the "MemD" subgroup (61.5%) than in the "Other CIND" subgroup (30.3%), $p=.051$. The two subgroups did not differ significantly in terms of age, years of education, sex, and baseline MMSE score, $p>.30$ for all.

Conclusions : The results of this investigation provide biological validation of our "MemD" subgroup and underscore the fact that individuals in this subgroup are an at-risk clinical population.

Correspondence: *Kevin R. Peters, Ph.D., Psychology, Trent University, 1600 West Bank Drive, Peterborough, ON K9J7B5, Canada. E-mail: kevinpeters@trentu.ca*

E. SUNDERMANN & C. MURPHY. The Effect of Gender and the Apolipoprotein E $e4$ Allele on Rate of Decline in Recognition Memory for Olfactory Stimuli in Patients Diagnosed with Alzheimers Disease.

Objective: Patients diagnosed with Alzheimers disease (AD) demonstrate impairments in episodic recognition memory. The decline in recognition memory associated with AD is particularly pronounced with odor stimuli, likely due to early degeneration of brain areas mediating olfaction. The Apolipoprotein E4 allele (ApoE), a genetic risk factor for AD, has been associated with increased risk of AD onset as well as a faster rate of decline after disease onset. It has been shown that females with AD may be more susceptible to this effect of the E4 allele. The current study investigated the influence of gender and the ApoE genotype on the rate of decline in performance in a recognition memory task for olfactory stimuli in AD patients.

Participants and Methods : Participants were 28 male AD patients (16 E4 positive and 12 E4 negative) and 24 female patients (13 E4 positive and 11 E4 negative). Participants completed a recognition memory task involving odor stimuli.

Results : No significant differences were found in rate of decline of task performance between males and females or between E4 positive and E4 negative patients. No significant differences existed in task performance between male and female E4 negative patients. However, E4 positive females showed a significantly higher rate of decline, expressed as false positive errors, than E4 positive males.

Conclusions : The results suggest that the effect of the E4 allele is more prominent in females leading them to show a faster rate of decline in odor recognition memory than E4 positive males.

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K. DEMERTZIS, S.A. ROGERS, K.J. MILLER, L. ERCOLI, P. SID-DARTH & G.W. SMALL. Emotional and Neuropsychological Functioning in Individuals At-Risk for Alzheimer's Disease.

Objective: The early stages of Alzheimer's disease (AD) are associated with impairments in memory, but little is known about the non-memory related domains of cognitive functioning among those who are asymptomatic, but at risk for AD. This project compared the psychological and non-memory related cognitive functioning of low-risk controls with individuals at-risk for AD.

Participants and Methods : A full neuropsychological battery was administered to 374 individuals (228 women; M age = 63.46, SD = 11.2) who were at risk for AD, based on a family history of AD or being heterozygous/homozygous for the APOE-4 allele. Family history data were collected from 149 participants, and 289 received genetic testing.

Results : ANCOVA analyses controlling for age, gender, and education revealed significant reductions in measures of executive functioning ($p < .01$), attention ($p < .01$), and visual-spatial ability ($p < .05$) among those with a family history of AD. Those with the APOE-4 allele had significantly higher depression ($p < .01$) and reduced visual spatial ability ($p < .01$) and language ($p < .01$) compared to normal controls.

Conclusions : Individuals at risk for AD, based on family history of AD or the APOE-4 allele, displayed increased depression and significantly reduced neuropsychological functioning in multiple domains that were not memory related. These findings may indicate preclinical signs of AD and inform early identification and intervention. The different cognitive or psychological profiles of those with APOE-4 and a family history of AD also suggest differential pathways of risk transmission. Future directions for research are discussed.

Correspondence: *Kristen Demertzis, MA, Psychology; UCLA, 1421 Ambassador Street, Apt. 203, Los Angeles, CA 90035. E-mail: kdemertz@ucla.edu*

M. ROGER, S. ROBINSON & G. SAVAGE. Unirhinal Olfactory Identification Impairment and Neuropsychological Correlates in Mild Cognitive Impairment.

Objective: Olfactory dysfunction is a recognised functional impairment associated with the development of Alzheimer's disease (AD). Recent research has explored the possibility that olfactory dysfunction is a marker of incipient decline in Mild Cognitive Impairment (MCI), indicating preclinical AD. Not all patients with identified olfactory dysfunction, however, go on to develop AD. The majority of these studies have used conventional olfactory identification tests, presenting odours binorally with a multiple-choice format. This approach fails to take into account the potential for unirhinal differences to be expressed due to underlying hemispherically asymmetrical neurodegenerative changes. Indeed, recent neuroimaging studies suggest hemispheric asymmetry in the pathophysiology of MCI, which affects cortical areas associated with both memory formation and olfactory processing. With olfaction the only human sense that is primarily processed ipsilaterally, unirhinal olfactory identification has the potential to be used as a marker of lateralized hemispheric dysfunction in MCI.

Participants and Methods : We examined olfactory detection, spontaneous identification and forced-choice identification in 13 patients with MCI utilising a modified olfactory function assessment with unirhinal presentation. Findings were correlated with cognitive performance on a standardised neuropsychological test battery, and compared with the performance of 23 demographically matched controls. Testing was repeated after 18 months.

Results : Olfactory deficits were observed in the sample, with a tendency for left-nostril identification to be worse than right, regardless of group membership; the bias was more prevalent in MCI participants. This unirhinal bias correlated with MMSE score and only Logical Memory and RAVLT scores from the test battery.

Conclusions : Left-nostril olfactory impairments correlate with verbal memory performance, and stand to provide prognostic information about potential decline in memory and general cognition.

Correspondence: *Greg Savage, PhD, Psychology; Monash University; Department of Psychology; Building 17, Monash University; VIC 3800, Australia. E-mail: greg.savage@med.monash.edu.au*

H. WESTERVELT, J. CARVALHO & K. DUFF. Clinical Presentation of Alzheimer's Disease in Patients With and Without Odor Identification Deficits.

Objective: Notable odor identification deficit is a well established finding in Alzheimer's disease, including in early disease. However, in clinical practice, our group has observed significant variability in odor identification performance amongst our patients with probable mild Alzheimer's disease. Therefore, we investigated the similarities and differences between probable Alzheimer's patients with and without odor identification deficits.

Participants and Methods : Using a median split on the Brief Smell Identification Test, "olfactory impaired" ($n = 46$) and "olfactory intact" ($n = 44$) patients with probable Alzheimer's disease were compared on a host of cognitive, behavioral, demographic, and clinical variables.

Results : Compared with patients with intact olfaction, patients with olfactory deficits were more likely to be male ($p = .02$), less likely to have a family history of dementia ($p = .04$), and had significantly worse spatial skills ($p < .001$). There were no differences between the groups in terms of age, education, length of disease, indicators of disease severity, behavioral measures, or other cognitive measures (i.e., memory, attention, executive functioning, or language).

Conclusions : Probable Alzheimer's patients with and without olfactory deficits were similar on most variables assessed, though the few differences which surfaced are intriguing, particularly differences in family history. Possible explanations for these differences are discussed, including the possibility of a subtype of the disease or misdiagnosis due to limits of antemortem diagnostic criteria.

Correspondence: *Holly Westervelt, PhD, Psychiatry; Brown Medical School, POB Suite 430, 593 Eddy ST, Providence, RI 02818. E-mail: hwestervelt@lifespan.org*

R.D. RHODES, B. LOHSE, P.S. FOSTER, B.V. SHENAL, G.P. CRUCIAN & K.M. HEILMAN. Short-Term Verbal Learning in Alzheimer's Disease: Statistical Versus Clinical Significance.

Objective: Individuals with Alzheimer's Disease (AD) have verbal memory deficits. This experiment was designed to determine if AD patients can learn new verbal information.

Participants and Methods : Data from the Hopkins Verbal Learning Test - Revised (HVLT-R) were collected on thirty-seven patients with probable AD (33 women, 4 men; average age = 74.95 years; average MMSE score = 20.48). Data from Trial 1 and Learning (Higher performance on Trial 2 or 3 minus Trial 1) were compared.

Results : In comparison to normative data, AD patients performed worse on Trial 1 recall ($p < .0001$) and worse on Learning ($p < .003$). The AD patients were also Impaired (<1st %ile) on both Total Recall (sum of Trials 1 - 3) and Delayed Recall. These measures indicate a significant difference in the learning and memory of controls and AD patients, yet the clinical significance of the Learning discrepancy is not so apparent. Specifically, when comparing AD patients against normal controls, AD patients displayed Average (27th %ile) abilities for the learning of novel information. Thus, AD patients' learning is statistically below that of normal controls, yet their Learning score is still within normal limits (low end of Average, 27th %ile), and their ability to incorporate more words across trials is significantly above zero ($p = .000$).

Conclusions : While subjects with AD have poorer recall than normal controls, they do have relatively preserved abilities for short-term verbal learning. This could have promising implications for the clinical management of AD patients and future research should determine if their short-term learning ability could increase long-term recall.

Correspondence: Robert D. Rhodes, Social Sciences, Concord University, Box 42, Athens, WV 24712. E-mail: rhodes@concord.edu

A. NORDLUND, S. ROLSTAD, O. KLANG, K. LIND, A. EDMAN, S. HANSEN & A. WALLIN. Neuropsychological Differences Between MCI Subjects with Normal and High Concentrations of CSF tau.

Objective: Background: Mild cognitive impairment (MCI) is, according to several studies, the preliminary stage of dementia disorders, such as Alzheimer's disease (AD). Cerebrospinal fluid (CSF) analyses have been used to identify preliminary AD, and elevated concentrations of tau protein in CSF have been found in both AD and MCI.

Objective: To examine whether MCI subjects with high concentrations of tau protein in CSF (MCI-h) differ from those with normal concentrations (MCI-n) in terms of neuropsychological performance.

Participants and Methods : MCI-n (N=50) and MCI-h (N=30) subjects were included in the study and compared to normal controls (N=30) on tests of speed/attention, episodic memory, visuospatial function, language and executive function.

Results : The MCI-n group was significantly younger and better educated. When controlled for age and education, controls generally outperformed both MCI groups. MCI-n performed better than MCI-h on tests of speed and attention, memory, language and executive function. Further, a clear correlation between tau concentrations and a 3 test composite score was found in the MCI group, while no such correlation was present in the control group.

Conclusions : It may not be a surprising finding that MCI subjects with elevated concentrations of a biomarker associated with AD differ from MCI subjects with normal concentrations of the biomarker. Nevertheless, we found the differences between MCI-n and MCI-h more clear-cut than expected. Since a considerable proportion of MCI subjects have a benign form of MCI, a combination of tau concentrations and neuropsychology could be a step toward a more exact diagnosis of preliminary AD.

Correspondence: Arto Nordlund, MSc, Institute of Clinical Neuroscience, Sahlgrenska Academy, SU/Molndal, Molndal 431 80, Sweden. E-mail: arto.nordlund@neuro.gu.se

S.A. COSENTINO, B. BUTTERFIELD, O. TATARINA & Y. STERN. Anosognosia Assessment in Alzheimer's Disease: New Metacognitive Methodology.

Objective: Anosognosia, disordered awareness of cognitive and behavioral deficits, is a striking yet variable symptom of Alzheimer's disease (AD). Despite the practical relevance of anosognosia, its etiology, clinical correlates, and prognostic value remain unclear, in part due to the prevalent use of subjective methodology to assess awareness. We aimed to establish an objective metacognitive measure for use in AD.

Participants and Methods : Participants included 16 patients with mild AD (MMSE: M = 24.08; SD = 2.36) and 20 age matched controls. We assessed subjects with a novel Feeling of Knowing (FOK) task for Verbal Episodic Memory and a clinical rating of awareness. The FOK task requires subjects to predict whether or not they will recognize the correct answer for each memory item, resulting in an overall measure of predictive accuracy.

Results : As predicted, FOK ratings (gamma correlations) did not differ between the AD (M = .68, SD = .60) and NC groups (M = .70, SD = .66); $F(1, 22) = .00, p = .98$. However, FOK varied significantly across AD subjects with high (M = .90, SD = .21) versus low (M = -.11, SD = .97) clinical ratings of awareness, $F(1, 13) = 12.35, p < .01$. FOK was unrelated to dementia severity.

Conclusions : Results suggest that Episodic FOK is an objective means of quantifying metacognitive skills in dementia. This method has the potential to clarify the construct of anosognosia in AD by offering a reliable metacognitive measure that can be systematically explored in relation to disease variables.

Correspondence: Stephanie A. Cosentino, Ph.D., Sergiersky Center, Columbia University Medical Center, 630 West 165th Street, P&S Mailbox 16, New York, NY 10032. E-mail: scosentino@sergiersky.cpmc.columbia.edu

S. KONKA, K. QUENCER, G.R. FINNEY, G.P. CRUCIAN & K.M. HEILMAN. The Discrimination Index of the Hopkins Verbal Learning Test is Lower in Patients with Alzheimer's Disease than Patients with Frontal-subcortical Dementias.

Objective: Studies have suggested that patients with Alzheimer's disease (AD) produce more false versus true memories than healthy elderly. A similar dissociation might occur for between AD and fronto-subcortical dementia.

Participants and Methods : We compared age and MMSE matched AD (n=42) and non-AD dementias (n=16). The non-AD group was composed predominantly Pick's spectrum and vascular dementias. The performance of the two groups on the delayed recognition task of the Hopkins Verbal Learning Test as measured by Discrimination Index (true positives - false positives) was compared. We also analyzed the total number of true positive and false positive answers on the recognition task.

Results : No significant differences were found for the two groups for true positive or false positive responses when assessed alone. However, independent of MMSE scores, there was a significant difference in the discrimination index between the means of the groups (AD=2.69 versus nAD=6.31 $p=0.002$).

Conclusions : The reason we found a significant difference in the number of correct to incorrect endorsements made by the patients with AD versus those with frontal-subcortical dementias is not known, but frontal-subcortical dysfunction might induce a greater deficit in retrieval-recall with relative preserved recognition, and AD might be more likely to induce an encoding-consolidation deficit that impairs recall and recognition.

Correspondence: Glen R. Finney, MD, Neurology, University of Florida, MBI at UF 100 S Newell Dr L3-100, PO Box 100236, Gainesville, FL 32606. E-mail: finney@neurology.ufl.edu

J. GREEN, M.L. CLARK & G. WALLS. Neuropsychological Changes Related to Extrapyramidal Motor Symptoms (EPS) in Mild Cognitive Impairment (MCI).

Objective: Mild cognitive impairment (MCI) has been conceptualized as an early phase of progressive neurodegenerative disorders affecting cognition, most often Alzheimer disease (AD). Since EPS in Alzheimer disease (AD) is associated with a more rapid rate of cognitive decline, we hypothesized that MCI patients with EPS would show weaker neuropsychological performance than those without EPS.

Participants and Methods : Thirty-two MCI patients (age = 74(5.8), education = 16 (2.7)) received a comprehensive neuropsychological battery including conventional tests and computer-based tests from the CANTAB. EPS were assessed using the Unified Parkinson Disease Rating Scale (UPDRS), Finger Tapping and Grooved Pegboard. On the UPDRS, a score exceeding 0 on at least two different motor signs was considered abnormal. On the psychometric motor tests, a score exceeding one standard deviation below normal was considered abnormal. Patients abnormal on at least two of these measures were assigned to the EPS group.

Results : The EPS group (n = 20) showed significantly worse performance on the Hopkins Verbal Learning Test delayed memory savings ($t(30) = -1.7, p < .04$), Judgment of Line Orientation ($t(27) = -2.9, p < .01$) and the stages completed on the CANTAB Intra-extradimensional Shift ($t(30) = 2.0, p < .05$) and Paired Associate Learning ($t(28) = -2.6, p < .01$) than did the no-EPS group.

Conclusions : The findings suggest that MCI patients with EPS have weaker cognitive performance than those without EPS. The cognitive status of MCI patients with EPS should be monitored with special attention to assess disease progression.

Correspondence: *Joanne Green, Ph.D., Neurology, Emory University, Wesley Woods Health Center, 1841 Clifton Road, Atlanta, GA 30306. E-mail: jgreen@emory.edu*

N.K. NADKARNI & S.E. BLACK. Functional Impairment Correlates Differentially with Executive Function Deficits in Alzheimer's Disease and Frontotemporal Dementia.

Objective: Executive function [EF] is affected in Alzheimer's Disease [AD] and Frontotemporal Dementia [FTD]. EF correlates of functional impairment in these disorders are less studied.

Participants and Methods : We compared age- & education-matched AD [n=31], behavioural variant-FTD [bv-FTD n=24] and language variant-FTD [lv-FTD n=22] patients to normal controls [NC, n=29] on EF tasks. Patient's functional status was assessed on the Disability Assessment in Dementia. This scale measures activities of daily living [ADL] and instrumental activities of daily living [IADL] and provides subscores for initiation, planning and action. Groups were compared using ANOVA on the Dementia Rating Scale initiation-perseveration [DRSi-p] and conceptualization [DRSconc] scores, the Wisconsin Card Sorting Test perseverative errors [WCSTpe], Raven's progressive matrices [RPM], Trails B, Forward and Backward Digit Span [FDS and BDS] and fluency [FAS].

Results : MMSE (mean=24) and disease duration (mean=3.2 yrs) were similar between the patient groups. AD group performed better than the bv-FTD group on the DRSi-p ($p<0.05$), WCST pe ($p<0.01$) and FAS ($p<0.05$) and better than the lv-FTD group on the DRSi-p ($p<0.01$), DRScnc ($p<0.01$) and FDS ($p<0.01$). Bv-FTD and lv-FTD groups were similar in their EF performance. In the AD group, BDS best correlated with initiation sub-score of IADL ($r=0.4$, $p<0.05$). In the bv-FTD group, FDS correlated with the initiation sub-score of IADL ($r=-0.711$, $p<0.01$). In the lv-FTD group, RPM correlated with the initiation and action sub-score of ADL ($r=0.7$, $p<0.05$ for both) as well as the initiation ($r=0.8$, $p<0.01$), planning ($r=0.7$, $p<0.05$) and action ($r=0.6$, $p<0.05$) sub-scores of IADL.

Conclusions : EF measures correlate with initiation of activities in all three groups and additionally with planning and action in the lv-FTD group. These findings suggest the fractionation of daily-activities into components such as initiation may better capture the relation between executive deficits and functional decline in dementia.

Correspondence: *Neelesh K. Nadkarni, MD, PhD (Cand.), Neurology, Medicine, Institute of Medical Science, Sunnybrook & Women's College HSC-University of Toronto, A406, Cognitive Neurology, 2075 Bayview Avenue, Toronto, ON M3B 1X4, Canada. E-mail: neelesh.nadkarni@sw.ca*

M. MAPSTONE, M.T. WEBER, T. STEFANELLA & C.J. DUFFY. Visual Motion Perceptual Deficits and the Window of Spatial Attention in Alzheimer's Disease.

Objective: Optic flow is the large-scale pattern of visual motion obtained from movement through the environment. Optic flow perception is impaired in many Alzheimer's disease (AD) patients. Distribution of attention to large areas of extrapersonal space is also impaired in AD. We examined the relationship between this attentional window and optic flow perception as a mechanistic explanation for navigational impairments in AD. We hypothesized that a reduction in the window of attention would be associated with impaired optic flow perception.

Participants and Methods : We studied 16 AD subjects and 30 older (ONC), 21 middle aged (MNC), and 25 younger (YNC) normal control subjects. We obtained perceptual thresholds for heading discrimination using large optic flow patterns or, in a control condition not requiring

global attention, a single moving object to simulate a forward heading on a large screen. The Useful Field of View Test (UFOV) was used to measure the functional size of the attentional window. We used MANOVA to compare the groups on the perceptual tasks and UFOV. Relationships between thresholds and size of the UFOV were examined using non-parametric correlations.

Results : We found a significant age- and disease-related reduction in the size of the UFOV across the groups ($p<0.05$) which was correlated with elevated optic flow thresholds in the AD group only ($\rho = -.62$, $p<0.05$). The size of the UFOV was not correlated with the object thresholds in the AD group.

Conclusions : We conclude that optic flow perception requires global spatial attention. In AD a primary failure of spatial attention may contribute to optic flow perceptual deficits. This primary failure of spatial attention may underlie navigation impairments in AD.

Correspondence: *Mark Mapstone, PhD, Neurology, University of Rochester, Box 673, 601 Elmwood Avenue, Rochester, NY 14642. E-mail: mark_mapstone@urmc.rochester.edu*

J. BENGE, P. MASSMAN, R. JENKINS, G. THORNTON & R. DOODY. Phonemic Cued Performance on the Boston Naming Test: Longitudinal Change and its Correlates in Alzheimer's Disease.

Objective: A common finding in Alzheimer's Disease (AD) patients is that generation of words to a phonemic cue (initial letter fluency) is better than generation of exemplars in a semantic category. This finding is thought to exemplify the degradation of semantic memory in AD patients. Similarly, it has been suggested that phonemic cues help individuals with mild dementia generate more accurate responses on confrontation naming tasks by aiding retrieval from a degraded semantic memory store. The purpose of the current study is to evaluate the relationship of phonemic cueing to verbal fluency measures, and to determine predictors of change in phonemic cueing over time.

Participants and Methods : Participants in this study (N=152) met NINCDS-ADRDA criteria for probable AD and completed comprehensive neuropsychological evaluations including FAS and animal fluency measures and the Boston Naming Test (BNT) at baseline and at a 9 - 24 month follow-up. Mini Mental Status Exam (MMSE) scores were used to evaluate dementia severity at baseline (M= 21.9, sd=3.5) and follow-up. An index of phonemic cueing improvement (PCI) on the BNT was calculated by dividing the responses that were correct following phonemic cueing by the total number of phonemic cues administered. Annual rates of change on the PCI, fluency measures, and the MMSE were calculated (first score - second score)/time interval).

Results : Correlational analyses revealed that baseline PCI, along with annual rates of change on animal and letter fluency tasks were significantly associated with PCI change over time. Multiple regression revealed that baseline PCI performance and changes in animal fluency, but not letter fluency, were predictive of changes in phonemic cued assistance.

Conclusions : Results reinforce the finding that benefit from phonemic cueing in AD is related to changes in semantic memory.

Correspondence: *Jared Benge, M.S., University of Houston, 3813 Pin Oak Dr N, Pearland, TX 77581. E-mail: jfbenge@uh.edu*

A.J. SAYKIN, H.A. WISHART, L.A. RABIN, R.B. SANTULLI, L.A. FLASHMAN, N. PARE, J.D. WEST, T.W. MCALLISTER, C.H. RHODES, G.J. TSONGALIS, S.J. GUERIN & A.C. MAMOURIAN. Pharmacogenetic Imaging in Preclinical Alzheimer's Disease: Candidate Genes and Response to Cholinergic Enhancement in Amnesic MCI.

Objective: Imaging is increasingly being applied to the preclinical detection of Alzheimer's disease (AD) and as a biomarker for treatment response. This will take on increasing importance as novel neuroprotective strategies are developed requiring early introduction for optimal efficacy. Several studies have employed fMRI to assess neural changes

induced by cholinergic therapy in AD or MCI. Genetic polymorphisms related to memory and neurodegenerative processes may influence treatment response and show promise for targeted therapeutics. The present study was designed to examine cholinergic enhancement in amnesic MCI, incorporating candidate genes as predictors of changes in brain activity.

Participants and Methods : Participants included 19 patients with MCI and 20 demographically-matched healthy controls. Subjects underwent structural and functional MRI before and after short term treatment with donepezil. An auditory verbal encoding and retrieval task was used to challenge episodic memory circuitry. Genotyping was performed for several candidate genes related to AD and plasticity/repair (APOE, BDNF), neurotransmission (CHRM2, COMT, DAT) and neuroinflammation (IL-6). Scans were analyzed on a voxel by voxel basis using SPM and regression models on extracted ROI data.

Results : A group by time interaction indicated that following treatment, MCI patients showed increased right medial temporal activation during encoding of new stimuli and increased right frontal activation during retrieval. Polymorphisms related to neurotransmission were associated the medial temporal increase, whereas IL-6 and BDNF were associated with increased frontal activation.

Conclusions : Imaging, genetic and cognitive measures in combination have the potential to elucidate the biological pathways and circuits related to memory processes and therapeutic response.

Correspondence: *Andrew J. Saykin, PsyD, Brain Imaging Laboratory, DHMC, Dartmouth Medical School, DHMC, Lebanon, NH 03756. E-mail: saykin@dartmouth.edu*

L.H. WARREN, J. TSCHANZ, M. NORTON, L. SANDERS, T. OST-BYE, C. PIEPER, K.M. HAYDEN & K.A. WELSH-BOHMER. Prediction of Dementia: A Comparison of Multiple Preclinical Dementia Algorithms.

Objective: Numerous constructs are used in the aging literature to denote intermediate states of cognitive impairment between normal function and dementia. We examined the differential ability of these various constructs to predict subsequent dementia.

Participants and Methods : The sample consisted of individuals (n=661) participating in the Cache County Memory Study (CCMS). We compared dementia outcomes three years after initial evaluation in several different nondemented groups who met algorithmically-derived criteria for either normal cognition, cognitive impairment no dementia [CIND], age-associated memory impairment [AAMI], age-associated cognitive decline [AACD], mild cognitive impairment functionally impaired [MCI-functional], MCI-isolated memory [MCI-amnesic], and our own construct "mild ambiguous" [MA; signifying suspected prodromal AD].

Results : Our results indicated the various constructs identify different subgroups, which do not necessarily overlap. Three years after baseline examination, 68 (10.3%) had developed dementia. In a series of bivariate logistic regressions, MA, MCI-functional, CIND, and AACD significantly predicted later dementia diagnosis, as compared to normals. However, after adjusting for age, education, sex, APOE status, and baseline 3MS score, only MA significantly predicted dementia (OR 5.1, CI 2.0-12.7). Nevertheless, MCI-functional, CIND, and AACD predicted dementia status as well as MA when considered simultaneously in subsequent ROC models.

Conclusions : These results underscore the importance of considering both

functional change and cognitive impairment in addition to common demographic factors when predicting later dementia. Our results support the utility of an algorithmic approach in conceptualizing preclinical dementia in a community setting.

Correspondence: *Lauren H. Warren, M.A., Psychology, University of North Carolina at Chapel Hill, 601 Tinkerbell Rd., Chapel Hill, NC 27517. E-mail: lauren_warren@unc.edu*

G. MCCAWLEY, S. ANTANI, P. MOORE, P. KOENIG & M. GROSSMAN. Category Specific Naming Difficulty in Alzheimer's Disease and Frontotemporal Dementia.

Objective: Assess category-specific naming deficits in Alzheimer's disease (AD) and frontotemporal dementia (FTD).

Participants and Methods : Participants were 36 AD, 9 FTD-NA (non-aphasic), 12 FTD-PNFA (progressive non-fluent aphasia), 21 FTD-SD (semantic dementia), and 13 age- and education-matched healthy controls. Participants named 60 pictures from the Snodgrass series including: 22 natural kinds subdivided into fruits/vegetables, non-mammals, and mammals; and 38 manufactured artifacts subdivided into vehicles, tools, household items, kitchen items, clothing/accessories, and toys. Analysis of variance (ANOVA) indicated that all semantic subcategories matched for familiarity, visual complexity, and frequency.

Results : Examination of individual patient profiles revealed that only one patient (1.3%) was impaired naming all subcategories of manufactured artifacts, but not impaired naming natural kinds. Chi-square analysis was performed looking at the number of patients impaired in the subcategories by diagnosis group. The chi-square distribution showed patient groups demonstrated different proportions of impairment for naming of natural kinds subcategories ($X^2(6) = 20.56, p < 0.01$). For example, more FTD-PNFA patients were impaired naming fruits/vegetables and non-mammals than mammals. There was a similar pattern for naming manufactured artifacts that did not reach significance.

Conclusions : Careful assessment of patient performance demonstrated unequal patterns of naming difficulty within the large categories of natural kinds and manufactured artifacts. Moreover, single patient analyses did not demonstrate convincing evidence for a category-specific semantic memory impairment. These observations call into question the usefulness of classifying naming difficulty at the level of large categories of knowledge.

Correspondence: *Gwyneth McCawley, University of Pennsylvania, 3400 Spruce Street, 3 West Gates, Philadelphia, PA 19104. E-mail: gwynethm@mail.med.upenn.edu*

S.A. ROGERS, P. LU, C. CHICOTA, S. BELKONEN & J.L. CUMMINGS. Premorbid Intelligence and Age-Associated Memory Impairment.

Objective: Past research has suggested that high levels of premorbid intellectual functioning can delay the onset of Alzheimer's disease (AD), but little has been done to determine if it has an earlier influence in the aging process. This study examined the relationship between premorbid intellectual levels and performance in multiple cognitive domains among those with age-associated memory impairment (AAMI).

Participants and Methods : The sample consisted of 52 participants consecutively referred from the UCLA Memory Disorders Clinic who were diagnosed with AAMI (M age = 74.87, SD = 7.10; M education = 16.35 years, SD = 2.52) after clinical interview and neuropsychological evaluation, including two tests of premorbid intelligence (AMNART and WAIS-III Information). Composite Z scores were calculated for each neuropsychological domain.

Results : Premorbid intelligence was positively correlated with a combined language score, $r(35) = .40, p < .02$, and a combined visuospatial score, $r(35) = .41, p < .02$. Participants were then divided into high ($z > 1.25$) and low ($z < 1.25$) premorbid intellectual levels. Using independent samples t-tests, those with high premorbid functioning performed significantly better on composite scores of attention ($p < .01$), language ($p < .01$), and executive functioning ($p < .05$) compared to those with lower premorbid intelligence. Statistically controlling for education did not meaningfully alter the results.

Conclusions : Individuals who meet criteria for AAMI, but who possess high levels of premorbid intelligence, performed better in the domains of language, visuospatial functioning, attention, and executive tasks. High premorbid functioning may represent a source of cognitive reserve that can delay the expression of visuospatial, language, and executive deficits that may herald the onset of a dementia syndrome.

Correspondence: *Steven A. Rogers, Ph.D., Alzheimer's Disease Center, UCLA - Neuropsychiatric Institute, 4573 Willis Avenue, Apt. #202, Sherman Oaks, CA 91403. E-mail: SARogers@mednet.ucla.edu*

S. VAN GAAL, F. GAO, F. LEIBOVITCH & S. BLACK. Validation of Simple Measures for Progression of Brain Atrophy and Cognitive Decline in Alzheimer's Disease.

Objective: To investigate concordance between cognitive decline and planimetric measurements of progressive brain atrophy in Alzheimer's Disease (AD). Linear and areal measures can discriminate between normal aging and AD cross-sectionally, but validation of their utility in assessing longitudinal change is needed.

Participants and Methods : Fifty probable AD patients and twenty age-matched normal controls underwent at least three imaging & neuropsychological assessments over a minimum of two years of follow-up (mean 4.1±1.5 yrs). Axial 3D T1 MR and Mattis Dementia Rating Scale (DRS) measures were selected for analysis. Progression of atrophy was calculated from area measures of each lateral ventricle (body and temporal horn) and from multiple width measures of each medial temporal lobe (MTL). Cognitive decline was defined as rate of change on the DRS. **Results :** Results: Rate of decline on the DRS-Total, DRS-Memory and DRS-Attention subscales correlated with enlargement rate of lateral ventricle measures ($R=0.61$, $p<0.01$) and with thinning of the MTL ($R=0.35$, $p<0.01$).

Stepwise linear regression models ($p_{\text{entry}}<0.01$) incorporating MR measurements explained significant additional variance (after first entering age and education ($R^2=0.35-0.50$, $p<0.05$)) on DRS-Total ($\Delta R^2=0.35$, $p<0.01$), DRS-Memory ($\Delta R^2=0.55$, $p<0.01$) and DRS-Attention ($\Delta R^2=0.40$, $p<0.01$). These models were driven primarily by the rate of expansion of the body of the right lateral ventricle. Thinning of the right MTL added slightly to DRS-Memory.

Conclusions : Progressive enlargement of the lateral ventricle correlated significantly with cognitive decline, validating this quick and user-friendly index of longitudinal brain atrophy in patients with Alzheimer's Dementia.

Correspondence: *Stephen van Gaal, Linda C Campbell Cognitive Neurology Research Unit, Division of Neurology, Department of Medicine, Sunnybrook and Women's College Health Sciences Centre, 2075 Bayview Ave, Toronto, ON M4N3M5, Canada. E-mail: steve.vangaal@utoronto.ca*

Paper Session 1

11:00 a.m.–12:30 p.m.

Cognitive Dysfunction in HIV/AIDS

M. CHERNER, P.A. SUAREZ, S.E. DAWES, M. RIVERA MINDT, T.D. MARCOTTE, R.K. HEATON & I. GRANT. Relationship Between Cognitive Deficits and Performance on Tests of Everyday Functioning in HIV+ Spanish Speakers: Preliminary Results.

Objective: HIV/AIDS continues to affect Latinos disproportionately but consequences of the illness remain understudied in this group. Many HIV-positive Latinos from the US-Mexico border region are primarily Spanish speaking, and properly validated instruments are needed to evaluate changes in daily functioning that this population may experience as a result of the infection or its treatment.

Participants and Methods : The functional impact of HIV-associated neuropsychological (NP) impairment was examined in 48 HIV-positive

Spanish speakers of Mexican origin. Subjects received Spanish versions of a comprehensive NP battery and laboratory measures of instrumental activities of daily living (IADL), including medication management, finances, shopping, cooking, and a restaurant scenario. Clinical ratings of NP impairment were performed using demographically corrected T-scores for each NP test. Raw scores for IADL measures were standardized as z-scores. An Average Functional z-score (AF-z) was computed to index overall IADL performance.

Results : Sixteen (33%) participants were deemed globally NP impaired. NP impaired (NPI) and NP normal (NPN) subjects had comparable demographic and HIV disease characteristics. NPI participants performed significantly worse than their NPN counterparts on the overall functional battery (AF-z, $p<0.002$), and particularly in basic ($p<0.02$) and advanced ($p<0.001$) financial management tasks, as well as in a complex medication management task ($p<0.001$).

Conclusions : These preliminary results validate earlier pilot work on the laboratory IADL measures, suggesting that they are ecologically valid and vary according to HIV-associated brain dysfunction in Spanish speakers. This is consistent with work in English speakers indicating functional declines related to cognitive compromise in HIV infection.

Correspondence: *Mariana Cherner, PhD, Psychiatry, University of California San Diego, 150 W. Washington St., 2nd floor, San Diego, CA 92103. E-mail: mcherner@ucsd.edu*

J.T. BECKER, O.L. LOPEZ, H.J. AIZENSTEIN, S.B. JUENGST & D.J. MARTINECK. Patterns of Neuropsychological Impairment in HIV/AIDS Differ as a Function of Immune System Competence and Age.

Objective: Since the advent of the use of highly active anti-retroviral medication regimes (HAART) in HIV/AIDS, there has been increasing evidence that the nature and extent of the neuropsychological deficits associated with HIV/AIDS have been changing. The purpose of the present report is to describe a pattern of cognitive dysfunction that suggests that more than one process may be responsible cognitive impairments.

Participants and Methods : Seventy-seven individuals (54 AIDS, 23 Controls) participated in this study. After completing a battery of neuropsychological tests the individual test scores were standardized and the protocols reviewed and graded for presence/severity of impairment (None, Mild, Severe).

Results : AIDS patients were more likely to be impaired (35%) than controls (8.6%), and older individuals (>45) were more likely to be impaired (36%) than younger (14%). More important, however, was the fact that the pattern of impairment differed as a function of age and degree of immunosuppression. A multinomial regression model indicated that Mild Impairment was significantly associated with older age ($p=.06$) in the AIDS patients. By contrast, Severe Impairment was significantly associated with immunosuppression ($CD4+ < 200$) ($p=.02$). In the younger AIDS patients, viral load was associated with Severe Impairment, but not so in the older AIDS patients.

Conclusions : These data add to the growing body of evidence that in the era of HAART the predictors of cognitive impairment are changing. There appears to be a syndrome that is associated with chronic immunosuppression, onto which viremia places extra burden. There is an association with age, which confers an independent risk of a milder form of impairment, and which may interact with biological measures to produce the neuropsychological syndrome of HIV/AIDS.

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*

D. BYRD, M. RIVERA MINDT, E. RYAN, S. MORCELLO & M. HIV BRAIN BANK. HIV-Related Cognitive Disorders in U.S. Ethnic Minorities: Influence of Confounds and Classification Systems.

Objective: The current study compared the prevalence of HIV-related neurocognitive disorders, and significant confounding factors, using two classification systems: American Academy of Neurology (AAN) criteria and the clinical ratings (CR) methodology of the National NeuroAIDS Tissue Consortium.

Participants and Methods : Neuropsychological (NP) data from 254 HIV+ adults (44% African American, 32% Hispanic, and 24% Caucasian) from the Manhattan HIV Brain Bank were reviewed. Diagnoses of NP impairment due to other causes (NPI-O) were assigned to patients with significant confounds (i.e., head trauma, low pre-morbid functioning).

Results : Using the AAN system, the overall prevalence of HIV-associated disorders was 50%, and ethnic minorities were significantly more likely than Caucasians to be diagnosed with HIV-associated impairment (93% v. 79%; $c1 = 11.2, p = .001$). Using the CR method, the overall prevalence of HIV-associated disorders was 14%, and this system did not yield ethnic disparities (35% vs. 30%; $p > .05$). Both methods, however, yielded a high rate of NPI-O diagnoses (AAN = 37%, CR = 46%). Cognitive profiles of patients with NPI-O did not differ from those with HIV-associated dementia (HAD).

Conclusions : Results suggest that the AAN method may be overly sensitive and lack specificity in identifying NP impairment in urban, ethnically diverse HIV+ populations, resulting in inflated estimates of HIV-associated cognitive disorders. A high prevalence of non-HIV NP impairment was observed across systems and ethnic groups, predominantly in patients with low education. The need for improved diagnostic distinction between NPI-O and HAD remains for cohorts with multiple confounding characteristics.

Correspondence: *Desiree Byrd, PhD, Mt Sinai School of Medicine, One Gustave Levy Place, MHBB, Box 1134, NY, NY 10029. E-mail: desiree.byrd@mssm.edu*

J. RICHARDSON, M. NOWICKI, K. DANLEY, E. MARTIN, M. COHEN, R. GONZALEZ, J. VASSILEVA & A. LEVINE. Neurocognitive Function and Hepatitis C Disease: The Women's Interagency HIV Study.

Objective: Infection with the hepatitis C virus (HCV) is associated with neurocognitive impairment, particular among persons dually infected with HIV. However, this is little information available regarding the neurocognitive status of HCV-infected women.

Participants and Methods : We tested 220 women with no evidence of dementia or other neurological disorder enrolled in the Women's Interagency HIV Study. These included 70 women dually infected with HIV and HCV, 105 women mono-infected with HCV or HIV, and 45 women seronegative for both viruses. All participants completed a series of standardized neuropsychological (NP) tests.

Results : Impairment in functions typically affected by HIV, including psychomotor speed and working memory, were evident among this sample. A positive HIV or HCV serostatus was associated with a significantly increased risk of NP impairment but the risk of NP impairment was highest among dually infected women who were not receiving antiretroviral therapy (OR=7.03, 95% CI=2.63-18.82). In addition, the relationship between serostatus and NP impairment among the HCV+ women has significant only for those younger than 40.

Conclusions : This study emphasizes the critical association of HCV with the risk of neurocognitive impairment in women living with HIV/AIDS, and especially among those with HIV who are not on antiretroviral therapy. Further, the influence of age as a mediating variable requires further study, especially since HIV+ persons are living longer due to advances in HIV disease management.

Correspondence: *eileen martin, university of illinois, 1601 W taylor st, M/C 912, chicago, IL 60612. E-mail: emartin@psych.uic.edu*

B.C. SCHWEINSBURG, S.P. WOODS, A.D. SCHWEINSBURG, M.P. PAULUS, I. GRANT & T. HNRC GROUP. Neural Substrates of Response Inhibition in HIV-1 Infection.

Objective: HIV-1 infection is associated with cognitive dysfunction and neuropathological alterations in fronto-striatal brain networks. These pathways play a role in response inhibition, which reflects an individual's ability to exert control over a prepotent response. Response inhibition is a particularly relevant construct in HIV, as infected individuals often engage in high-risk behaviors. However, the neural substrates of HIV-related disinhibition are not well understood.

Participants and Methods : Participants were 13 seronegative healthy controls (CON: age 42.5 ± 14.5 years) and 11 HIV seropositive volunteers (HIV: age 41.8 ± 6.1 years). The groups were matched on education, gender, ethnicity, and handedness. Participants performed a Go/Nogo task that assesses response inhibition during functional magnetic resonance imaging (fMRI).

Results : HIV and CON did not differ on Go/Nogo task accuracy or reaction time, and both groups showed comparable patterns of fMRI brain response to the Go task condition. However, HIV showed significantly less brain response to the Nogo task condition in numerous fronto-striato-thalamo-cortical (FSTC) pathways including bilateral superior frontal gyrus (BA 6/8/10), bilateral middle frontal gyrus (BA 8/9), bilateral inferior frontal gyrus (BA 47), left medial frontal gyrus (BA 11), right striatum, left caudate head, and right thalamus ($p < .05$, cluster size > 512 microliters). Exploratory follow-up analyses revealed that while CON demonstrated increased FSTC activation to Nogo, HIV showed patterns of negative fMRI signal relative to baseline in FSTC pathways.

Conclusions : HIV-infected individuals showed diminished brain activation in FSTC pathways during response inhibition compared to healthy seronegative volunteers, consistent with previous studies demonstrating neuropathological alterations in these brain networks. The altered fMRI response observed may reflect different neural strategies and/or neuroenergetic dysfunction, which may underlie HIV-associated behavioral disinhibition.

Correspondence: *Brian C. Schweinsburg, Ph.D., Psychiatry, UCSD/SDVAHS, HIV Neurobehavioral Research Center, 150 West Washington Street, Second Floor, San Diego, CA 92103. E-mail: bschweinsburg@ucsd.edu*

Symposium 5

11:00 a.m.–12:30 p.m.

Does Age at Insult Predict Outcome From Childhood Brain Insult?

G.H. TAYLOR. Age-related Influences on Outcome of Childhood Brain Injury: Review of the Evidence.

The purpose of this presentation is to summarize the findings of studies examining the effects of three age factors on outcomes of pediatric brain insults: age at insult, time since insult, and age at testing. Essential distinctions in research on age-related influences on outcomes are the nature of the brain insult (e.g., focal vs. diffuse), the developmental stage of the outcome measure (established, developing, or later emerging skills), and length of follow-up (single vs. repeated assessments). The results of research presented at this symposium and related studies by the presenter and others are reviewed in light of methodological issues. This review reveals consensus regarding: (1)

persisting consequences of early brain insults; (2) more marked effects on developing or emerging skills compared with established ones; (3) more marked effects of early compared with later lesions; and (4) environmental influences on post-injury development. Survey of the existing literature suggests a limited form of plasticity of function that varies with the age-related factors. This review also underscores the need for further studies emphasizing long-term follow-up, direct comparisons of effects on established vs. developing skills, administration of more sensitive outcome and environmental measures, and consideration of the effects of experience on brain development and neural reorganization. Models of age-related effects are needed to help guide these investigations. The challenge of these models is to account for variations in initial and residual brain lesions, the relation of lesions to patterns of neuropsychological impairment, processes of skill acquisition, and the roles of children's premorbid status, cognitive reserve, and the environment.

Correspondence: Vicki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au

K. HOWARD, P. ANDERSON, M. BEAR, V. ANDERSON & T. INDER. Early White Matter Injury in Very Preterm Children is Associated With Executive Difficulties at 2 Years Corrected Age.

Objective: Preterm birth may have major consequences for the developing brain. Neuroimaging studies indicate that the majority of very preterm infants exhibit diffuse white matter (WM) abnormalities in the neonatal period. However, the degree to which these abnormalities contribute to the later cognitive deficits observed in this population is not well understood. The aim of this study was to examine the impact of WM injury on early executive skills.

Method/ Participants: Participants included 130 very preterm (<30 weeks) and 50 full term children. Preterm participants were recruited at birth, and at term underwent magnetic resonance imaging (MRI). The scans were assessed qualitatively for WM abnormalities, which included signal abnormality, enlarged ventricles, reductions in WM volume and thinning of the corpus callosum. At 24 months of age participants were administered two tasks assessing working memory, inhibition and set shifting (Delayed Alternation (DA) and Spatial Reversal (SR)).

Results: Results revealed marked differences between very preterm and term children in terms of their performance on both tasks. Specifically, very preterm children experienced more problems complying with task demands (DA: $X^2 = 6.53$, $p < 0.001$; SR: $X^2 = 4.01$, $p < 0.05$) and made significantly more perseverative errors (DA: $t = 3.00$, $p < 0.01$; SR: $t = 2.07$, $p < 0.05$). Within the very preterm group, those with WM injury were more likely to perseverate than those without (DA: $X^2 = 12.90$, $p < 0.01$; SR: $X^2 = 8.21$, $p < 0.05$).

Conclusion: These findings provide important insights into how WM injury occurring as a result of prematurity may impact on emerging executive skills.

Correspondence: Vicki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au

V. ANDERSON, C. CATTROPA, S. MORSE, F. HARITOU & J. ROSENFELD. Outcome Following TBI Sustained at Different Stages of Childhood.

Objective: Traumatic brain injury (TBI) is a common, acquired childhood disability, which may be employed as a model to better understand the impact of early brain injury on brain structure and function. Contrary to previously held views of the 'plasticity' of the young brain, re-

cent research suggests that early insult may have a profound impact on development. To date, these suggestions remain largely untested. This prospective, longitudinal study aimed to plot changes in cognitive abilities following childhood TBI over the 30 months post-injury, and to examine the impact of age at injury on cognitive outcomes.

Method/ Participants: 122 children with a diagnosis of TBI were divided according to (a) injury age: 'young' (3-7 yrs), 'old' (8-12 yrs); (b) injury severity (mild, moderate, severe), and were evaluated acutely, and at 12 and 30 months post-injury. A further sample of children injured before age 3 years ($n=27$) was compared to these groups for global intellectual ability only.

Results: Results demonstrated a clear relationship between injury severity and cognitive performance. For children sustaining severe injury, younger age at injury was associated with minimal recovery, but better outcome was observed after severe TBI in older children. Age at injury was not predictive of outcome for children with mild/moderate TBI, although infants (0-2.11 years) with moderate TBI showed poorer outcome than older children sustaining injuries of similar severity.

Conclusion: Findings support a 'double hazard' model for severe and early brain insult, and add to the ongoing debate on cerebral plasticity, suggesting that, contrary to traditional views, young children sustaining severe TBI in early childhood, and moderate and severe TBI in infancy, may be particularly vulnerable to significant residual cognitive impairment.

Correspondence: Vicki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au

C.R. DE LUCA, S.J. WOOD, C.P. PANTELIS, R.J. LEVENTER & V.A. ANDERSON. The Cognitive and Behavioural Legacy of Congenital Anomalies.

Objective: Malformations of cortical development (MCD) are a cluster of congenital anomalies that are found in people suffering from epilepsy, intellectual disability or developmental delay. Subtle forms of MCD are now being identified with more powerful imaging techniques, providing a novel model to investigate the cognitive and behavioural impact of a neurodevelopmental lesion of the type purported to underpin many developmental disorders including autism, attention-deficit-hyperactivity-disorder (ADHD) and schizophrenia.

Method/Participants: In this study, we conducted a comprehensive neuropsychological and psychopathological assessment on 25 MCD patients (9 male:15 female), ranging in age from 8 to 18 years. Eleven participants presented with epilepsy.

Results: Findings demonstrated that 76% of children showed intellectual abilities in the Average to Low Average range. Sixteen children (64%) displayed significant attentional difficulties, with 11 identified by their parents as suffering from distractibility and restlessness on a daily basis. Of this group, two had been formally diagnosed and medicated for ADHD. Fifty-two percent of children were rated by their parents as displaying social skills deficits, with 7 (28%) children significantly delayed in their emotional and social development. A range of other significant psychopathology symptoms were reported, including anxiety (16%), oppositional behavior (24%), obsessive-compulsive traits (4%), dysthymia (8%), mania (4%), auditory hallucinations (16%), substance abuse (4%) and suicidal ideation (12%). Size, location and side of lesion did not distinguish children in terms of the type or severity of difficulties displayed.

Conclusion: These findings highlight the significant impact of prenatal lesions in emotional and behavioral development, while demonstrating the relative preservation of intellectual skills.

Correspondence: Vicki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au

D. RANKINS, D. BOYCE, L. HUMPHRIES, M. WELLARD, F. CAMERON, G. WERTHER & E. NORTHAM. Processing Speed in Young Adults with a 12-14 Year History of Type 1 Diabetes: The Impact of Age of Disease Onset.

Objective: This study aimed to examine processing speed in a group of patients with a 12-14 year history of childhood-onset type 1 diabetes. More specifically, the impact of age of disease onset was examined by comparing the performance of those diagnosed before 4 years of age (early disease onset) and those diagnosed at 5+ years (later disease onset).

Method/ Participants: Participants comprised children with a diagnosis of Type 1 diabetes assigned at (1) age < 4 years, or (2) age 5 years and over. Processing speed was assessed using a computerised simple (SRT) and choice reaction time (CRT) task, Block Design, and the Telephone Search and Visual Elevator Timing scores from The Test of Everyday Attention.

Results: Participants with an early disease onset performed more poorly on tasks of processing speed, compared to those with a later disease onset [$p < 0.05$]. In particular, participants with disease onset before 4 years of age took longer to complete the computerised choice reaction time task [$p < 0.05$], Telephone Search [$p < 0.05$] and Visual Elevator [$p < 0.05$] tasks, compared to participants with a late disease onset. In addition, the relationship between processing speed and neurometabolite profiles revealed a different pattern for each group, suggesting that age at disease onset differentially affects neuropsychological and neurometabolite profiles in children.

Conclusion: Overall, results support previous findings that early disease onset is a risk factor for neuropsychological sequelae in young people with type 1 diabetes 11-14 years post diagnosis.

Correspondence: *Ficki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au*

A.C. DA COSTA, J.G. MEARA, J.A. WRENNALL & R. SAVARI-RAYAN. Neurodevelopmental Functioning in Infants with a Craniofacial Disorder: Single-suture Craniosynostosis.

Objective: Craniosynostosis is a congenital craniofacial disorder which is associated with skull growth distortions due to premature fusion of one or more cranial sutures. This disorder of prenatal onset disrupts normal growth processes of the immature brain during a critical phase of early development. Major surgery is typically required during infancy to improve brain growth potential. As with other disorders of prenatal onset, craniosynostosis carries a known risk to developmental outcomes. Research indicates an elevated prevalence of cognitive dysfunction in school-aged children with this condition. However the literature remains inconclusive as to whether developmental delays are detectable during infancy. The objective of this study was to determine the neurodevelopmental characteristics of infants with untreated single-suture craniosynostosis.

Method/ Participants: Subjects for this cross-sectional study comprised 40 infants with unoperated single-suture craniosynostosis (sagittal, metopic, coronal and lambdoid), aged between 3 and 22 months (mean=9.0, SD=4.0 months). Neurodevelopmental functioning was assessed with the mental (Mental Development Index [MDI]) and motor (Psychomotor Development Index [PDI]) scales of the Bayley Scales of Infant Development-2nd edition. **Results:** Results showed that participants displayed significantly lower mental (mean MDI=95.1, SD=11.6, $p < .05$) and motor (mean PDI=87.2, SD=14.3, $p < .001$) scores than normative population averages. An increased rate of significant developmental delays in mental and motor skill functions compared with population averages was also found, with no infants performing in the accelerated range.

Conclusion: In conclusion, infants with single-suture craniosynostosis are at risk of developmental delay. Findings suggest that prenatal brain growth disruptions have implications for developmental outcomes.

Correspondence: *Ficki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au*

V.A. ANDERSON, G.H. TAYLOR, C.R. DE LUCA, A.C. DA COSTA, K. HOWARD, V.A. ANDERSON & D. RANKINS. Does Age at Insult Predict Outcome From Childhood Brain Insult?

Symposium Description : Outcome from childhood brain insult may be predicted by a number of factors. The best established is severity of insult, with more severe insult or presence of medical complications clearly associated with poorer recovery. Psychosocial disadvantage has also reported to be detrimental to long-term outcome. However, these factors, alone or in combination, are not sufficient to explain the wide variability in outcomes that occur following early brain insult. More recently, age at insult has also been identified as potentially influential, although the relationship to outcome appears complex. Evidence emerging from both animal and human literature suggests that the link between age at insult and outcome may not be linear. Rather, there may exist certain critical periods (both biological and behavioral) throughout development during which optimal recovery may result, while other timings may be related to poorest outcome. To date, investigation of this relationship has been hindered due to a focus on specific cerebral conditions (e.g. traumatic brain injury, cerebral infections, prematurity), which are unable to span the full developmental spectrum. To establish the predictive value of age at insult it is necessary to compare outcomes across conditions, which occur at different stages of development, both pre- and post-natal. This symposium attempts to do this by presenting a series of papers, each describing outcomes from brain disorders occurring at different stages of child development, including pre-natal, perinatal, early childhood and later childhood. Presentations will focus on a range of outcome domains including brain structure, neurocognitive functions and psychiatric status.

Correspondence: *Ficki A. Anderson, PhD, Psychology, Royal Children's Hospital, Royal Children's Hospital, Flemington Road, Parkville, VIC 3052, Australia. E-mail: vaa@unimelb.edu.au*

Paper Session 2

11:00 a.m.–12:30 p.m.

Psychopathology and the Brain

J.M. GOLD, R.L. FULLER, B. ROBINSON, R. MCMAHON, E. BRAUN & S.J. LUCK. Intact attentional control of working memory encoding in schizophrenia.

Aims: Multiple lines of evidence suggest that patients with schizophrenia demonstrate impairments in the encoding of information for working memory storage. This series of experiments was designed to assess the role of selective attention in guiding the encoding of relevant information into WM.

Methods: A series of 5 experiments using visual change detection paradigms were performed by a total recruited sample of 62 patients with schizophrenia and 55 healthy controls. A variety of cues were studied to guide selection including perceptually salient perceptual cues, symbolic cues, and verbal instructions to select items of a specific color or shape. In addition, subjects were presented with super-capacity arrays and had to spontaneously select a subset of items.

Results: In all experiments, patients demonstrated intact selective attention as evidenced by the ability to effectively store relevant items and avoid encoding irrelevant items. Patients also demonstrated the ability to selectively encode only a subset of sample array items when presented with arrays that far exceeded actual capacity.

Conclusions: These findings strongly suggest that it is not possible to account for reduced working memory capacity in schizophrenia on the basis of an impairment in selective attention. These findings provide important constraints on models of attentional impairment in schizophrenia and suggest that some prefrontal functions may be relatively preserved in schizophrenia.

Correspondence: *Raymond C. Chan, Ph.D., Psychology, Sun Yat-Sen University, NA, Guangzhou 510275, China. E-mail: rckchan2003@yahoo.com.hk*

K.L. MEDINA, B.J. NAGEL, T. MCQUEENY, A.D. SCHWEINSBURG, M. COHEN-ZION & S.F. TAPERT. White Matter & Depressive Symptoms in Adolescent Marijuana Users.

Objective: Depressed adolescents have shown decreased white matter volumes. Reduced hippocampal volumes have been found among depressed adults. However, due to the potential disruption of neuro-maturation caused by substance use, the relationship between brain structure and depression cannot necessarily generalize to adolescent marijuana users who are also at increased risk for depression. The goal of this study was to examine the relationship between brain structure (global white and gray matter and hippocampus) and depressive symptoms among adolescent marijuana users and controls.

Participants and Methods : Data were collected from marijuana users (n=16) and controls (n=16) aged 16-18. Extensive exclusionary criteria included premorbid psychiatric or neurologic disorders. Substance use, mood (HAM-D and BDI-II), and structural MRI were collected after 28 days of monitored abstinence.

Results : Marijuana users demonstrated more depressive symptoms than controls on the HAM-D ($p < .05$). Multiple regressions (controlling for alcohol use and ethnicity) revealed that marijuana use ($b = .75, p < .008$) and smaller white matter volume ($b = -.58, p < .001$) predicted higher levels of depressive symptoms on the HAM-D. An interaction between marijuana use and white matter volume was observed when predicting BDI-II scores: among MJ users, but not controls, white matter volume ($b = -.70, p < .04$) was negatively associated with depressive symptoms.

Conclusions : Results indicate that marijuana use and white matter volume were additive and interactive in predicting depressive symptoms among adolescents. Subtle neurodevelopmental white matter abnormalities may disrupt the connections between areas involved in mood regulation. Further, it is possible that disruption of white matter proliferation during adolescence may increase risk for depressive disorders.

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*

J.H. KALMAR, F. WANG, M.M. JONES, K. COLONESE, O.M. ADERIBIGBE, N.D. WEDER & H.P. BLUMBERG. Emotional Regulation and Cingulum Integrity in Bipolar Disorder.

Objective: Evidence implicates abnormalities in regulation of emotional responses, and in the white matter connectivity of the cortico-limbic neural system that subserves emotional regulation, in bipolar disorder

(BD). The cingulum is a white matter tract that provides major connections within cortico-limbic circuitry, e.g., between frontal and mesiotemporal structures implicated in BD. We investigated associations between behavioral measures of emotional regulation and measures of structural integrity of the cingulum via diffusion tensor imaging (DTI).

Participants and Methods : Participants were 28 individuals with DSM-IV BD and 22 healthy comparison subjects matched for age. The emotional face paradigm administered during scanning consisted of presentation of Ekman faces depicting happy, fearful or neutral expressions and required a male/female button press response. Means and standard deviations for reaction time were obtained and compared across groups. DTI was performed following task completion and fractional anisotropy values (FA, a measure of the organization of fibers within a white matter fiber tract) were calculated for the anterior cingulum.

Results : The BD group was significantly slower in responding to all emotional faces ($t = 3.577, p = .001$) and displayed more variability in responding to emotional stimuli ($t = 2.024, p < .05$) relative to healthy controls. FA values in the left anterior cingulum were significantly associated with reaction time during emotional processing ($r = -.31, p < .05$), such that a higher degree of structural integrity was related to faster processing time.

Conclusions : These data provide preliminary evidence to suggest that structural abnormalities in the cingulum contribute to abnormalities in emotional responding in BD.

Correspondence: *Jessica H. Kalmar, Ph.D., Psychiatry, Yale University School of Medicine, 85 Stevenson Road, New Haven, CT 06515. E-mail: jessica.kalmar@yale.edu*

T.J. STORY, C.G. POTTER, D.K. ATTIX, K.A. WELSH-BOHMER & D.C. STEFFENS. Neurocognitive Correlates of Depression Improvement and Remission in Late-Life Depression.

Objective: Late-life depression (LLD) is associated with neurocognitive impairment in older adults, particularly with respect to information processing speed, memory, and executive functioning. Although some patients may demonstrate improvement in neurocognitive functioning following the remission of depressive symptomatology, recent research suggests that impairment often persists.

Participants and Methods : The current sample was composed of 110 female and 67 male older participants ($M = 69, SD = 6.9$) enrolled into the Clinical Mental Health Research Center at Duke University for treatment of depression. At baseline, participants completed a structured diagnostic assessment for depression, and completed neuropsychological testing at baseline and one-year follow-up. The Montgomery-Asberg Depression Rating Scale (MADRS) was used to stage depressive symptomatology.

Results : Separate ANOVAs indicated that individuals who were most depressed at baseline were also most likely to demonstrate a clinically significant decrease in depressive symptomatology at Year 1. Individuals who achieved remission of depression at Year 1 demonstrated better prose recall at baseline than individuals who remained depressed. When the sample was categorized by age of initial depression onset, individuals with initial depression occurring after age 55 demonstrated more persistent deficits in verbal recall, controlling for baseline MADRS, Year 1 MADRS, and the interval change in MADRS scores.

Conclusions : The current findings suggest that verbal memory may predict treatment responsiveness, but that individuals with late-onset depression may have more persistent memory impairments despite improvement in depression.

Correspondence: *Tyler J. Story, Ph.D., Neurology and Psychiatry, Duke University, Morreene Road Clinic, Box 3333, Durham, NC 27710. E-mail: tyler.story@duke.edu*

Poster Session 4/12:30–2:00 p.m.

Behavioral Neurology

L.D. BERKELHAMMER, A.L. WILLIAMSON, C.L. DIRKSEN, A.S. MARGULIES, W.C. WANG, C. LI, K.J. HELTON & R.B. KHAN. Soft Signs, Neuropsychological Deficits, and Neuroimaging Abnormalities in Children with Sickle Cell Disease.

Objective: Neurological soft signs are associated with atypical neurodevelopment and are evident in several neurological and psychiatric illnesses. In children with sickle cell disease (SCD), soft signs may be a biological marker of risk for silent infarct, a known predictor of overt stroke. Few studies have examined soft signs in this population. Our study is the first to explore soft signs, neuropsychological deficits, and neuroimaging abnormalities in children with SCD.

Participants and Methods : We retrospectively analyzed measures of intelligence, achievement, and psychosocial abilities and compared these results to MRA and MRI findings in 31 children with SCD. Patients were consecutive referrals, over a 3-year period, with the presence of at least one soft sign and absence of overt stroke. Median age was 9.3 years.

Results : Median IQ was significantly below published norms of children with SCD (FSIQ=78, VIQ=79, PIQ=81). Soft sign severity (SSS) was significantly correlated with decreased PIQ ($\rho=-0.50$, $p<0.04$) and total problems on the Achenbach Child Behavior Checklist ($\rho=-0.38$, $p<0.04$). A higher number of soft signs (SSN) was associated with lower PIQ ($\rho=-0.54$, $p<0.02$). VIQ and math and reading achievement on the Wechsler scales were related to vasculopathy on MRA ($p<0.04$). SSS and SSN were associated with leukoencephalopathy on MRI ($p<0.01$).

Conclusions : Soft signs were associated with decreased PIQ, fewer psychosocial problems, and leukoencephalopathy on MRI. VIQ and achievement were correlated with vasculopathy on MRA. Suboptimal perfusion may partially explain neuropsychological results. Soft signs may reflect areas of neurocognitive compromise in children with SCD. Prospective studies are warranted.

Correspondence: *Leslie D. Berkelhammer, Ph.D., Division of Behavioral Medicine, St. Jude Children's Research Hospital, 332 N. Lauderdale St., MS 740, Memphis, TN 38105-2794. E-mail: leslie.berkelhammer@stjude.org*

Child - Assessment

B.C. FISHER, G. AVCI-WOLF & B. COUVADELLI. Use of lamotrigine in Autism Spectrum Disorder (ASD) B.C. Fisher, G. Avci-Wolf, & B. Couvadelli.

Objective: Introduction: The symptoms and characteristics of ASD are multifactorial and vary with many phenotypes and subgroups. No approved treatment is currently available.

Participants and Methods : Methodology: This was a retrospective chart review of all patients on LAMICTAL (lamotrigine, LTG) at our clinic with ASD. Outcomes collected included physician assessed with parent report indices of behavior, LTG blood levels, and neurometric memory testing by neuropsychologist.

Results : Results: Charts from 22 patients (aged 4-17 years, exposure 1-5 years) were reviewed. Three children did not have complete information. For the remaining 19 patients, physician documented improvement in the outcomes as 79% improved sleep, 95% increased attention, 95% decreased moodiness, 95% family functioning improved, 95% increased

learning, 79% improved morning waking, and 100% socially better. LTG levels in 13 children with clinical improvement ranged 7.4 to 14.9 mcg/mL. Improvement seen in neurometric testing pre and post (NEPSY, WRAML, CVLT-C) in 64% of patients. Side effect of exacerbated tremor was seen in four children (21%), however no patients reported rash.

Conclusions : Discussion: In this retrospective chart review, improvement was seen with LTG treatment on commonly reported symptoms of increased quality of life. Neurometric testing improvement seen in majority, however the statistical analysis not possible due to retrospective design. Clinical relevance of LTG levels could not be established. There is a need for rigorous controlled prospective study with consistent neurometric evaluations and predefined LTG levels. Rational medical treatment options desperately needed for ASD.

Correspondence: *Barbara C. Fisher, Ph.D., United Psychological, 59100 Mound Road, Washington Township, MI 48094. E-mail: drbcfisher@hotmail.com*

Child - Developmental Disorders

J.S. BLOOM, C.J. MILLER, S.R. MILLER, M.A. GARCIA & G.W. HYND. Planum Temporale and Planum Parietale Morphology in Children with Developmental Dyslexia.

Objective: The planum temporale (PT) is a highly lateralized cortical region located within Wernicke's area which is thought to be involved in auditory processing, phonological processing, and language. The PT normally shows a leftward asymmetry, but prior research has shown abnormal asymmetry of the PT and its parietal extension, the planum parietale (PP), in individuals with developmental dyslexia. The purpose of this study is to further investigate the relationship between PT and PP morphology, reading ability, and dyslexia diagnosis in children.

Participants and Methods : Participants were children referred to an NIH research grant designed to investigate variation in brain morphology and its relationship to neurolinguistic ability in developmental dyslexia. Children participated in a comprehensive neuropsychological assessment and structural MRI scan. Subjects for this study included 29 children who met criteria for dyslexia and 26 children who did not. Statistical methods included regression, correlations, and analysis of covariance.

Results : Normal leftward asymmetry of the PT was found in the total sample. This leftward asymmetry, however, was significantly reduced in children with dyslexia due to a PT that is significantly larger in the right hemisphere. In this sample, leftward PT asymmetry was significantly correlated with right-handedness, but not with verbal intelligence or phonological processing. Furthermore, PT asymmetry did not predict reading achievement. Significant results were not found with regard to PP asymmetry.

Conclusions : This study demonstrates that there is a relationship between PT asymmetry and dyslexia diagnosis that exists even when controlling for handedness, verbal intelligence, and total brain size. The link between PT asymmetry and dyslexia diagnosis may be related to global language skills rather than phonological processing or rapid naming. Further research is needed on PP morphology in developmental dyslexia.

Correspondence: *Juliana S. Bloom, M.Ed., Department of Psychology, Children's Hospital of Philadelphia, 34th Street and Civic Center Boulevard, Philadelphia, PA 19104. E-mail: juliana_sanchez@hotmail.com*

S.K. SMITH, S.E. CAUDLE & K.R. KRULL. Investigation of Visual Skills in Preschool-Aged Children Diagnosed with Severe to Profound Sensorineural Hearing Loss.

Objective: With considerable literature documenting the impact of hearing impairment on children's spoken language skills, of less focus has

been the effect on visual abilities, an important area of functioning given reliance on such skills for communication. Prior investigations have suggested typical development in visual perception but not memory (e.g., Wilson, et al., 1975). As the majority of research has been with school-aged children, the present study focused on development in preschool-aged children.

Participants and Methods : Preschool-aged children diagnosed with severe to profound sensorineural hearing loss underwent neuropsychological testing as part of a screening process for cochlear implantation. Children from the clinical group (N=15) did not include those with overt neurological disorders. These children were age-matched to a normal-hearing group evaluated for non-clinical reasons (N=63).

Results : As indicated by a one-way ANOVA, deaf children were found to have significantly lower visual reception (VR) skills (Mullen; $p < .012$). Pearson correlations revealed reduced VR with age among the clinical group, a replication of Kutz, et. al (2003). Fine motor skills also significantly declined with age. Visual memory skills (Stanford-Binet Bead Memory), however, were average across ages. On the Leiter-R, the clinical group demonstrated average overall visual reasoning skills, but reduced performance with age on the Figure Ground subtest.

Conclusions : Results indicate reduced VR skills even among young, deaf children; however, visual memory appears age appropriate. In the future, item analyses of the VR scale will be conducted to delineate the nature of items with which deaf children struggle. Implications for timing of cochlear implantation will be discussed.

Correspondence: *Suzanne K. Smith, PhD, Learning Support Center, Texas Children's Hospital, 6621 Fannin Street, CC1630.00, Houston, TX 77030. E-mail: sksmith1@texaschildrenshospital.org*

P. KUSHALNAGAR, K.R. KRULL & H. HANNAY. Effects of Intelligence and Parental Depression on Behavior Adaptability in Pre-Cochlear Implant Candidates.

Objective: Deaf children who have limited access to early communication with their hearing parents often demonstrate greater externalizing behavior problems and less adaptability than their hearing peers. It is unclear whether these behavior difficulties are related to reduction in early cognitive stimulation or to poor parental adjustment. The present study investigates the relationship between these child and family characteristics and the overall behavioral adaptability of deaf children.

Participants and Methods : Parents of 46 pre-cochlear implant participants seen for neuropsychological assessment were administered the Parental Stress Index to provide information about levels of parent distress. Parents also completed the Vineland Behavior Adaptive Scales to assess their child's everyday functioning. Pre-cochlear implant participants' cognitive functioning was assessed via the Mullen Scales of Early Learning or the Leiter International Performance Scale-Revised, depending on the child's age at time of testing.

Results : Regardless of age or neurological status, adaptive behavior consistently showed a strong relationship with intelligence ($r=.47$ to $.68$; $p < .05$ to $.0001$). For children who were 35 months or younger, adaptive behavior was predicted by intelligence, parental depression, and age of enrollment in an early intervention program ($F=20.81$; $p < .0001$). For older participants, intelligence was the only predictor for adaptive behavior ($r=.47$; $p < .05$). Parental depression was not found to be associated with adaptive behavior in this older group. The relationship between parental depression and child communication was moderated by intelligence for children without neurological complications.

Conclusions : The data support roles of intelligence and parental depression in predicting adaptive behavior during the early years in pre-cochlear implant candidates who are deaf. The findings also emphasize the importance of promoting cognitive and language development in deaf children through early intervention services.

Correspondence: *Poorna Kushalnagar, MA, Psychology, University of Houston, 9809 Summer Breeze Dr, Pearland, TX 77584. E-mail: neuropsychdeaf@gmail.com*

A.P. KEY, E. DYKENS, S.M. WILLIAMS, S. MATHIESEN, E. ROOF & K. SCHWENK. Atypical Auditory Attention In Young Adults With Williams Syndrome.

Objective: Williams syndrome (WS) is a genetic disorder characterized by increased anxiety and sensitivity to sounds. Previous ERP findings suggested abnormal auditory processing in WS. The current study examined differences in brain activity associated with auditory attention in persons with WS as measured by event-related potentials (ERPs).

Participants and Methods : Auditory ERPs were recorded from 10 adults with WS ($M=20.27$ \pm 4.09 years) and a group of age and sex matched controls, using 128-electrode nets. Stimuli included a piano chord C played in 3 octaves (low, middle, high pitch) presented in a 3-stimulus oddball paradigm (20 target, 80 standard, 20 distracter stimuli).

Results : PCA-ANOVA analysis noted that all participants differentiated the three stimulus types. However, the WS group showed an unusual ERP topography in 300-500ms range. Compared to the frequent sounds, target stimuli elicited more positive amplitudes over right parietal sites but instead of the frontal P3, distracter and target stimuli elicited frontal negativity. Target vs. distracter sounds were differentiated over left temporal locations with greater positivity for the latter. Amplitudes for distracter and standard stimuli correlated with anxiety (Beck). Higher anxiety co-occurred with greater positivity in 300 ms range for standard tones ($r=.72$) and in 500 ms range for distracter sounds ($r=.56$).

Conclusions : Reported high auditory sensitivity in WS may be due to difficulties in disengaging attention from the sounds. Rare target and distracter stimuli were processed in equally great detail despite of instructions to ignore the latter. The degree of processing increased with higher anxiety levels suggesting a strong connection between attention and emotions in WS.

Correspondence: *Alexandra P. Key, PhD, Vanderbilt University, Peabody Box 74, 230 Appleton Place, Nashville, TN 37203. E-mail: sasha.key@vanderbilt.edu*

Y. POLLAK, M. FRIEDLER & A. DEUTSCH. Deficient Prospective Time Estimation in Adult ADHD: Lack of Effect for Attention to Non-Temporal Stimuli and Working Memory.

Objective: Attention deficit and hyperactivity disorder (ADHD) is one of the most prevalent behavioral disorders in children and adults. ADHD is associated with deficient time estimation and temporal organization. Several hypotheses have been raised to explain this deficit such as delay aversion, deficit in working memory and vulnerability to non-temporal distractions. To examine the role of working memory and distractibility in mediating the link between ADHD and deficient time estimation we used a prospective time estimation paradigm in which load of non-temporal distraction and working memory has been manipulated.

Participants and Methods : Adult students, with or without ADHD, had to verbally estimate either short (~5 sec) or long (~12 sec) durations of exposure to visual stimuli. Verbal estimations were used to rule out a delay aversion effect on reproduction. Stimuli were consisted of either static figures (low non-temporal distraction) or cartoons (high non-temporal distraction). In half of the trials a working memory task was conducted in parallel with the time estimation task.

Results : ADHD was associated with shorter time estimation along all conditions. No interactions between group and either non-temporal distraction or working memory task were found.

Conclusions : The results suggest that time estimation deficits in adult ADHD are not due to differences in working memory capacity or in attention to non-temporal stimuli, but are reflective of deficient basic time processing.

Correspondence: *Yehuda Pollak, Ph.D., Psychology, The Hebrew University of Jerusalem, Mount Scopus, Jerusalem 91950, Israel. E-mail: msyehu@huji.ac.il*

J.J. LI & R. GRAY. Gender Differences in Childhood Disruptive Behavior Disorders.

Objective: This study examined aggressive behavior and neuropsychological functioning in boys versus girls diagnosed with conduct disorder (CD) and oppositional defiant disorder (ODD).

Participants and Methods : The study sample included 30 male and 30 female children aged 5-16 years old ($M = 9.9$), referred for evaluation due to behavioral, emotional, or learning concerns. All of the children met DSM IV-TR diagnostic criteria for CD or ODD. The subjects were divided into groups of males versus females with CD ($N = 26$) and ODD ($N = 28$), and matched for age and comorbid diagnosis. In addition to IQ data (WISC-III), ratings of aggression (overt/reactive and covert/proactive) and developmental history were obtained.

Results : Analysis of variance revealed no significant gender based differences in the quality or severity of aggression. However, females with CD were more likely to demonstrate a history of maltreatment ($p < .05$), and significantly worse IQ scores than males with CD ($p < .05$) [Males VIQ 87.7, PIQ 91.0; Females VIQ 75.0, PIQ 78.6].

Conclusions : Results support previous findings noting similar levels of overt and covert aggression amongst males and females diagnosed with CD or ODD, but the developmental pathways to aggression may differ by gender. Findings of significantly worse IQ functioning and more frequent histories of maltreatment are suggestive of gender-based differences in CD rather than ODD, characterized by potentially distinct etiological/historical experiences and cognitive manifestations. Early intervention for maltreated children may be particularly important for females, as early trauma may interfere with both social/emotional and neuropsychological development.

Correspondence: *Robert Gray, PhD, Neuropsychology, Shapiro & Associates, 26440 La Alameda, Suite 350, Mission Viejo, CA 92691. E-mail: RobGray3@gmail.com*

K. PRICE, K.A. KERNS, D. EDGELL, N. VIRJI-BABUL & C.A. MA-TEER. Irregular Movement Timing in Asperger Syndrome.

Objective: Although motor deficits are presumed to be common in Asperger Syndrome (AS), the causes and characteristics of these deficits are unknown. This study addressed whether timing deficits could account for clumsiness.

Participants and Methods : There were 14 AS participants (7 to 23 years old), and an age and gender matched group of 16 normal controls with no group IQ differences. Participants completed a perceptual discrimination task involving rhythmic beats. They also completed a paced rhythmic tapping task in which they tapped a computer key at the same rate as a 400 ms interstimulus interval pacing tone. The pacing tone then ceased, and they were to maintain the same rate independently for 30 intervals.

Results : There were no group differences in the perception of rhythms or in reaction time in responding to the perceptual task. In the tapping task, the overall mean inter-response intervals were not different between the groups, but there was more variability in the length of the intervals in the AS group, suggesting more erratic responses.

Conclusions : Variability in the timing task suggests that timing problems do not relate to a central timing mechanism, in that both groups perceived rhythms equally well and produced mean inter-response intervals of similar lengths. Instead, the variability likely implicates movement execution. Although the Wing-Kristofferson (1975) model separates the variance due to a central clock from motor execution times, both groups failed to fulfill the model's assumptions. Notably, the variability in responses correlated with a clinical measure of clumsiness. Further implications of this work will be discussed.

Correspondence: *Kelly Price, M.Sc., Psychology; University of Victoria, Department of Psychology, PO Box 3050 STN CSC, Victoria, BC V8W 3P5, Canada. E-mail: kprice@uwic.ca*

R. LAJINESS-O'NEILL, C. WELLS & L. HEARSHEN. Differentiating Autism and Developmental Language Delay with the Preschool Language Scale-3.

Objective: The ability to distinguish Autism and Developmental Language Delayed (DLD) children based on the Preschool Language Scale-3 (PLS-3; Zimmerman et al., 1992) Task Analysis has not been previously explored. Hypotheses included: 1) DLD will perform more poorly than children with Autism on the Expressive Communication domain of the PLS-3; 2) Autism will perform more poorly on Total Language and 3) Integrative Thinking Skills.

Participants and Methods : Subjects included children with Autism ($N=19$, 13 males; Mean Age=46 months) or DLD ($N=22$, 16 males; Mean Age=51). Mean IQ for Autism subjects was 61 (S.D.=19.7) and 71 (S.D.=17.7) for DLD subjects. Groups did not differ significantly on age ($F=.87$; $p=.35$), gender ($X^2=.76$), or IQ ($F=2.61$; $p=.12$). Subjects underwent a comprehensive neuropsychological battery. Diagnosis was based on clinical criteria (DSM-IV-TR, 2000) and the Childhood Autism Rating Scale (Schopler, Reichler, Renner, 1988). Group differences on the PLS-3 domains and Task Analysis composites (e.g., Semantics, Structure, etc.) were examined with t-tests and chi-squares.

Results : There were no significant group differences on Total Language ($F=3.22$; $p=.08$) or Auditory Comprehension ($F=3.33$; $p=.08$). Children with Autism performed significantly below the DLD group on Expressive Communication ($F=4.37$; $p=.04$). Task Analysis results revealed trends on Attention ($X^2 = 10.3$; $p=.07$) and Semantic (Expressive Communication; $X^2 = 13.10$; $p=.07$) composites with Autism performing below DLD. Children with Autism also performed significantly poorer on Morphology (Auditory Comprehension; $X^2 = 10.87$; $p=.03$).

Conclusions : In contrast to the recognized deficits in pronoun usage for children with Autism, present data reveal language impairments are partially characterized by difficulties *comprehending* morphology (i.e., pronouns). Executive communication deficits (Integrative Thinking) were not more evident in Autism. Difficulty distinguishing Autism and DLD by quality of communication impairment is underscored.

Correspondence: *Renee Lajiness-O'Neill, Ph.D., Psychology; Eastern Michigan University; 537 Mark Jefferson, Ypsilanti, MI 48197. E-mail: reneoneill04@comcast.net*

M. SHANAHAN, H.B. BARNARD, E.G. WILLCUTT & B.F. PENNINGTON. Is Pure ADD Neuropsychologically Distinct from ADHD Combined Type?

Objective: It has been suggested that pure ADD (ADHD without hyperactivity) is neuropsychologically distinct from ADHD (with hyperactivity). Diamond (in press) proposed a cognitive double dissociation across these two subtypes: working memory but not inhibition deficits in the pure ADD group and an opposite pattern in the ADHD-Combined Type group (CT) (which included children with subthreshold CT and traditionally-defined CT). The current study tested this hypothesis in a community sample of children with ADHD.

Participants and Methods : Participants included 45 children with pure ADD, 67 children with CT, and 137 controls. Composites were created for Inhibition, Working Memory (WM), and Processing Speed (PS).

Results : Repeated measures ANOVAs revealed a main effect of group, with the clinical groups performing worse than controls on all domains ($F(2, 246)=46.7$, $p<.001$). The group by cognitive domain interaction was a trend ($F(2, 246)=2.98$, $p=.052$), driven by the fact that the pure ADD and CT groups are similarly impaired on Inhibition, while the pure ADD group is better on WM and PS. Results did not change when covarying Full Scale IQ.

Conclusions : These results do not support the hypothesis that children with pure ADD have the opposite cognitive profile as children with CT. Contrary to Diamond's theory, the pure ADD group was similarly im-

paired to the CT group on Inhibition and slightly better at WM. In addition, they were slightly better at PS. These results support the hypothesis that Inattention and Hyperactivity/Impulsivity are related symptom domains, that neuropsychological deficits are driven by Inattention, and that pure ADD is not a cognitively distinct disorder.

Correspondence: *Michelle A. Shanahan, M.A., Psychology, University of Denver, 2155 S. Race Street, Denver, CO 80205. E-mail: mshanah2@du.edu*

J. BAPP NEWMAN, S. RAZ, A. GUSTAFSON-DEBASTOS, A. SCHOMAKER, S. MEACHEN & D. BATTON. Differences in Neuropsychological Development Between Preterm-Birth Twins and Singletons.

Objective: This study examined the unique contribution of twin gestation in preterm-birth preschoolers to the variance in neuropsychological development.

Participants and Methods: We recruited 29 sets of preterm-birth twins and 29 control singletons hospitalized at birth at William Beaumont Hospital Neonatal Intensive Care Unit between 1996 and 2000. The heavier co-twin at birth was matched on gestational age, birth weight, and sex to a singleton born within the same four-year period. The twin and singleton groups did not differ on sociodemographic, ante- peri- or neonatal variables with the single exception of ruptured membranes hours (used as a covariate in statistical analyses). The children were tested between the ages of 3 to 6 years on a neuropsychological battery including tests of cognitive (Wechsler Preschool and Primary Scale of Intelligence - Revised), language (Preschool Language - Third Edition) memory (Woodcock-Johnson - Third Edition and NEPSY), attention (NEPSY) and motor skills (Peabody Developmental Motor Scales - Second Edition).

Results: Statistical analyses (MANCOVA procedures) revealed that the heavier co-twins scored significantly below their singleton counterparts on measures of expressive ($F [1, 55] = 7.33, p < .01$) and receptive ($F [1, 55] = 8.27, p < .01$) language, as well as on Performance IQ ($F [1, 55] = 4.87, p = .03$). No group differences were noted in Verbal IQ, memory, attention and motor skills.

Conclusions: The results suggest that there are specific domains of relative neuropsychological deficit observed in the preschool age for premature twins in comparison to singletons well matched for prematurity and associated complications.

Correspondence: *Sarah Raz, Ph.D., Merrill Palmer Institute, Wayne State University, Merrill Palmer Institute, 71 E. Ferry St., Detroit, MI 48202. E-mail: sarahraz@wayne.edu*

R.J. MCINERNEY & K.A. KERNS. Transfer of Learning in Children with Fetal Alcohol Spectrum Disorder (FASD).

Objective: Fetal alcohol spectrum disorder (FASD) is a permanent developmental condition that can occur when women consume alcohol while pregnant. Despite substantial variability in FASD on the whole, families frequently express concern that their children have difficulty learning from experience and make the same mistakes over and over. Consistent with research in cognitive and educational psychology, we conceptualized these difficulties as impairments in "transfer of learning," and attempted to investigate this ability using two experimental transfer measures.

Participants and Methods: A sample of 17 children diagnosed with FASD and 17 age- and gender-matched controls participated in the study. Children completed two transfer tasks, a novel, experimental modification of the Tower of Hanoi task involving nested plastic cups and Tupperware containers (versus disks), and a variation of Chen's (1996) Bead Retrieval Task. Additionally, participants completed measures of

concept formation (Picture Concepts) and cognitive flexibility (D-KEFS Color-Word Interference Test), as research suggests that transfer of learning depends in part on these abilities. Parents also completed a questionnaire designed to assess children's transfer of learning in everyday situations.

Results: Children with FASD demonstrated significantly poorer transfer on the modified Tower of Hanoi, but did not differ on the Bead Retrieval Task. This group difference persisted even after controlling for intelligence and for abilities in concept formation and cognitive flexibility. Further, in children with FASD, parent reports of transfer ability correlated highly with transfer of learning as assessed by the modified Tower of Hanoi.

Conclusions: Current findings and their implications will be presented and discussed.

Correspondence: *Robert J. McInerney, M.Sc., Department of Psychology, University of Victoria, PO Box 3050, STN CSC, Victoria, BC V8W 3P5, Canada. E-mail: robertm@uwic.ca*

N.C. WALZ, A. BEIDATSCH, M.D. RIS & R. AMMERMAN. Discourse Abilities in Adolescents with Myleomeningocele and/or Nonverbal Learning Disabilities.

Objective: Children with myleomeningocele (MM) are at risk for deficits in narrative discourse and nonverbal learning disabilities (NLD). However, research has not directly examined the role of NLD in the neuropsychological and social functioning of children with MM. The primary goal of this study was to compare the discourse skills of adolescents with MM, with and without NLD, to adolescents without MM, with and without NLD. The second goal of the study was to determine the relationship between discourse skills and social competence.

Participants and Methods: Thirty-nine adolescents with MM, aged 10-17, were compared to an aged-matched group of 82 adolescents without MM. Twenty-four adolescents with MM had NLD and 26 adolescents without MM had NLD. Groups were compared on multiple indices of narrative discourse while controlling for age and overall cognitive ability (FSIQ).

Results: There was a main effect for MM. Individuals with MM used less language and gleaned less important and implicit information from the story. There was also a main effect for NLD status. Individuals with NLD transformed less information, answered fewer implicit questions correctly, and produced stories with poorer coherence and depth of processing compared to individuals without NLD. Finally, there was a significant interaction between NLD and MM status. Individuals with NLD and MM produced less language and gleaned less important information than individuals with NLD but without MM. As predicted, many of the discourse indices were significantly correlated with maternal ratings of social and behavioral competence.

Conclusions: Findings revealed discourse deficits in individuals with MM or NLD. Moreover, adolescents with both MM and NLD were at increased risk for certain deficits. Discourse skills were linked to social competence. Implications for intervention will be discussed.

Correspondence: *Nicolay C. Walz, Ph.D., Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave., MLC 3015, Cincinnati, OH 45229-3039. E-mail: nicolay.walz@cchmc.org*

K.A. KERNS & S. SIKLOS. Differences Between Children with Fetal Alcohol Spectrum Disorder (FASD) and Attention Deficit/Hyperactivity Disorder (ADHD) on the Behavior Rating Inventory for Executive Function (BRIEF).

Objective: FASD results in various behavioral sequelae in children, including hyperactivity, impulsivity, inattention, and social difficulties. As a result, many children with FASD are misdiagnosed with ADHD. There is a need to better describe the behavioral symptoms of FASD and how

they differ from ADHD. Several studies have used parent questionnaires to describe the behavioral difficulties in children with FASD, but few have compared children with FASD to children with ADHD. The current study aimed to elucidate differences between these diagnoses on a parent report measure of executive function (EF), the BRIEF.

Participants and Methods : Responses to the BRIEF were analyzed from two samples of children: 16 children diagnosed with FASD and 16 children diagnosed with ADHD. The samples were matched by age.

Results : The ADHD and FASD groups did not significantly differ on any of the 3 indices on the BRIEF. Of the 8 scales, the groups significantly differed on the Organization of Materials scale ($p < .01$), with the ADHD group showing more difficulties. The groups showed significant differences on 22 items of the BRIEF, with the majority of differences from the Working Memory, Plan/Organize, and Organization of Materials scales. The ADHD group showed more significant EF dysfunction on all of these items except one.

Conclusions : Analyses suggest that children with ADHD may have more difficulty organizing their materials, or children with ADHD may have more significant executive dysfunction on the type of EF's assessed by the BRIEF in comparison to children with FASD. The specific differences on the BRIEF will be further discussed.

Correspondence: Susan Siklos, Psychology, University of Victoria, 4625 Capilano Rd., North Vancouver, BC V7R 4K2, Canada. E-mail: ssiklos@uvic.ca

N.S. KOUSHIK, C.D. SAUNDERS & J.E. CASEY. Subtypes of Children with Intellectual Disabilities: External Validation Using the Vineland Adaptive Behaviour Scales.

Objective: The aim of the present investigation was to externally validate a typology of intellectual functioning on the Wechsler Intelligence Scale for Children- Third Edition (WISC-III) using the Vineland Adaptive Behaviour Scales (VABS).

Participants and Methods : The sample consisted of 86 children between 7 and 12 years of age who had been referred to a regional children's mental health center due to concerns regarding a variety of learning and psychosocial problems. All children had Full Scale IQ scores of 75 or lower on the WISC-III.

Results : A one-way univariate analysis of covariance (ANCOVA), controlling for the effects of FSIQ revealed a statistically significant difference between the subtypes of intellectual functioning on the VABS composite score.

Conclusions : These results provide support for the validity of the typology using a measure external to the initial subtyping process.

Correspondence: Nikhil S. Koushik, M.A., Psychology, University of Windsor, 2645 Bridgeway Blvd., Lasalle, ON N9H 2L2, Canada. E-mail: koushik@uwindsor.ca

E.L. WODKA, L.P. BARAKAT, R.A. TARAZI, M. GRANT & B. ELY. A Prospective Examination of Neuropsychological Functioning in Preschool-Age Children with Sickle Cell Disease and its Association with Psychosocial Factors.

Objective: To prospectively examine neuropsychological functioning in preschool-age children with sickle cell disease (SCD), current neuropsychological functioning and change in functioning over one year was assessed; psychosocial factors (baseline) were used to predict current neuropsychological functioning.

Participants and Methods : Children with SCD completed a neuropsychological battery at baseline and one year later ($N = 18$; Mage = 67.5 months, range = 54 - 85 months). Computed domains included: Language, Visuospatial, Memory/Attention, Reasoning, and Motor. Illness-related risk factors were assessed through research/medical chart review. Psychosocial risk factors were assessed through parent report measures.

Results : Children performed significantly below the normative mean on all measured areas. No significant changes were noted between (standard score) performance at baseline compared to present; greatest non-significant decline in performance was noted in the Reasoning Domain (4.6 point decline over year). Maternal income/education (baseline) was the strongest predictor of present functioning; disease severity was the sole predictor of the Memory/Attention domain. The Emergent Metacognition Composite (Working Memory and Plan/Organize indexes) from the BRIEF-P was identified by parents as significantly elevated.

Conclusions : Findings add to the limited literature on neuropsychological functioning in preschool-age children with SCD and indicate performance significantly below the normative sample, primarily associated with maternal/socioeconomic factors. Although children were progressing slower than the normative sample, they were making gains. Therefore, early intervention may help young children with SCD develop at an age-appropriate pace. Furthermore, results show that memory/attention and reasoning skills in children with SCD may be an area that could be screened to identify those children at greatest academic/developmental risk.

Correspondence: Ericka L. Wodka, M.S., Psychology, Drexel University, 517 S. Hanover St., Baltimore, MD 21230. E-mail: ela24@drexel.edu

M. SEMRUD-CLIKEMAN, S. PLIZSKA & K. HIGGINS. Behavioral Functioning Differences in Children with ADHD with and without Stimulant Treatment.

Objective: Children with ADHD with a history of treatment with stimulants have been hypothesized to show improved functioning on measures of behavioral functioning. There are few studies that have evaluated children with a history of stimulant treatment on the same measures as administered to children without a treatment history.

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 have had no previous medication treatment (TN), and typically developing controls. No child diagnosed with ADHD had any comorbid diagnosis. All were right-handed and English speaking. Each child's parent completed the BASC. Scores on this measure was compared across groups using Repeated Measures ANOVA.

Results : Significant differences were found among the groups on measures of hyperactivity and attention. Both ADHD groups differed significantly from the control group on these measures with the ADHD treated group's scored significantly stronger than the ADHD:TN. Similar findings were present on the aggression scales and on the conduct problems scales. In both cases the ADHD:TN scored significantly poorer than the other two groups. Internalizing symptoms were also significantly elevated for both ADHD groups with the ADHD:TN group scoring the poorest on measures of anxiety, somatization, atypical behavior, withdrawal, and depression.

Conclusions : While both ADHD groups showed elevated internalizing behaviors, the ADHD:TN group showed the most significant difficulties in all areas. The emotional distress for the ADHD:TN group was more pronounced with the ADHD treated group means generally in the average range and the TN group in the clinical range (> 70). Thus, the ADHD:TN group shows more externalizing behaviors as would be expected but the depth of the emotional distress noted by the child's parent is symptomatic of more difficulty both for the child as well as for the parent.

Correspondence: Margaret Semrud-Clikeman, Ph.D., Educational Psychology, university of Texas, 1 University Station, D 5800, University of Texas at Austin, Austin, TX 78712. E-mail: peg.semrud@mail.utexas.edu

H. GOMES, M. DUFF, V. WOLFSON & J. HALPERIN. Auditory and Visual Attention in Language Impaired and AD/HD Children.

Objective: Difficulties with attention in language impaired children have been suggested by a number of researchers. However, few studies have

directly examined the relationship between language and attention or the extent to which attention difficulties are modality specific in these children. This study examined visual and auditory simple, selective and divided attention in language impaired (N=9), AD/HD (N=12) and control children (N=10).

Participants and Methods : All participants were referred to a NIDCD funded project, were between 7 and 10 years of age and had full scale IQs of at least 80. They were presented with one or two streams of stimuli (identified by frequency [1000Hz and 2000Hz] or shapes [circles and squares]). Children responded to infrequent less intense stimuli (softer in intensity tones, darker in luminance shapes) in all tasks. In addition, they attended to a second target in the divided tasks. The values for the infrequent targets were individually determined during a pretest to ensure that the difficulty of the discrimination was relatively equivalent across children and modalities.

Results : Data were analyzed using repeated measures MANOVAs. All children performed better on the visual than auditory tasks, despite the pretesting. Performance was especially poor for the auditory selective and divided attention tasks. On the simple tasks, language impaired children exhibited more commission errors than control children in the auditory modality and AD/HD children exhibited more in the visual.

Conclusions : These findings support a hypothesis of modality specific difficulties with attention and/or inhibitory control in language impaired and AD/HD children.

Correspondence: *Hilary Gomes, Ph.D., Psychology, City College of NY, 37 Gristmill Drive, Kings Park, NY 11754. E-mail: hgomes@earthlink.net*

C.C. DUMITRESCU & S.J. HUNTER. Neuropsychological profile differences between Aspergers Syndrome and Nonverbal Learning Disorder: Implications for diagnostic divergence.

Objective: Research suggests convergence between Aspergers Syndrome (AS) and Nonverbal Learning Disorder (NLD), particularly in presentation and etiology. Still, significant variation in difficulties children with these disorders present remain, warranting continued clinical distinction. To delineate how these disorders overlap and differ, we examined performances across a comprehensive neuropsychological battery. We considered how tests of executive functioning, language, academic achievement, memory and psychomotor ability can separate these groups clinically.

Participants and Methods : Examined performances on a neuropsychological assessment battery, administered to children between 6 and 14, referred for evaluation of AS or NLD. Children completed WISC-3, WJ-3 Tests of Achievement, and tests of psychomotor speed, dexterity, executive functioning, visuospatial and visuoconstructional ability, and verbal and visual memory. Performances were compared across groups, using a series of multivariate ANOVAs, and t-tests to assess significant differences.

Results : NLD were compromised on measures of nonverbal processing. AS were compromised on measures of verbal performance. AS had significantly higher scores on visuospatial measures: Block Design ($p = .001$), VMI ($p = .02$) and RCFT Recognition ($p = .02$). NLD outperformed AS on tests of academically based verbal processing: Writing Fluency ($p = .001$), Academic Fluency ($p = .012$) and Written Expression ($p = .001$). NLD performed better on the CMS Stories subtests.

Conclusions : Difficulties seen for AS represent a deficit in language skill, consistent with situation along the Autism Spectrum. AS demonstrated greater difficulty in utilizing effective strategies for higher-order verbal memory and production tasks, in comparison with NLD, whose deficits are consistent with right hemisphere dysfunction. While NLD and AS share success with rote verbal capability, divergence is seen with complex linguistic processing.

Correspondence: *Scott J. Hunter, Ph.D., Psychiatry, University of Chicago, 5841 S. Maryland Ave., MC 3077, Chicago, IL 60637. E-mail: shunter@uchicago.edu*

V.M. WOLFSON, H. GOMES & T. TAMNY-YOUNG. Semantic Verbal Fluency in Children with Language Impairment and ADHD.

Objective: To examine executive control and semantic networks using a verbal fluency task with children diagnosed with ADHD, language impairment, or comorbid ADHD and language impairment.

Participants and Methods : Children (7 to 10.11 years of age) were administered Word Association (WA), a subtest of the CELF-4, as part of a NIDCD funded project examining language and attention. Based in neuropsychological testing; parent interview and ratings; and teacher input children were grouped as ADHD, language impaired (LI), comorbid for ADHD and LI (ADHD/LI), or as controls (C). WA requires a child to name items within a given category (i.e. animals, food, jobs) in 60 seconds. Correct responses were totaled across the three categories as were the percentage of intrusions and repeats. In addition, animals were rated for prototypicality.

Results : LI and ADHD/LI groups generated significantly fewer correct items than C or ADHD children while ADHD and ADHD/LI children produced a significantly higher percentage of intrusions and repeats. ADHD/LI children received significantly higher prototypicality scores compared to ADHD and Cs.

Conclusions : These findings suggest that ADHD interferes with verbal inhibition while language impairment alters verbal fluency. ADHD/LI children generate word lists with higher prototypicality scores compared to ADHD and Cs suggesting limitations in semantic networks and impaired search and retrieval strategies.

Correspondence: *Virginia M. Wolfson, BS, Dept of Psychology, The City College of New York, NAC, 138th St and Convent Ave, New York, NY 10031. E-mail: ginwolf50@aol.com*

H.B. TAYLOR, S. LANDRY, M. BARNES, L. COHEN & P. SWANK. Early Information Processing among Infants with Spina Bifida.

Objective: Individuals with Spina Bifida (SB) demonstrate a consistent neurocognitive profile, with common origins reflecting difficulties with integration of information and responding to contingencies in the environment. These early skills relate to later school intelligence. We expect these origins to also be found in infancy. This study evaluates the development of early visual information processing (IP) among infants with SB compared to typically developing infants using the habituation-dishabituation paradigm. Objectives: (1) evaluate infant habituation, response to novel stimuli, and composite stimuli (faces) at 6, 12, and 18m of age; and (2) determine the relation of habituation, and novel and composite looking time, to mental and motor performance at each time point.

Participants and Methods : The sample includes 128 infants (SB=58; Control=70) who participated in an international longitudinal study and completed the habituation-dishabituation paradigm on at least one of three time points (6m, 12m, and 18m). This task measured infants habituation rate to two female faces and infant response to a familiar, composite, and novel face. Relations between infant task performance and motor and mental functioning were also evaluated. A cross-sectional design was used due to an expected lack of correlation between time points.

Results : General Linear Model analyses were conducted. Overall, infants with SB were less likely to habituate than control infants at all time points. Habituation ability related to mental and motor functioning at 18m. Other findings (novel, composite) will be discussed.

Conclusions : Difficulties in IP skills can be detected in infants with SB relating to motor and mental functioning. Clinical implications will be discussed.

Correspondence: *Heather B. Taylor, Ph.D., Pediatrics, University of Texas Health Science Center, 7000 Fannin, Suite, 2355g, Houston, TX 77030. E-mail: Heather.Taylor@uth.tmc.edu*

S. SUTERA, M.A. ROSENTHAL, P.E. DIXON, J.M. KLEINMAN, H.C. BOORSTEIN, L.B. WILSON, E.L. ESSER, J. PANDEY, A. VERBALIS, M. BARTON, S. HODGSON, G.A. MARSHIA, T.M. DUMONT-MATHIEU & D.A. FEIN. Factors Influencing Positive Prognosis in Toddlers Diagnosed With an Autism Spectrum Disorder.

Objective: To determine if cognitive level, adaptive level, and symptom severity in children diagnosed with an autism spectrum disorder (ASD) at age 2 years differentiates toddlers who retain the ASD diagnosis at age 4 from those who no longer meet criteria for a diagnosis of ASD.

Participants and Methods : Seventy-six children were evaluated after failing the Modified Checklist for Autism (M-CHAT; Robins, Fein, Barton, & Green, 2001) at age 2 and re-evaluated at age 4. Of these 76 children, 57 were diagnosed with an ASD at their initial evaluation. At reevaluation, 11 of these 57 children no longer met criteria for a diagnosis of an ASD. A cognitive test (the Bayley Scales of Infant Development or the Mullen Scales of Early Learning) and the Vineland Adaptive Behavior Scales were administered at age 2. The Childhood Autism Rating Scale (CARS) was used as a measure of symptom severity.

Results : Independent samples t-tests were used to determine if differences in cognitive ability, adaptive level, and symptom severity existed at age 2 between the participants who retained an ASD diagnosis and participants who no longer met criteria for a diagnosis of an ASD at age 4. No difference in symptom severity existed between the groups at age 2. However, the group of subjects who no longer met criteria for an ASD diagnosis at age 4 had higher Vineland Motor ($M=77.1$ for those who retained an ASD diagnosis; $M=89.2$ for those who did not meet criteria for an ASD diagnosis) and Adaptive Behavior Composite scores ($M=62.4$ for those who retained an ASD diagnosis; $M=66.7$ for those who did not meet criteria for an ASD diagnosis) at age 2, and a trend toward higher cognitive scores at age 2.

Conclusions : These data suggest that overall cognitive and adaptive level, but not symptom severity, may predict prognosis in toddlers diagnosed with an ASD.

Correspondence: *Saasha Sutera, Clinical Psychology, University of Connecticut, 335 Center Road, Apt. 6c, Vernon, CT 06066. E-mail: saasha.sutera@uconn.edu*

L.B. WILSON, P.E. DIXON, J.M. KLEINMAN, J. PANDEY, H.C. BOORSTEIN, E.L. ESSER, M. ROSENTHAL, S. SUTERA, A.D. VERBALIS, M. BARTON, J.A. GREEN, S. HODGSON, G.A. MARSHIA, D.A. FEIN & T.M. DUMONT-MATHIEU. Effects of Demographic Factors on Satisfaction with Screening and Diagnosis of Autism Spectrum Disorders.

Objective: To determine if parental income, parental education, and child diagnosis are related to satisfaction with screening, evaluation, and diagnosis of neurodevelopmental disorders.

Participants and Methods : Seventy-four children (Mean age=31 months) were evaluated and diagnosed after screening positive on the Modified Checklist for Autism in Toddlers (M-CHAT). Upon completion of the evaluation, caregivers completed a 30-item Post-Evaluation Satisfaction Questionnaire modified from the Client Satisfaction Questionnaire (CSQ-8). Items were scored on a 4-point Likert scale, with 1 indicating dissatisfaction and 4 indicating satisfaction.

Results : The internal reliability of the questionnaire was good ($\alpha=.89$). Overall, caregivers were mostly to extremely satisfied with the screening and evaluation process ($M=3.42$). There was no effect of income, maternal education, or child diagnostic status (i.e., ASD vs. Non-ASD disorders) on overall satisfaction score. Lower levels of paternal education were associated with higher overall satisfaction scores ($p=.027$). Caregivers with lower incomes reported significantly higher satisfaction with various aspects of the screening and diagnostic process and reported that they were more likely to follow through with recommendations. Lower levels of both maternal and paternal education were also associated with higher satisfaction with several aspects of the process. No significant relationships were found between child diagnostic status and satisfaction.

Conclusions : Overall, satisfaction with the screening and diagnostic process was high. The increased satisfaction expressed by families of lower income and education may be due to lower expectations of health care providers. Understanding the factors influencing parental satisfaction with specific aspects of screening and diagnosis is an essential component of improving these practices.

Correspondence: *Leandra B. Wilson, M.A., Psychology, University of Connecticut, 33 Windermere Avenue, Apt 11, Vernon, CT 06066. E-mail: leandra_wilson@hotmail.com*

J. BERNABEU, C. FOURNIER, B. GAVILAN, G. ALMERICH, J. SUAREZ, A. CANYETE & V. CASTEL. Neuropsychological Profiles and Differences among NVLD, Asperger and Healthy Children.

Objective: To find out differences in the neuropsychological profile between Non Verbal Learning Disabilities (NVLD) and Asperger children. **Participants and Methods :** 24 children were studied, median age was 9.12 (range: 7-14). There were 12 healthy, 7 Asperger and 5 NVLD children. 14 were boys and 10 girls. Statistical analysis (descriptives and ANOVA) was carried out by using SPSS 12.0 package.

Results : NVLD children showed the worst scores of these three groups. They present difficulties in cognitive general abilities (performance and total IQ, perceptual organization, simultaneous and mental composite processing), motricity (dominant, non-dominant and visuomotor coordination), perception (visual attention and integration), non-verbal abilities (line orientation, visuoconstructive praxias), non-verbal memory (spatial, serial visual learning, delayed visual recall), executive functioning (working memory, planning, non-verbal fluency). Asperger children did not present cognitive deterioration; only lower scores in cognitive general abilities (verbal and total IQ), attention (sustained, divided and selective), language (auditory processing), memory (serial verbal learning) and executive functioning (concept formation and non-verbal fluency).

ANOVA multiple comparisons: both groups showed significant differences compared to healthy in cognitive general abilities, perception, memory, attention and academic abilities. Asperger children present significant differences with healthy children in language and executive functions. The only significant differences between Asperger and NVLD children were in motricity and non-verbal abilities (NVLD present the worst scores).

Conclusions : Children with Asperger and NVLD are frequently defined clinically. Here we present some clues to try to define neuropsychological profiles of these pathologies.

Correspondence: *Jordi Bernabeu, Master, Hospital La Fe, Pediatric Oncology Unit, Argda. Blasco Ibañez, 30, Valencia 46010, Spain. E-mail: bernabeu_jor@gva.es*

R.L. PETERSON, E.M. PHINNEY, R.K. OLSON & B.F. PENNINGTON. Cognitive Overlap between Speech Sound Disorder and Reading Disability.

Objective: The current study evaluates competing accounts of the cognitive overlap between two comorbid developmental disorders, speech sound disorder (SSD) and reading disability (RD). The severity hypothesis holds that a single underlying cognitive impairment causes both RD and SSD, with SSD + RD resulting from a more severe impairment than RD alone. The prediction that follows is that both groups (SSD + RD, RD alone) should perform similarly on cognitive/linguistic tasks tapping abilities beyond phonology. In contrast, a multiple deficit account holds that a phonological deficit is shared by RD and SSD but is not sufficient to cause either disorder. Other cognitive deficits should distinguish the groups.

Participants and Methods : This study compares phonological awareness (PA), phonological memory (PM), rapid naming (RN), and expressive vocabulary (EV) skills in three age-matched groups of 7- to 9-year-old children (total $n = 136$): RD only, SSD only, and SSD + RD. Analyses were completed using repeated-measures ANOVA and follow-up t -tests, covarying nonverbal IQ when necessary.

Results : Results included a significant group-by-task interaction, indicating group differences in cognitive profiles. Post-hoc comparisons revealed that both RD only and SSD + RD groups had similar phonological impairments (PA and PM), with both groups performing more poorly than the SSD only group. In contrast, the SSD + RD group displayed larger RN and EV deficits than either the RD only or the SSD only group.

Conclusions : These results suggest broader cognitive/linguistic impairments in the comorbid group than in either disorder alone, and contradict the strictly phonological account of the severity hypothesis.

Correspondence: *Robin L. Peterson, A.B., Psychology, University of Denver, 2155 S. Race St., Denver, CO 80205. E-mail: rpeters6@du.edu*

L. KENEALY, C.J. VAIDYA, J.W. VAN METER, J. FOSS-FEIG, A. SCOZZAFAVA & M.E. FLEISCHER. White Matter Microstructure in Childhood ADHD: Association with Behavioral Inhibition.

Objective: Attention Deficit Hyperactivity Disorder (ADHD) is characterized by executive dysfunction that is associated with functional abnormalities in distributed cortical and sub-cortical brain regions. Current neuropsychological theories particularly emphasize inhibitory control as the main behavioral deficit in ADHD. We examined whether integrity of white matter tracts that facilitate regional communication was correlated with performance on measures of inhibitory control in prepubescent children with ADHD and controls.

Participants and Methods : 29 children ages 7-12 (including 13 with ADHD- Combined Subtype and 16 age, sex, and handedness-matched controls) participated in the study. Six were females (2 with ADHD, 4 controls), and the rest were males. Fractional anisotropy (FA) maps from diffusion tensor images were statistically analyzed with SPM99 and correlated with behavioral data reflecting inhibitory control (False Alarms in a Go/ No Go task).

Results : Correlational analyses revealed that white matter integrity in three major regions was significantly correlated ($p < .05$) with behavioral inhibition. These regions included bilateral motor tracts from the primary motor cortex to the spinal cord, the anterior corpus callosum, and arcuate fasciculus in the left hemisphere.

Conclusions : In a sample of children with ADHD-Combined and matched controls, performance on a behavioral measure of inhibitory control was significantly correlated with the integrity of white matter tracts connecting the anterior regions of the two cerebral hemispheres and connecting frontal cortex to posterior cortex and to the spinal cord. These findings are important for better understanding the neuroanatomical underpinnings of ADHD and the associated executive function deficits.

Correspondence: *Laura Kenealy, Children's National Medical Center, 14501 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: LKenealy@cnmc.org*

A.D. VERBALIS, J.M. KLEINMAN, S. SUTERA, J. PANDEY, P.E. DIXON, L.B. WILSON, E.L. ESSER, H.C. BOORSTEIN, M. ROSENTHAL, S. HODGSON, G.A. MARSHIA, M. BARTON & D.A. FEIN. Sex Differences in Toddlers with Autism.

Objective: Few studies have examined sex differences in autism and none have examined sex differences in autistic toddlers. Several studies have shown that females with autism have lower IQs and that males with autism are more likely to show visual fascinations, stereotypic play, and decreased social skills.

Participants and Methods : 123 males (mean age = 27 months, $SD = 4.6$ months) and 30 females (mean age = 27 months, $SD = 4.8$ months)

were diagnosed with an Autism Spectrum Disorder (ASD) after failing the Modified Checklist for Autism in Toddlers (MCHAT). These participants were compared on the MCHAT items and on standard scores for the Mullen Scales of Early Learning and the Vineland Adaptive Behavior Scales.

Results : The male participants failed significantly more items on the MCHAT, and failed two items related to pretend play and pointing to express interest significantly more often than females. Males also scored significantly higher on the Motor subscale of the Vineland and female participants received higher scores on the Socialization subscale of the Vineland. No significant sex differences were found in IQ.

Conclusions : The data shown here replicates in toddlers previous findings for older children that female children with autism are more socially developed and have more appropriate play skills, and have more motor delays, but found no IQ difference. It is possible that at this age there is not enough variability in IQ scores to see a significant sex difference. These differences may be representative of the biological sex differences in typical children and may modify the disorder in females.

Correspondence: *Alyssa D. Verbalis, BA, Psychology, University of Connecticut, 141 Tudor Lane, Apt 1, Manchester, CT CT. E-mail: alyssa.verbalis@uconn.edu*

K.C. BROCKI, K.A. KERNS & K.D. RANDALL. Novel Computerized Measures of Spatial And Verbal Working Memory: A comparison Between Children With ADHD And Normal Controls.

Objective: Using several novel and engaging measures of spatial and verbal working memory (WM), the main aim of the study was to investigate WM abilities in children diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) compared to aged matched controls.

Participants and Methods : A total of 43 male children (20 clinical and 23 controls) between the ages of 7 and 12 years participated in this study. Spatial working memory was assessed using two novel computerized tasks (the Pig house and the Boxes WM task). Verbal working memory was assessed via a new computerized Self-Ordered Pointing Test and a novel computerized verbal task (the Words WM task). All of the novel WM tasks required temporary maintenance of spatial or verbal information in order to guide the forthcoming correct response. A standardized measure of working memory, the Letter Number Sequencing (LNS) of the WISC IV was also administered to validate the tasks as proper measures of working memory.

Results : A MANOVA showed a significant main effect of ADHD, suggesting that the variance shared by the WM variables differed between children with ADHD and normal controls. The results from the separate tasks showed that significant group differences were obtained on both of the novel spatial WM tasks, with the ADHD children performing at a lower level compared to the controls. No significant differences between the two groups were obtained on the verbal WM tasks. Further, the novel computerized WM tasks significantly correlated with the standardized LNS.

Conclusions : The results indicate that the novel computerized spatial WM tasks were sensitive to impaired spatial WM ability in children with ADHD, whereas the verbal WM tasks did not show the anticipated results. The significant correlation between the established LNS and all of the WM tasks validates the novel computerized WM paradigm. Together, the results from this study may suggest that children with ADHD are more impaired in spatial working memory than in verbal working memory.

Correspondence: *Karin C. Brocki, Phd, Department of Psychology, Uppsala University, Box1225, Uppsala SE- 751 42, Sweden. E-mail: karin.brocki@psyk.uu.se*

D.M. RAINES, K.L. RODAK, S.L. LEVIN, I.S. PANYAVIN, D. LEGOFF & S.M. PLATEK. The Computerized Mind in the Eyes-Revised Test: An Initial Investigation and Validation in Patients with Aspergers Syndrome.

Objective: Baron-Cohen et al. (2001) have developed the Mind in the Eyes Test for investigating the capacity to attribute mental states (social cognition) to others based on expressions from only the eyes. Patients within the autistic spectrum are impaired on this task. In an attempt to automate administration and scoring of this measure we developed a computerized version of the Mind in the Eyes. The advantages of computerized neuropsychological testing have been outlined elsewhere (Gur et al., 2001a, b) and include: measurement of reaction time in milliseconds, automated scoring, and ease of use by multiple laboratories.

Participants and Methods : Six children diagnosed with Aspergers syndrome and one patient control were recruited from Bancroft Neuro-health. For each participant a parent or guardian completed The Childhood Asperger Syndrome Test (CAST) (Scott, Baron-Cohen, Bolton & Brayne, 2002). Participants were asked to choose one of four qualitative terms that best describes the mental state of a person whose eyes are depicted in a photograph. Accuracy and reaction times were recorded. **Results :** This is the first attempt at computerizing a test of social cognition and offers the same advantages over standard paper-pencil techniques. Here we report data on patients with Aspergers syndrome showing comparable results to published norms for the paper-pencil version of this task.

Conclusions : These findings suggest that computerization of social cognitive tasks is accurate and potentially useful for investigations of such constructs in patient populations.

Correspondence: *Danielle M. Raines, Psychology, Drexel University, 3175 JFK Blvd, Apt 1307, Philadelphia, PA 19104. E-mail: dmr35@drexel.edu*

J. MICHEL, K.A. KERNS, J. DOWN & P. MACLEOD. Monozygotic Twin Boys Discordant For Fetal Alcohol Spectrum Disorder (FASD) Diagnosis: A Case Study.

Objective: To contribute to the understanding of the individual factors which may contribute to the development of Fetal Alcohol Spectrum Disorders (FASD) and increase our understanding of the role of genetics in susceptibility to alcohol as a teratogen by examining monozygotic twins discordant for FASD features.

Participants and Methods : Presented in this case study are monozygotic 6 year old twins who were exposed to alcohol and cocaine in the first trimester. Twin A weighed approximately 2 pounds more than Twin B at birth. They shared a common placenta, with 2 amniotic sacs. Zygosity testing was performed and confirmed their identity. The twins have been reared together with no known significant illnesses or injury in either twin. Twin B has a history of developmental problems. Neuropsychological assessment, and medical evaluation including MRI analyses have been conducted. The twins received differing 4-digit Washington Diagnostic codes.

Results : Neuropsychological assessment revealed that both twins were concordant with significant deficits in adaptive behavior and a number of behavioral problems, with slightly more severe problems in Twin B. Twin B's intellectual, pre-academic, memory and fine motor skills lagged consistently behind Twin A, who was generally in the average range. Both showed mild facial features characteristic of FASD. Twin B showed mild growth delays.

Conclusions : To our knowledge this is the first report of discordant FASD diagnoses in monozygotic twins. The findings will be discussed in terms of relationships between pre and post-natal environmental risk factors and genetic factors. Cognitive and behavioral discordance will be discussed.

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*

S.H. MOSTOFSKY, J.G. BLANKNER, N. JAHANSHAD, M.C. GOLDBERG & J.J. PEKAR. Children with Autism Show Differences in Cerebellar-Cerebral Circuits During fMRI of Sequential Finger Tapping. Objective: Impaired performance on motor tasks is frequently reported in autism. To investigate the neural basis of these deficits, fMRI was used to examine brain activation associated with finger sequencing in children with autism compared with typically developing controls.

Participants and Methods : Children, ages 8-12 years, with autism (n=16) and controls (n=16) underwent fMRI scanning while performing a task in which thirty-second blocks of right-handed finger sequencing (RHFS) were alternated with blocks of left-handed finger sequencing (LHFS) and blocks of rest.

Results : FMRI group data were analyzed using separate random effects models designed to determine signal change patterns associated with RHFS and LHFS. Random effects analyses were also used to examine between-group differences in activation during RHFS and LHFS. In both groups, activation (uncorrected $p < 0.001$) associated with RHFS and with LHFS was seen in the primary motor/sensory cortex (predominantly contralateral), supplementary motor area, basal ganglia, and cerebellum (predominantly ipsilateral). Statistical contrast between the groups revealed that during both RHFS and LHFS controls showed significantly greater activation in bilateral cerebellum and right occipital cortex. During LHFS controls also showed greater activation in regions near the right superior temporal sulcus (STS). Children with autism showed greater activation in premotor regions and in the basal ganglia, particularly during LHFS.

Conclusions : Children with autism are less able to recruit cerebellar regions important for automatic/habitual performance of simple motor tasks, instead showing greater reliance on cerebral premotor regions involved in conscious/effortful performance. They are also less able to recruit regions in the STS important for encoding spatial representations of movement.

Correspondence: *Stewart H. Mostofsky, M.D., Neurology, Kennedy Krieger Institute, Johns Hopkins University School of Medicine, 707 N. Broadway, Baltimore, MD 21205. E-mail: mostofsky@kenedykrieger.org*

C. KIMBERG, S. HEATON, L. HAHN & S. REED. A Pilot Study Comparing the Attentional Profile of Autism Spectrum Disorders and ADHD.

Objective: Autism Spectrum Disorders (ASD) are developmental disorders characterized by impairments in social interaction and communication, and stereotyped patterns of behavior and interests. Some researchers suggest that these behavioral abnormalities stem, in part, from a generalized deficit in attention. However, the pattern of attentional impairment in children diagnosed with ASD has not been systematically studied. It is also unknown if performance impairments and behavior ratings resemble those seen in other childhood disorders of attention, such as Attention Deficit Hyperactivity Disorder (ADHD).

Participants and Methods : The current study compares unmedicated children between the ages 6 and 16 who have been diagnosed with ASD (n=8) or ADHD (n=29). Groups were compared, with Full Scale IQ as a covariate, on three composite scores from the Test of Everyday Attention for Children (TEA-Ch) and three DSM-IV scales from the Conners' Parent Rating Scale Revised Long Version (CPRS).

Results : Results indicate that the ASD group performed similarly to the ADHD group, with intact selective attention and impaired sustained attention on the TEA-Ch. Furthermore, both groups were rated as having similarly elevated levels of hyperactivity on the CPRS. In contrast, the ASD group performed better than the ADHD group on TEA-Ch tasks of attentional control ($p = .003$) and were rated as having fewer inattentive behaviors on the CPRS ($p = .023$).

Conclusions : This pilot study suggests that although children with ASD may perform poorly on tasks of sustained attention and display hyperactivity, they may be differentiated from children with ADHD in terms of parent ratings of inattention and performance on attentional control tasks.

Correspondence: *Cara Kimberg, Clinical and Health Psychology, University of Florida, Health Science Center, PO box 100165, Gainesville, FL 32610. E-mail: ckimberg@php.ufl.edu*

F.J. GALLO, K.D. PHILLIPS, K.T. LI, M.S. GAFFREY & B.P. KLEIN-TASMAN. Differences Among Parent-Report Measures of Pervasive Developmental Problems in Very Young Children.

Objective: The Social Communication Questionnaire (SCQ) and the Pervasive Developmental Problems subscale of the Child Behavior Checklist for Ages 1.5-5 (CBCL/PDP) are both parent-report questionnaires commonly used to screen for the presence of behaviors that characterize autism spectrum disorders. However, their appropriateness for very young populations (ages 2.5-5 years) has not been thoroughly examined.

Participants and Methods: In the current study, we examined the correspondence of these measures to each other and to more formal clinical observational methods (Autism Diagnostic Observation Schedule-ADOS) in two groups of children; 19 children with Williams syndrome (WS) and 14 children with developmental delay of mixed etiology (ME). Participants ranged in age from 30 to 70 months and groups were matched for chronological age and developmental level. Overall raw scores as well as diagnostic classification comparisons were examined.

Results: While both parental measures significantly corresponded to each other on total raw score and diagnostic classification for each group, divergent patterns of classification correspondence to the ADOS were found. The CBCL/PDP subscale classifications corresponded well to the ADOS for the WS group ($X^2[1, N=19]=8.146, p=.004$), but not for the ME group ($X^2[1, N=14]=2.431, p=.119$). The SCQ classifications had adequate correspondence to the ADOS for the ME group ($X^2[1, N=14]=4.667, p=.031$), but less so for the WS group ($X^2[1, N=19]=3.352, p=.067$).

Conclusions: The differences among these parental measures and the implications of these findings for the understanding of the socio-communicative behavior of young children with developmental disabilities will be discussed.

Correspondence: *Frank J. Gallo, Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford Ave, Garland Hall, Milwaukee, WI 53211. E-mail: fgallo@uwm.edu*

J.M. HALPERIN & K.P. SCHULZ. A New Perspective on the Role of the Prefrontal Cortex in the Pathophysiology of ADHD.

Objective: The "frontal lobe/executive function hypothesis" has been the primary explanatory model for the pathophysiology of attention-deficit/hyperactivity disorder (ADHD) for over two decades. However, inconsistencies in neuropsychological and neuroimaging findings, coupled with only moderate effect sizes, raise substantive questions about the veracity of this model. Further, the reduction of ADHD symptoms with age does not correspond with what is known about the development of the prefrontal cortex (PFC) or executive functions.

Participants and Methods: Developmental, neuropsychological and neuroimaging data will be presented to support an alternative model which posits that at least partially distinct neural and cognitive mechanisms are involved in the etiology of and recovery from ADHD.

Results: We hypothesize a central role for PFC circuitry in the recovery from ADHD, as indicated by diminishing symptomatology over development. However, PFC systems are not linked to the cause of the disorder. Rather, we hypothesize that ADHD is due to non-cortical neural dysfunction that is present early in ontogeny, remains relatively static throughout the lifetime, and is not associated with the remission of symptomatology that typically occurs over development.

Conclusions: The diminution of symptoms frequently seen in adolescents and young adults is accounted for by the degree to which the de-

velopment of the PFC and executive functions are able to compensate for these early neural deficits through the implementation of 'top-down' regulatory control. As such, the structure and function of PFC systems are intimately involved in the manifestation of ADHD symptoms, but dysfunction to this region does not cause ADHD.

Correspondence: *Jeffrey M. Halperin, Ph.D., Psychology, Queens College, 65-30 Kissena Blvd., Flushing, NY 07645. E-mail: jeffrey_halperin@qc.edu*

S.N. MATTSON, L.E. VAURIO & E.P. RILEY. Executive Functioning in Children with Fetal Alcohol Spectrum Disorders and ADHD.

Objective: Executive functioning (EF) may be a core deficit following heavy prenatal alcohol exposure. Furthermore, prenatal alcohol exposure can cause attention deficits and individuals with such exposure are frequently diagnosed with attention deficit hyperactivity disorder (ADHD).

Participants and Methods: The current study compared EF performance of three matched groups of children: (1) children with histories of heavy prenatal alcohol exposure and ADHD (FASD); (2) nonexposed children with ADHD (ADHD); and (3) nonexposed, non-ADHD controls (CON). ADHD was diagnosed using a psychiatric interview. The EF tasks were the Wisconsin Card Sorting Test (WCST), the Controlled Oral Word Association Test (COWAT), and the Trail Making Test (TMT). In addition, children were given the WISC-III.

Results: On the COWAT, both the FASD and ADHD groups demonstrated a relative weakness on letter vs. category fluency. On the TMT, children with FASD demonstrated relative weakness on TMT-B vs. TMT-A in comparison to the other two groups, which did not differ from each other. On the WCST, both the FASD and ADHD groups performed more poorly than the CON group. However, in relation to IQ, the ADHD group performed significantly below expectations and FASD group performed significantly above expectations.

Conclusions: These results indicated that while there were EF deficits in both the FASD and ADHD groups, the pattern of these deficits was different between the groups. Thus, these EF tasks may be useful in differentiating individuals with alcohol-related ADHD from those of other etiologies. Research supported by NIAAA grants 10417 and 10820.

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. PANDEY, K. TOTH, P. DIXON, J. KLEINMAN, L. WILSON, E. ESSER, H. BOORSTEIN, S. SUTERA, A. VERBALIS, M. ROSENTHAL, S. HODGSON, G. MARSHIA, J. GREEN, M. BARTON, G. DAWSON & D. FEIN. The Modified Checklist for Autism in Toddlers (M-CHAT) Sibling Study: An Update.

Objective: Research indicates that younger siblings of children with autism are at higher risk for the development of autism and other developmental disorders (Silverman, 2001.) This higher rate of recurrence provides an opportunity to study the emergence of autism prospectively, but it is not known whether siblings are representative of the larger autism population. The current study used the M-CHAT (Robins, et.al, 2001), a parent-report checklist, to detect Autism Spectrum Disorders in 16-30 month old younger siblings of ASD diagnosed children.

Participants and Methods: Presently, 161 children have been screened (mean age = 19.5 months), of which 75 younger siblings failed the screening and 86 passed, resulting in an initial fail rate of 46.6%. 62 of the 75 children that failed the initial screener, also failed the telephone interview follow-up, and qualified for a developmental evaluation (mean age 22 months).

Results: 43 siblings have been diagnosed with ASD, 11 with language and other development delays, and 8 were found to be typically developing. These diagnoses suggest a positive predictive power of 69% for

the MCHAT and a recurrence rate of 27% in our sample. Our ASD sibling sample was similar to our general ASD sample in severity of autism, but was higher functioning in adaptive skills (Vineland daily living skills and socialization) and cognitive development (Mullen visual reception, fine motor, and expressive language.)

Conclusions : These data will be presented in detail and suggest that either autism in multiplex families is different from autism in singleton families, or that higher suspicion in parents of siblings results in diagnosis of more mildly affected children.

Correspondence: *Juhi Pandey, University of Connecticut, 406 Babbidge Road, Storrs, CT 06269. E-mail: juhi.pandey@uconn.edu*

V.J. HINTON, A. BATCHELDER, S. CYRULNIK, R. FEE & J. KIEFEL. Autism and Duchenne Muscular Dystrophy.

Objective: To investigate reciprocal social skills and behaviors consistent with autism spectrum disorders among children with Duchenne muscular dystrophy.

Participants and Methods : Parents of 58 children diagnosed with Duchenne muscular dystrophy (DMD) and 43 unaffected siblings were given the Social Communication Questionnaire (SCQ). An a priori cut-point of 12 was set and parents of all individuals scoring at or above 12 were given the Autism Diagnostic Interview - Revised (ADI-R).

Results : SCQ scores for the unaffected siblings ranged from 1 to 9, while those for DMD children ranged from 1 to 23. No controls and 33% (19/58) of the DMD group scored above the SCQ cut-point. The group was variable in terms of age and receptive vocabulary ability (age range: 4 to 14 years; Peabody Picture Vocabulary-III standard scores 40 to 125). Of the 19 children identified, 15 mothers have been given the ADI-R. Responses from 13/15 indicated that the child with DMD met criteria for autism spectrum disorder according to the diagnostic algorithm. The two who did not meet criteria had the lowest SCQ scores. Older children showed evidence of improved behavior across the three domains, (impairments in reciprocal social interaction, communication and repetitive behaviors) but met criteria between the ages of 4 and 5 years old.

Conclusions : DMD presents with poor reciprocal social and communication skills and individuals affected by DMD may be at increased risk for autism spectrum disorders.

Correspondence: *Veronica J. Hinton, Ph.D., Sergievsky Center, Columbia University, Columbia University, P & S Box 16, 630 West 168th Street, New York, NY 10032. E-mail: vjh9@columbia.edu*

C.B. GRANT, M. FITZPATRICK, R. CALVANO & C.A. O'CALLAGHAN. Use of a Handheld Computer to Facilitate the Evaluation of Treatment Approaches with an Autistic Student.

Objective: We investigate here the value of handheld computers (HHC) in a single case study designed to evaluate treatment interventions with a disengaged autistic boy in a classroom setting. The potential value of the HHC is that it is less intrusive and more easily formats the data for charting and analysis.

Participants and Methods : Two hypotheses were advanced to help explain this boy's lack of engagement in class. Two interventions were accordingly designed and tested. The first hypothesis was that this boy might be sensitive to the high-pitched shrieking of a female student. He would, therefore, wear earphones to filter out the noxious auditory stimuli (but not the teacher's voice). The second hypothesis and treatment intervention was designed around his supposed processing style, i.e., mainly visual, reinforced by tactile and kinesthetic cues. A storyboard with brightly colored, small pictures mounted on Velcro strips provided the opportunity for active visualization and manipulation of the information. Data were collected in class: (1) during baseline (2) with earphones and (3) with the addition of the storyboard.

Results : Earphones alone had no effect on attention and response accuracy. The storyboard had a dramatic positive effect on both attention and response accuracy. (Ratings increased from "poor" to "excellent.")

Conclusions : Since use of the electronic monitoring (HHC) greatly enhanced behavioral analysis and treatment planning, we will use it with a larger group of HFA/Asperger students. This same design has much broader application to other pediatric neuropsychological populations. Correspondence: *Clare A. O'Callaghan, R.N., C.S., Ed.D., Mental Health, South End Community Health Center, 1601 Washington Street, Boston, MA, MA 02118. E-mail: clareoc68@aol.com*

R. FEE & V.J. HINTON. Possible Evidence of Cognitive Side Effects with Steroid Treatment for Duchenne Muscular Dystrophy.

Objective: To determine whether steroid treatment contributes to behavior and cognition in children with Duchenne muscular dystrophy (DMD).

Participants and Methods : Behavior and memory skills were examined using the Child Behavior Checklist (CBCL) and two subtests from the Wide Range Assessment of Memory and Learning (WRAML). 118 children diagnosed with DMD with normal IQ were divided into two groups - no medication (n=63) versus steroid treatment (n=55). Groups did not differ with respect to age (age mean + SD: untreated = 9.94 + 2.76, steroid treated = 9.47 + 2.71, $t = 0.97$) or IQ estimates (Ravens Coloured Matrices SS: untreated = 99.10 + 13.76, steroid = 102.52 + 12.46, $t = 1.47$). Unexpectedly, the group treated with steroids performed better than those off treatment on the Peabody Picture Vocabulary Test-III (PPVT-III SS: untreated = 103.06 + 16.10, steroid treated = 109.30 + 15.68, $t = 2.21$, $p < .05$).

Results : Groups did not differ on any subtest of the CBCL using multiple t-tests. Likewise, a 2 group by 2 WRAML subtest ANOVA entering PPVT-III as a covariate was not significant (omnibus $F = 2.31$, $p = 0.10$). However, the groups did differ on the univariate Picture Memory analysis, with the steroid group scoring lower (WRAML Picture Memory SS: untreated = 9.66 + 3.20, treated = 8.68 + 3.03, Picture Memory $F = 4.28$, $p = .04$), suggesting a possible influence of steroid medication on performance.

Conclusions : These data demonstrate that steroid treatment has no effects on reported behavior and that the cognitive deficits observed in DMD are not due to medication.

Correspondence: *Robert Fee, Sergievsky Center, Columbia University, 630 West 168th St. PH19, New York, NY 10032. E-mail: rf237@columbia.edu*

L. THEDE, L.D. STANFORD, J. MILLER & J. DORFLINGER. Subtle Psychosocial Differences Perceived among Autistic Groups.

Objective: Autism is a neurological disorder with various etiologies and includes some combination of language or communication difficulties, atypical socialization, repetitive behaviors, cognitive delays, and restricted interests which often result in impaired functioning. Parents seeking a diagnostic evaluation also often present with concerns regarding their child's inattention, emotional lability, and poor regulation of behavior. Disorders along the Autism Spectrum (i.e., Autistic Disorder, Asperger's Disorder, and Pervasive Developmental Disorder-Not Otherwise Specified [PDD-NOS]) share some overlapping criteria but are differentiated by both qualitative and quantitative differences in symptoms and behaviors. The relationship between behavioral symptomatology reported by parents and their child's diagnosis along the Autism Spectrum is explored in this study.

Participants and Methods : Participants included 38 children with a mean age of 7.9 years (30 males, 8 females) who were diagnosed in an outpatient clinic by trained clinical neuropsychologists using the Autism Diagnostic Observation Scale (ADOS) in conjunction with clinical interview as having Autistic Disorder, Asperger's Disorder, or PDD-NOS. Parents of participants also completed the Achenbach Child Behavior Checklist (CBCL) in order to provide information regarding their perception of and concerns about their child's behaviors. ANOVAs and LSD post-hoc analysis indicated subtle but significant group differences across CBCL domains.

Results : Parents of children with Asperger's Disorder identified their children as displaying more anxiety/depression, emotional reactivity, and attentional problems than reported by parents of children with Autistic Disorder or PDD-NOS.

Conclusions : These findings were consistent with clinical observation that children with Asperger's Disorder more overtly demonstrate emotional lability and attentional difficulties, likely secondary to their better awareness and cognitive status. Implications for treatment will also be discussed.

Correspondence: *Lisa D. Stanford, Ph.D., Psychiatry, University of Illinois at Chicago, 912 S. Wood Street M/C 913, Chicago, IL 60612. E-mail: lstanford@psych.uic.edu*

J.M. KIEFEL, A. BATCHELDER, R. FEE, V. HINTON & E. GOLDSTEIN. Evidence of a unique behavioral phenotype in Duchenne Muscular Dystrophy.

Objective: To examine executive skills and behavior among children with Duchenne Muscular Dystrophy (DMD), using parental ratings from the Behavior Rating Inventory of Executive Function (BRIEF) and the Behavior Assessment System for Children (BASC).

Participants and Methods : Responses from parents of 18 matched sibling pairs (one child affected with DMD and one unaffected child) were collected. Groups did not differ with respect to age (DMD = 8.5 + 2.6, control = 8.4 + 3.6, paired $t = 0.13$, $p = 0.89$) or receptive vocabulary (PPVT-III ss: DMD = 105.5 + 22.9, control = 107.8 + 14.3, paired $t = 0.96$, $p = 0.34$).

Results : Contrary to expectations, the groups did not differ on the composite BRIEF General Executive or BASC Behavioral Symptoms Index scores (BRIEF GE T: DMD = 53.22 + 10.11, controls = 47.78 + 11.39, $t = 1.87$, $p = .08$; BASC BS T: DMD = 48.65 + 7.95, controls = 44.76 + 10.36, $t = 1.94$, $p = .08$). Subtest analysis using multiple (17) paired t -tests with Bonferroni-adjusted alpha (.05/17 tests = .003) indicated that the DMD group had significantly higher values on the BRIEF Shift scale and the BASC Withdrawal scale (BRIEF Shift T score: DMD = 57.83 + 14.64, control = 47.22 + 6.04, paired $t = 3.4$, $p = .003$; BASC Withdrawal T score: DMD = 60.89 + 10.59, control = 47.67 + 8.24, $t = 3.91$, $p = .001$). Groups were comparable on all other scales.

Conclusions : Thus, children with DMD have a unique profile characterized, in part, by an increased resistance to change.

Correspondence: *Jacqueline M. Kiefel, Ph.D., Neuropsychology, Children's Healthcare of Atlanta, 1001 Johnson Ferry Road, Atlanta, GA 30342. E-mail: jackie.kiefel@choa.org*

G. LOCASCIO, K. SILVA, G.T. VOELBEL, R. HENDREN & M.E. BATES. Corpus Callosum Area Differences in Children with Autism, Asperger's Disorder and Bipolar Disorder.

Objective: The corpus callosum (CC) is a white matter midline structure responsible for connecting right and left cerebral hemispheres, allowing inter-hemispheric communication. Abnormalities in CC anatomy have been associated with bipolar disorder (BD) and schizophrenia and may be related to clinical symptoms of the disorders. Changes in the CC have also been implicated in Pervasive Developmental Disorders (PDD), with one study reporting smaller areas of the anterior subregions in the autistic group compared to controls.

Participants and Methods : Participants included 27 children with Asperger's Disorder (ASP), 11 with High functioning Autism (HFA), 17 with BD, and 20 with no history of psychiatric disorder (NPD). Age range: 7-13 years. Exclusions were CNS disease, serious medical illness and IQ <70. No control child had a history of psychiatric disorder or LD. Clinical diagnoses were made with the Kiddie-Schedule of Affective Disorders & Schizophrenia (K-SADS) and DSM-IV criteria. All children underwent MRI with a 1.5 Tesla scanner. Corpus callosum regions were manually segmented, following a well-established protocol.

Results : Controlling for age and gender, significant differences were found for isthmus and splenium areas. The HFA and NPH groups had significantly larger isthmus areas than the ASP and BP groups. The ASP group had significantly smaller splenium areas than the HFA and NPH groups.

Conclusions : The results suggest that differences in the size of the CC may help distinguish diagnostic variations in children with Autistic Spectrum Disorders (ASD). Another recent study found that the size of the genu and splenium helped to define subtypes of ASD children via cluster analyses.

Correspondence: *Gianna Locascio, Psy.M., Center of Alcohol Studies/GSAPP, Rutgers University, 607 Allison Rd, Piscataway, NJ 08854. E-mail: locasciog@yahoo.com*

A.R. GROFF, N. PERKINS, V. WILSON & K. PUTNAM. The Relationship Between Attachment Style and Frontal Lobe Functioning in an Adult Sample.

Objective: Literature is emerging that conceptualizes attachment as a behavioral manifestation of a neurobiological phenomenon. Only a few studies have systematically tested this conceptualization, and these studies have typically assessed the relationship between attachment style and information processing in children. Results of these few studies have converged on the finding that insecure attachment is related to poorer performances on individual tests related to various aspects of frontal lobe functioning. The aim of this study is to use a comprehensive test battery (rather than an individual test) to assess the relationship between attachment style and frontal lobe functioning in an adult sample.

Participants and Methods : Participants were 85 undergraduate women from a major northeastern university. Individuals completed a large battery of neuropsychological tests sensitive to frontal lobe dysfunction as well as general intelligence measures. They also completed validated self-report questionnaires regarding attachment style and symptom checklists for Axis I disorders.

Results : Results indicate that attachment style (secure vs. insecure) is significantly related to neuropsychological performances on specific frontal lobe tests, but not to general intelligence. Insecure attachment is significantly negatively correlated with many individual test scores and domain index scores. Insecurely attached individuals performed significantly worse than securely attached individuals on several tests and domain indices.

Conclusions : These results replicate previous findings from childhood literature in an adult sample and also provide a more comprehensive description of the relationship between attachment and different domains of frontal lobe functioning. Overall, this study provides supportive data to the growing theoretical literature regarding the connection between brain function and attachment.

Correspondence: *April R. Groff, M.A., Boston University, 1766 Sand Hill Rd., #308, Palo Alto, CA 94304. E-mail: agroff@bu.edu*

K.D. MRAZ, S. MAKIN, D. FEIN & T. DUMONT-MATTHEWS. An Investigation of Head Circumference During Infancy in Autism.

Objective: Previous research has demonstrated that children diagnosed with Autistic Spectrum Disorder (ASD) show an abnormal acceleration of head growth during the first year of life. It has been suggested that this acceleration could serve as an early warning signal that a child is at risk for developing autism. This study attempts to replicate these findings and to determine whether overgrowth is associated with clinical outcome.

Participants and Methods : Measurements of head circumference (HC), body weight, and body length taken during the first two years of life

were obtained from a sample of 38 children diagnosed with ASD. Longitudinal measurements were averaged over seven intervals during infancy: birth to 2 weeks, 1 to 2 months, 3 to 5 months, 6 to 9 months, 10 to 14 months, and 15 to 25 months. HC, body weight, and body length measurements were compared to both national normative data and an independent control group of 38 healthy children.

Results : Results showed that, compared to healthy infants, ASD children showed significantly smaller HC from birth to 2 weeks, which then became significantly larger by 3 to 5 months. ASD children were also significantly longer across all intervals, and significantly heavier for those intervals from 1 to 9 months, and after 15 months. Change in HC over the first year was also correlated with language impairments.

Conclusions : These findings confirm accelerated brain growth during the first year of life in ASD, and question whether growth factors might contribute to accelerated brain growth as well as overall body growth. Correspondence: *Krista D. Mraz, B.A., Psychology, University of Connecticut, 143 Coventry Rd, Mansfield Ctr, CT 06250. E-mail: dalbecmraz@yahoo.com*

J.C. LARSON, J.G. BLANKNER, M.D. SUGI, A.J. BASTIAN & S.H. MOSTOFSKY. Examination of Motor Skill Learning Using Maze Tracing in Children With Autism.

Objective: To examine deficits in motor skill learning in children with high-functioning autism using a maze tracing task.

Participants and Methods : Eight high-functioning children with autism and six controls, ages 8-12, completed a maze tracing task. Subjects were asked to trace a novel continuous closed-loop maze while blindfolded. The maze had eight linear segments with dead ends at each 90 ° corner. Each subject completed five 1-minute trials in which they were instructed to trace as fast as they could in a clockwise direction. Successful loops, angular velocity, and backtracking errors were calculated using measurements from a digitizing tablet. Repeated measures ANOVAs were used to examine changes in performance across trials indicative of motor learning.

Results : Across both groups of subjects there was a trend towards a significant increase in successful loops across trials, with no significant effect of diagnosis. There was a trend towards a significant effect of diagnosis on change in velocity between trials 1 and 5 ($p=.06$); control children started tracing slower than did children with autism and became quicker, while children with autism began tracing quickly with little change across trials. Controls showed a trend for a significant decrease in backtrack errors across trails ($p=.09$); whereas children with autism did not ($p=.9$).

Conclusions : Both groups showed an increase in the number of successful loops across trials; however, only controls showed a decrease in errors and an increase in velocity across trials. The findings suggest that children with autism demonstrate a strategy less consistent with motor skill learning than that observed in typically-developing children.

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. CYRULNIK, R. FEE, J. KIEFEL, A. BATCHELDER & V. HINTON. Preschool Children with Duchenne Muscular Dystrophy Exhibit Delays in Complex Language Skills.

Objective: To examine complex verbal skills in preschool children with Duchenne Muscular Dystrophy with normal receptive vocabulary.

Participants and Methods : Twenty-four children with DMD and 18 controls were tested on the Clinical Evaluation of Language Fundamentals (CELF). Inclusion criteria were standard scores on the Peabody Picture Vocabulary Test-III >70.

Results : A wide variation in single word comprehension was observed across the children with DMD (PPVT-III range = 82-131, mean + SD

= 100.88, 15.04), yet as a group they did not perform significantly differently from the controls (range = 88-124, mean + SD = 107.89, 9.30; $t = -1.74$, $p > .05$). In contrast, the DMD group scored worse than controls on the CELF total language composite (CELF Total SS: DMD = 87.46, 15.85; control = 106.33, 11.96; $t = 4.23$, $p < .001$). Further analysis of individual subtests of the CELF controlling for receptive vocabulary indicated that young children with DMD have selective difficulty with certain aspects of complex language. A 2 group by 6 test MANOVA with PPVT-III SS entered as a covariate was significant (overall $F = 6.36$, $p < .001$). Between-group differences were seen on Basic Concepts [$F(1,4) = 13.13$, $p < .001$], Recalling Sentences [$F(1,4) = 11.39$, $p = .002$], and Word Structure [$F(1,4) = 12.91$, $p = .001$], such that the DMD group scored significantly more poorly than their controls.

Conclusions : These deficits in complex language skills are similar to the deficits seen in older children with DMD.

Correspondence: *Shana Cyrulnik, The Graduate Center of CUNY, 530 West 236th Street, Apt. 1K, Bronx, NY 10463. E-mail: ssteiner@pobox.com*

E.L. ESSER, H.C. BOORSTEIN, L.B. WILSON, P.E. VENTOLA, J.M. KLEINMAN, J. PANDEY, M. ROSENTHAL, S. SUTERA, A. VERBALIS, M. BARTON, T.M. DUMONT-MATHIEU, J.A. GREEN, S. HODGSON, G. MARSHIA & D.A. FEIN. Sensory Reactivity in Young Children with Autism Spectrum Disorders and Other Developmental Disorders.

Objective: Children with autism spectrum disorders (ASD) frequently exhibit unusual responses to sensory stimuli. Previous research suggests that such symptoms fall into three factors, across sensory modalities: overreactivity, underreactivity, and sensory-seeking. Although similar symptoms can be seen in children with other types of developmental delays and disorders, little is known about differences between these children and those with ASD.

Participants and Methods : Parents of 110 children between the ages of 18 and 36 months (mean age of 27 months) diagnosed with an ASD or with another developmental disorder (either global developmental delay or developmental language delay) completed the Sensory Profile (Dunn, 1999) and 45 additional sensory questions more specific to ASD (Liss, Saulnier, & Fein, 1999). These questionnaires required parents to rate the frequency of various sensory behaviors and reactions on a scale of 1 (never) to 5 (always). From these responses, mean summary scores were calculated based on the factors of overreactivity, underreactivity, and sensory-seeking.

Results : A multivariate analysis of covariance was conducted to determine if the two diagnostic groups (ASD and global developmental delay/developmental language delay) differed significantly in presentation of sensory symptoms while controlling for age. The overall Wilks lambda was significant, $\lambda = .859$, $F = 5.726$, $p < .01$. Children with ASD scored significantly higher on all three factors, indicating an increased intensity of all types of unusual sensory responses. Data on specific behaviors most pathognomonic of ASD will be presented.

Conclusions : It appears that children with ASD differ from children with other developmental disorders in their sensory processing and behaviors.

Correspondence: *Emma L. Esser, Clinical Psychology, University of Connecticut, 300 South Street, Apt T3, Vernon, CT 06066. E-mail: emmaless@pobox.com*

S.E. MCLAUGHLIN-BELTZ, M.D. CURRIER, D. ARMSTRONG & L. LAPOINTE-D'AMORE. EEG Neurofeedback Brain Activity in Children with ADHD - Inattentive Type.

Objective: Previous research has demonstrated increased slow wave activity (Theta) in children with ADHD, both inattentive and combined types (Stewart et al., 2001). However, much of the existing research does not examine the relationship between theta, alpha and beta activity in

various regions of the brain. In the present study, EEG Neurofeedback Assessment was used to examine brain wave activity in children with ADHD - Inattentive Type. Specifically, theta/beta ratios in five regions of the brain, the alpha/beta ratio in the left frontal lobe, and high beta activity in the temporal lobes were examined.

Participants and Methods : Participants included 10 children (8 male, 2 female), ages 7-14 ($M = 10$ yr. 8 mos.). Recording of the EEG was performed using BioExplorer software. Two channels compared 2 sites in each reading (frontal, temporal, parietal, occipital, and midline). Activity was recorded for a total of three minutes with the subject's eyes closed (1 min.), eyes open (1 min.), and then during a task (1 min.). Brain wave activity (absolute/relative amplitudes for each frequency at each site) was then analyzed using the BioExplorer Assessment Software.

Results : All of the children ($N = 10$) in this small sample had increased theta/beta ratios at the frontal, parietal, occipital, and midline sites. However, five of the ten children demonstrated average or low theta/beta ratios in the temporal lobes. All children demonstrated increased alpha/beta ratios in the left frontal lobe, as well as excessive high beta activity in the temporal lobes.

Conclusions : Like previous research, the children in this study did demonstrate an increase in slow wave activity, suggesting underarousal. Additionally, the increased alpha, as opposed to beta, activity present in the left frontal lobe has been associated with inattentiveness, while the excessive high beta activity in the temporal lobes has been associated with anxiety (The Learning Curve, Inc., 2001).

Correspondence: *Susan E. McLaughlin-Beltz, PhD, Neurodevelopmental Institute of NH, 1461 Hooksett Rd., Hooksett, NH 03106. E-mail: sbeltz@nihh.info*

F.J. GALLO, A.M. WILL, M.R. NELSON & B.P. KLEIN-TASMAN. Observations of Heightened Anxiety in Young Children with Williams Syndrome.

Objective: The main objective was to extend research about the presence of heightened anxiety in children with Williams syndrome (WS) by using observational methods. WS is a genetically-based neurodevelopmental disorder. To date, research about the personality of individuals with WS has relied primarily on self- and parent-report to indicate elevated levels of anxiety. In the current study, we attempted to reduce the possible impact of response biases and demand characteristics by examining the anxious tendencies of young children with WS using observational data. In particular, we looked for indications of anxiety during a structured socio-communicative interaction. We examined group differences in: 1) standard overall ratings of anxiety immediately following the interaction; 2) more detailed coding of anxious behaviors from videotape; and 3) startle reactivity coded from videotape.

Participants and Methods : Participants were 25 children with WS and 20 mixed etiology controls (ME), matched for age and IQ (age range 30-78 months). Startle reactivity was examined for a subset of these participants. Research assistants, blind to the diagnosis of each participant, coded the magnitude of startle eyeblinks using a 5-point scale which ranged from low to high. Inter-coder reliability (Cohen's κ) based on 25% of the cases was .79.

Results : Standard overall ratings of anxiety indicated significantly higher ratings for the WS group ($X^2[2, N=45]=6.075, p=.048$). More detailed coding from videotapes by an independent examiner also indicated higher levels of anxious reactivity to certain sounds (e.g., balloon deflating) for the WS group ($X^2[1, N=45]=18.787, p<.001$). Lastly, children with WS were observed to have more intense startle reactivity than the ME group across all startle probes ($F[1, 31]=8.328, p=.007$).

Conclusions : Taken together, these data provide evidence beyond parental or self-report for the anxious tendencies in the WS population and may further the investigation of genotype/phenotype relations.

Correspondence: *Frank J. Gallo, Psychology, University of Wisconsin-Milwaukee, 2441 E. Hartford Ave, Garland Hall, Milwaukee, WI 53211. E-mail: fgallo@uwm.edu*

J. PUNDLIK, E. VAZQUEZ-NUTTALL, C. ARMENGOL, E. MASON & K. LIFTER. Executive Functions and Perceived Self-Efficacy in African American Boys with Attention Deficit Hyperactivity Disorder.

Objective: Contemporary views on Attention-Deficit Hyperactivity Disorder (ADHD) acknowledge that a wide array of cognitive deficits, most of which fall under the realm of executive functions, form a core of the children's difficulties in learning situations. The purpose of this investigation was to examine executive functions associated with ADHD within the context of ethnicity, and to include the construct of self-efficacy in order to explore possible connections between cognitive beliefs and functions and their implications for learning and self-regulatory behavior.

Participants and Methods : We compared performances of African American boys with and without ADHD on two executive function measures (WCST and Stroop Test). Further, we examined children's beliefs of perceived self-efficacy. Sixty African American boys between ages 7 and 13, matched for age, education, IQ, and SES were recruited from local health centers and institutions. Participants were classified into equal-sized groups—ADHD and Non-ADHD, based on referral information/psychiatric diagnosis and behavioral ratings by parents.

Results : Results of discriminant analysis indicated that the WCST and Stroop performances correctly differentiated the groups in 68.3% and 75% of the cases, respectively. Correlational analyses partially supported group differences in self-efficacy. Despite comparable socio-cultural contexts, more adversity in the form of family living situation, resource allocation, and genetic disposition was noted in the ADHD group.

Conclusions : Overall findings supported executive dysfunction associated with ADHD in African American boys. By contrast, relationship between executive functions and self-efficacy remained equivocal. Our study lends further support for a need to integrate social-cognitive and cross-cultural components into neuropsychological inquiries.

Correspondence: *Jyoti Pundlik, Ph.D., Neurology, University of Iowa Hospitals and Clinics, 200 Hawkins Drive, Iowa City, IA 52242. E-mail: jyoti-pundlik@uiowa.edu*

K.L. RODAK, D.M. RAINES, L.L. SARAH, I.S. PANYAVIN & S.M. PLATEK. Impact of autistic spectrum pathology on self-face recognition: A pilot study of children with Aspergers Syndrome.

Objective: The autism spectrum disorders are characterized by deficits in social behavior that have been hypothesized as being related to deficits in self-processing. A growing number of studies have linked the right hemisphere to self-processing. We therefore hypothesized that children with Asperger's syndrome would perform worse at self-face recognition, and show specific impairments with their left hand, which may be a marker for RH processing.

Participants and Methods : In a pilot study, six Asperger's diagnosed children (aged 8 to 10 yrs) took a computerized face recognition test. They responded using both hands to self-, familiar (first degree relative), and unknown faces when presented on the computer.

Results : Subjects were quicker to recognize self-face with their right than left hand. Also subjects were less accurate at identifying a self-face in comparison to a familiar-face with their right hand, but no different when responding with their left hand.

Conclusions : These findings suggest that lateralization of self-processing may be impacted by autistic spectrum pathology since the right hemisphere is more accurate while the left hemisphere works quicker to recognize the self.

Correspondence: *Katie L. Rodak, B.S., Drexel University, S201 Henry Ave., Apt M9, Philadelphia, PA 19128. E-mail: klr36@drexel.edu*

N. ROULEAU & A. SANSCARTIER. Is ADHD Associated With an Homogeneous Neuropsychological Profile?

Objective: Diagnostic of ADHD is based on the observation of behaviors and two principal subgroups are identified: inattention subtype (inattentive, forgetfulness) and mixed subtype (inattentive with impulsivity

and hyperactivity). Cognition is thought to be impaired in ADHD. A few authors hypothesized that ADHD is associated with low IQ. Barkley (1997) proposed that executive functions (EF), especially inhibition, are the core deficit, but only for the mixed subtype. This study aims to assess cognition in ADHD, with the hypothesis that ADHD impairs IQ, attention and EF. The inattentive subtype should show attentional deficits and the mixed subtype, deficits of EF.

Participants and Methods : Patients were recruited from our clinic, located on the campus. Thirty patients were included if they 1) presented ADHD, 2) were aged from 6 to 14, 3) had a global IQ above 80, 4) did not suffer from neurological disorders. They were individually matched with controls on age and gender. Controls were excluded if they showed ADHD or IQ under 80. The neuropsychological assessment addressed intelligence, attention, memory, EF, and visuo-construction. Subjects were tested individually in three different sessions. Medication was removed for a minimum of 24 hours.

Results : Only principal results of the large protocol are shown. We observed no intellectual deficit (global IQ) (only 1 excluded for IQ under 80), and IQ was not related to cognitive performance. Attention was impaired only in a subgroup of patients, and was not specifically associated to the inattentive subtype. Deficits of EF (planning being the most impaired) were observed in the majority of the patients, from both subtypes.

Conclusions : ADHD children show heterogeneous deficits. Contrary to Barkley's hypothesis, the EF deficit is not specific to the mixed subtype and inhibition does not seem to be the most impaired nor the primary deficit. Behavioural manifestations could be distinct from cognitive profile. Research is needed to study the links between cognition and behavior in ADHD.

Correspondence: *nancie rouleau, Ph.D, psychology, university laval, pavillon FA Savard, 11ième étage, U Laval, Québec, QC G1K 7P4, Canada. E-mail: nancie.rouleau@psy.ulaval.ca*

H.C. BOORSTEIN, E.L. ESSER, L.B. WILSON, P. VENTOLA, J. PANDEY, J. KLEINMAN, A. VERBALIS, S. SUTERA, M. ROSENTHAL, M. BARTON, S. HODGSON, G. MARSHIA, T. DUMONT-MATHIEU, J. GREEN & D. FEIN. Stability of DSM-IV-TR Symptoms in Young Children With Autism Spectrum Disorders.

Objective: Although there has been little empirical research into the stability of symptoms of autism spectrum disorders (ASD) over early childhood, it has been suggested that symptoms change over time, especially stereotyped behaviors and interests.

Participants and Methods : This study examined the stability of the 12 DSM-IV-TR symptoms in 27 children evaluated at both 2 and 4 years of age with either Autistic Disorder or Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS).

Results : Paired samples T-tests revealed no significant difference in the mean number of total symptoms at the 2 evaluations (6.59 at 2 and 6.85 at 4). The mean number of symptoms in the specific domains of social interaction, communication, and stereotyped behaviors and interests also did not differ significantly between age 2 and age 4. The most consistent symptom (aside from language delay) was impairment in multiple nonverbal behaviors and a lack of spontaneous seeking to share enjoyment, which was displayed by 81% of children at both evaluations. The symptoms that showed the largest change from "no" to "yes" were the stereotyped use of language (probably because enough language appeared by age 4) and inflexible adherence to nonfunctional routines/rituals; 7 children did not exhibit the symptoms at age 2, but did at age 4. Other behaviors in the repetitive behavior domain did not show consistent changes over time.

Conclusions : Many symptoms of ASD appear to be relatively consistent during early childhood, suggesting the validity of early diagnosis. However, specific symptoms of repetitive behavior tended to appear somewhat later in early childhood.

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

S. LEVIN, D.B. LEGOFF, K.L. RODAK, D.M. RAINES, I.S. PANYAVIN & S.M. PLATEK. Social Functioning and maladaptive behavior scores predict performance on theory of mind tasks in children.

Objective: To determine if maladaptive and social functioning could be predicted from performance on theory of mind (ToM). This research suggests that deficits in social/adaptive functioning may be related to deficits in ToM, which may have utility in certain patient populations. The degree to which interventions designed to increase social skills impact ToM is unknown. This knowledge is potentially beneficial to clinicians and it may be possible to apply experimental ToM tasks to clinical settings as a measurement of adaptive functioning in social environments.

Participants and Methods : 8 participants diagnosed with Asperger's Syndrome completed a computerized version of the Revised Mind in the Eyes Test to measure ToM. The Eyes test entails presentation of persons' eyes and participants chose the appropriate mental state. Participants' parents completed the Asperger Syndrome Diagnostic Scale (ASDS).

Results : Performance on the Eyes test was significantly negatively correlated with expression of maladaptive behaviors. A negative relationship between Eyes test performance and social functioning approached significance. That is, subjects who performed worse on the Eyes test were recorded (by parent report) as expressing increased maladaptive behaviors and deficits in social functioning.

Conclusions : Results of the current study indicate that it may be possible to predict maladaptive behavior (i.e. inappropriate social behaviors) and social functioning using the "Eyes" task. These data lend support for the use of this experimental task in clinical settings, as well as apply what has been traditionally a research based tool to clinical environments. In the future, these findings may have the potential to objectively monitor progress of therapy interventions.

Correspondence: *Sarah Levin, BS, Drexel, 3141 Chestnut St., Philadelphia, PA 19104. E-mail: sarahdrexel@gmail.com*

A. SUTTON & W.G. HAMILTON. Variable Executive Function and Cognitive Performance in Apert Syndrome.

Objective: Apert Syndrome is a rare but identifiable craniosynostosis syndrome occurring in 15.5 of 1 million births. In the last decades, literature addressing Apert's Syndrome reported few cognitive commonalities between children but rather revealed considerable diversity.

Participants and Methods : In this case, a 6-year-old female with Apert syndrome performed with similar variability.

Results : Intelligence testing revealed a discrepancy in verbal and performance IQ with verbal stronger than performance (WISC IV VC: 32nd percentile and PR: 4th percentile). This is unlike previous findings with Apert's syndrome where performance exceeds verbal scores. Weaknesses were found in three primary domains: executive function, verbal memory, and visuospatial performance. In executive functioning, the obvious deficit was inattention and hyperactivity, comparable to findings in other Apert Syndrome studies. The child's own performance was variable, demonstrating above-average performance on a verbal reasoning task and below-average performance on visual executive measures. Overall intact executive functioning was reported at home per parents despite weaknesses observed in clinical testing. Thus, adaptive executive function may need to be distinguished from simulated demands to accurately assess functional abilities. In verbal memory, weaknesses coincided with previous findings of deficits in verbal abilities. Compared to visual memory

(WRAML-2 Picture Memory $SS=95$; 37th percentile), verbal memory was impaired (WRAML-2 Verbal Learning and Story Memory, both $<1\%$). The last weakness was in visuomotor performance, likely due to the history of corrected syndactyly. This defect presents over-all fine motor challenges.

Conclusions : These findings contribute to the growing body of literature suggesting variability and unpredictability in Apert Syndrome and underscores inattention and hyperactivity concerns.

Correspondence: Amy M. Sutton, Georgia State University, 5222 Clearwater Drive, Stone Mountain, GA 30087. E-mail: suttonav@yahoo.com

T. KONDO, K. NAKAMURA, K. TAKAHASHI, R. FUKUMOTO & Y. NAKANO. Noise Sensitivity and Prefrontal Activations in Asperger's Syndrome: a NIRS Imaging Study.

Objective: Some people with autism spectrum disorders often have extremely sensitivity to noise or specific sounds. This sensitivity might cause a panic, confusion or irritation and might indicate an abnormality in their inhibition function. We investigated this sensitivity through prefrontal activations, which is referred to as the inhibition function, by using a near-infrared spectroscopy (NIRS) imaging method.

Participants and Methods : Seven participants with Asperger's syndrome (AS) and eight healthy control participants participated in this study. We measured activations in prefrontal region when AS and control participants hear two noises (A. rubbing two pieces of styrofoam together, B. jingling keys) and a pure tone (300 Hz) in comparison with a control task (pure tone, 400Hz). These sounds were two seconds long and each intervals were randomly alternated between 500 to 2000 ms. Participants were instructed to keep pressing a button for hearing sounds.

Results : Control participants showed a deactivation (decrement of oxy-hemoglobin) for the noise A or B, and activated (increment of oxy-hemoglobin) for the pure tone. This deactivation might indicate that the inhibition function for unpleasant sounds. In contrast with control participants, AS participants did not show the deactivation for the noises. Additionally, two of the AS participants showed significant activations for the noise A.

Conclusions : There is a discriminate difference in the pattern of activations between control participants and AS participants for the noises, which shows an abnormality in their inhibition function. This difference might indicate that AS participants' difficulty in inhibiting unpleasant sounds.

Correspondence: Takeo Kondo, Ph. D, Research Center for Advanced Science and Technology, The University of Tokyo, Barrier-Free Project, Research Center for Advanced Science and Technology, The University of Tokyo, 4-6-1 Komaba, Meguro-ku, Tokyo 153-S904, Japan. E-mail: kondo@bjp.rcast.u-tokyo.ac.jp

J. HALE. Quantifying Medication Response in ADHD: Does Neuropsychological Impairment Matter?

Objective: Although frontal-subcortical circuit dysfunction in ADHD is likely, diagnosis and medication titration is often determined by informant report/behavior ratings, largely because executive measures have adequate ADHD sensitivity but limited specificity. Differentiating executive measures based on known circuit functions could foster diagnostic and treatment efficacy. It was predicted that executive and/or regulation deficits would identify those likely to benefit from Ritalin (MPH) treatment.

Participants and Methods : Children with Inattentive (IT; $n = 17$) or Combined (CT; $n = 32$)/Hyperactive-Impulsive (HT; $n = 4$) 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 executive/regulation factor scores of a published maximum likelihood SEM study, the MPH response was compared for those with low (LI; $n = 15$) and moderate/high (MHI; $n = 35$) impairment. For both the cognitive ($\chi^2(1) = 7.48, p = .006$) and behavior ($\chi^2(1) = 4.76, p = .029$) analyses fewer LI (9 of 15) than MI/HI (31 of 35) participants showed any significant MPH response. Only 3 in the LI group, but 22 children with MI/HI, showed significant cognitive and behavioral MPH response. Most children with LI were ADHD-IT ($n = 12$), but MI/HI was common in CT/HT ($n = 29$).

Conclusions : Results suggest those with executive (i.e., dorsolateral circuit) and regulation (i.e., orbital circuit) deficits, and ADHD-CT, show better MPH response than those with LI and ADHD-IT. CT/HT subtypes may experience striatal dysfunction that secondarily affects the prefrontal cortex, and is ameliorated by the dopamine agonist MPH; whereas the IT could have attention problems secondary to other psychiatric (e.g., depression) or neuropsychological (e.g., right parietal) dysfunction, making significant MPH response unlikely.

Correspondence: James Hale, Ph.D., Philadelphia College of Osteopathic Medicine, Department of Psychology, 4190 City Avenue, Philadelphia, PA 19131-1693. E-mail: jamesha@pcom.edu

Cross-Cultural Issues

S.T. MALLERY, V.C. LLAMAS & A.R. ALVAREZ. Performance Advantage on the Tower of London-DX for Monolingual vs. Bilingual Young Adults.

Objective: Previous research has demonstrated a bilingual advantage for some cognitive processes and a disadvantage for others. Evidence suggests enhancement of some executive functions in bilinguals (Bialystok, 2001) but the extent and mechanism of this advantage is still unclear. This study extends these findings by examining planning and spatial problem solving among bilinguals.

Participants and Methods : Participants were 58 college students (31 monolingual and 28 bilingual) at a small private university. Participants took a battery of tests including the Tower of London DX (TOL-DX) and the Raven Advanced Progressive Matrices (APM).

Results : Four ANCOVAs examined Tower of London performance by language status, controlling for socioeconomic status (SES) and non-verbal intelligence (APM). While monolinguals and bilinguals did not differ in time spent planning problem solutions before executing them (initiation time), bilinguals were less accurate in problem solving (total correct solutions) $F(3,54) = 3.42, p = .024, \eta = .40$; produced significantly less efficient solutions (total move scores) $F(3,54) = 3.23, p = .029, \eta = .39$; and took longer to execute their solutions $F(3,54) = 5.81, p = .002, \eta = .49$.

Conclusions : The reasons for bilinguals' equivalent planning time but relative lower efficiency and accuracy in problem-solving on the TOL-DX are still unclear. Further elucidation of the pattern of strengths and weaknesses of bilinguals in executive tasks may help clarify underlying mechanisms. These results also suggest that bilingual norms may be useful in clinical use of the TOL-DX.

Correspondence: Suzanne Mallery, Psychology, La Sierra University, 4500 Riverwalk Parkway, Riverside, CA 92515. E-mail: smallery@lasierra.edu

S. KAZANDJIAN, J.C. BOROD, J.M. MANLY & A. KLUGER. Effects of Bilingualism and Acculturation on the Neuropsychological Test Performance of Armenian-Americans.

Objective: Given the extensive immigration into the United States from various countries and the strong ethnic communities that exist within

the major cities of the USA, effects of bilingualism and acculturation on neuropsychological test performance of non-Hispanic ethnic Americans is a crucial one. This study examined differences in neuropsychological test performance between non-Armenian, monolingual, Caucasian-American adults and Americans of Armenian descent.

Participants and Methods : Forty Armenian (25 female) and 43 non-Armenian (23 female) participants were given a comprehensive battery of neuropsychological tests, including an acculturation scale and reading measures. Armenian subjects varied in levels of bilingual proficiency, acculturation, years of formal Armenian education, and age of immigration into the United States. Non-parametric and simple regression analyses were used to analyze the data.

Results : Armenian participants performed significantly worse on tests of language ($p=.004$) and narrative memory ($p=.011$) than did non-Armenian participants. Lower scores on the language component of the acculturation scale were related to lower scores on verbal list-learning, narrative memory, and abstract reasoning measures. An effect of origin was found such that Armenians of Eastern origin (Iran/Armenia) performed significantly worse than US-born Armenians ($p=.009$) and Western Armenians (Lebanon/Turkey; $p=.012$) on verbal list-learning tests.

Conclusions : These results suggest that differences in performance on neuropsychological tests with strong verbal components (vocabulary, naming, fluency, story-memory, and verbal list-learning) can be found in bilingual Caucasian immigrants. This effect appears to be related to self-reported levels of Armenian language use, years of US residency, and origin of emigration.

Correspondence: *Seta Kazandjian, M.A., Psychology, Queens College and The Graduate Center of the City University of New York, 200 W.60th St. #21C, New York, NY 10023. E-mail: setakaz@gmail.com*

M. MADORE, J. BURCIAGA, J. WONG & J. RAZANI. The Relationship Between Specific Aspects of Acculturation and the WCST.

Objective: Current research in the field of neuropsychology suggests that cultural variables, such as acculturation, can influence a person's performance (Nell, 2000). The present study examines the different aspects of acculturation and its relationship to the Wisconsin Card Sorting Test (WCST) performance (Heaton, 1993).

Participants and Methods : Eighty-four participants from three broadly defined ethnic backgrounds: Middle Eastern, Asian, and Hispanic were included in this study. All participants were conversantly fluent in English and they ranged in age from 25 to 70. Sixty-five monolingual English-speaking Caucasians with similar demographic make-up also participated. All participants were administered the WCST and the ethnically diverse group were also administered an adapted version of the Acculturation Rating Scale for Mexican Americans (Cuellar, Harris, & Jasso, 1980). This measure is made up of four factors that indicate the degree of affiliation with the dominant American culture: Preferences, Identity, Exposure, and Interaction. Several additional variables used to measure acculturation were also used: U.S. experience, U.S. education, percentage of time English is currently spoken, and percentage of time English was spoken while growing up.

Results : Individual t-tests revealed that the Caucasian participants outperformed the ethnically diverse group on several of the WCST outcome measures. Pearson correlation coefficients found that U.S. Education, U.S. Experience, percentage of time English is currently spoken, and percentage of time English was spoken while growing up significantly correlated with the WCST. Lastly, multiple regression analyses revealed that adapted ARSMA scores indeed successfully predicted the WCST performance, with respect to set failure, of ethnically diverse group.

Conclusions : These findings suggest that it is important to consider various cultural factors when interpreting WCST performance of ethnically diverse individuals.

Correspondence: *Michelle Madore, M.A., Psychology, California State University, Northridge, 2316 Ohio Ave, Apt 103, Cincinnati, OH 45219. E-mail: madore_michelle@yahoo.com*

A.S. THAKUR, A.C. BRICKMAN, R. CABO, D.L. SANCHEZ & J.J. MANLY. Immigration, Cognition, and Aging among Hispanic New York City Residents.

Objective: The elderly population is becoming increasingly ethnically diverse, with particularly rapid growth of Hispanics. There are reports that Hispanic elders are more likely to develop age-related neurodegenerative diseases. One potential problem with this line of research is that many neuropsychological tests have low specificity among Hispanics. The purpose of this study was to characterize how time in the US, as well as cultural and educational experiences of elderly Caribbean Hispanic immigrants impact their performance on neuropsychological measures of language, memory, and executive function.

Participants and Methods : Participants were 1,081 randomly selected self-identified Hispanic residents of Northern Manhattan, age 65 and older who immigrated to the US, and had complete data on years of education, nationality, immigration year, English fluency, and Spanish literacy (measured using the 30-item Word Accentuation Test). Neuropsychological testing was administered in Spanish, and the battery was factor analyzed to yield three factors: language, memory, and executive function.

Results : Using multiple regression analysis, there was a significant effect of time in the US on the language and executive function factor scores, but there was no effect on the memory factor. The significant effect of time in the US remained unchanged after years of education and nationality were accounted for, and was reduced to non-significance only after factoring in Spanish reading level (executive function factor) and English fluency (language factor).

Conclusions : Quality of education, measured by Spanish reading level, and acculturation, measured by English fluency, appear to be the key background variables modulating cognitive test performance among Hispanic elders.

Correspondence: *Akanksha S. Thakur, BA Neuroscience, Sergievsky Center, Columbia University Medical Center, 630 W 168th St, GH Sergievsky Center PH1S, New York, NY 10032. E-mail: athakur@alum.wellesley.edu*

L. RENTERIA, S. TINSLEY-LI & N.H. PLISKIN. Validation of the Spanish Language Wechsler Adult Intelligence Scale - Third Edition (WAIS-III, TEA Version) in a Sample of Urban Mexican Americans.

Objective: The Census Bureau has projected that by 2050, 25% of the U.S. population will be Hispanic. Unfortunately, few measures have been created/adapted for this culturally distinct group. This study provides a first step in validating a cognitive ability measure, the Wechsler Adult Intelligence Scale - Third Edition (WAIS-III; TEA version), for Spanish speaking Mexican Americans.

Participants and Methods : Participants were 86 healthy, Mexican-American, Spanish speaking adults. Participants were administered the Spanish WAIS-III and additional measures to evaluate validity: Raven's Standard Progressive Matrices (criterion), Controlled Oral Word Association Test (convergent), Rey Complex Figure copy (convergent), and Color Trails (discriminant). Internal consistency reliability was examined. Validity was assessed by correlating WAIS-III test scores to performances on corresponding measures. Subtest performances were examined to determine potential test bias.

Results : Average internal consistency of WAIS-III subtests was satisfactory, but inadequate for Letter Number Sequencing. Analysis of criterion-related validity showed the Spanish WAIS-III to have properties similar to the English version. Analyses of convergent validity for visual/verbal domains as well as for discriminant validity were not as strong as anticipated. A review of subtest performances suggested that the order and content of WAIS-III test items may be biased.

Conclusions : Evidence was provided for the use of the Spanish WAIS-III when caution is taken. It is recommended that Letter Number Sequencing be omitted as it underestimates ability. Furthermore, items on the Information and Similarities subtests may be biased and should be re-ordered or revised. Importantly, these results inform the clinical use of cognitive ability measures with Spanish speaking populations.

Correspondence: *Laura Renteria, Ph.D., Psychiatry, University of Illinois Medical Center at Chicago, 912 S. Wood (MC 913), Chicago, IL 60612-7327. E-mail: laura@darrinrthomas.com*

L. RENTERIA, S. TINSLEY-LI & N.H. PLISKIN. The Influence of Acculturation, Education, and Language Proficiency on the Neuropsychological Test Performance of Urban Mexican Americans.

Objective: Given the increasing numbers of Hispanics in the United States, it is urgent we examine how cultural and demographic variables effect neuropsychological test performance in order to increase the validity and accuracy of test findings. The aim of this study was to examine how acculturation, education, and language proficiency predict test performance.

Participants and Methods : Participants were 86 healthy, Mexican-American, Spanish speaking adults. Participants completed the Short Hispanic Acculturation Scale by Marin and Marin (1991) to determine levels of acculturation. Various questions were used to assess proficiency in the English and Spanish language. Participants were also administered the Spanish WAIS-III (TEA Version), Color Trails, Rey Complex Figure copy, Controlled Oral Word Association, and Raven's Standard Progressive Matrices. Regression analyses were conducted to examine the hypotheses.

Results : Increased education and age were found to predict higher test performance across most of the WAIS-III subtests, except Picture Completion. Lower acculturation to the dominant culture predicted lower scores on FSIQ, PIQ, POI, and seven subtests of the WAIS-III. Higher proficiency in Spanish was expected to predict higher verbal test performances, but these analyses were not significant.

Conclusions : A salient finding from this study was the relationship between education and test performance, regardless of the verbal or non-verbal content of the test. These results challenge the notion that non-verbal measures provide the best estimate of IQ in cultural minorities with very little to no education. This study also emphasizes the importance of assessing acculturation level to enhance our understanding of neuropsychological test results.

Correspondence: *Laura Renteria, Ph.D., Psychiatry, University of Illinois Medical Center at Chicago, 912 S. Wood (MC 913), Chicago, IL 60612-7327. E-mail: laura@darrinrthomas.com*

S.P. VERNEY, J. BENNETT & F. CANDELERIA. The Influence of Ethnic Experience in Cognitive Ability Assessment.

Objective: Scores from cognitive ability tests are often the basis of one's educational and professional opportunities. The purpose of this study is to investigate the relationship between ethnic experiences and cognitive ability for a diverse sample of undergraduate students. Ethnic experiences are likely to better assess one's cultural influences than ethnic group status alone.

Participants and Methods : White (n=36) and Hispanic (n=25) students completed an abbreviated version of the WAIS-III and the Scale of Ethnic Experience (SEE).

Results : Consistent with the literature, the White students scored significantly higher than did the Hispanic students on Verbal and Full-Scale IQ, but the two groups did not differ on Performance IQ. The Hispanic students scored significantly higher than did the White students on the SEE factors of Ethnic Identity and Perceived Discrimination, but the groups did not on the Mainstream Comfort or Social Affiliation factors. As predicted, Ethnic Identity scores for the Hispanic students were negatively correlated with the Verbal and the Full-Scale IQ even after socio-economic status was taken into account.

Conclusions : This finding suggests that Hispanic students who are more acculturated (i.e. identify less with their ethnicity) scored higher on this cognitive ability measure. Culture, therefore, may play a role when using the WAIS-III to assess the cognitive ability of ethnic students. Thus, level of acculturation needs to be taken into account when measuring cognitive ability among ethnic groups or new assessment tools need to be created that do not have culture as a confound.

Correspondence: *Steven P. Verney, Ph.D., Psychology, University of New Mexico, MSC03-2220, Albuquerque, NM 87131-0001. E-mail: sverney@unm.edu*

P.A. SUAREZ, M. CHERNER, S. DAWES, I. GRANT & R. HEATON. The Relationship between Subjective Cognitive Complaints, Depressive Symptoms and Neuropsychological Functioning Among HIV-seropositive Spanish vs. English Speakers.

Objective: Research with English speakers has shown that depressed individuals typically have elevated cognitive complaints regardless of their neuropsychological (NP) status (impaired vs. unimpaired). Less is known about these relationships in Spanish speakers. The current study compares the pattern and strength of correlations between these variables in HIV+ Spanish vs. English speakers.

Participants and Methods : Seventy Spanish-speaking (Mexican descent) and 127 English-speaking (Caucasian) HIV+ participants with comparable age, education, gender proportions, and CD4 counts completed the Beck Depression Inventory (BDI) (Beck, 1979), the Patient's Assessment of Own Functioning Inventory (PAOFI) (Chelune, 1986), and a comprehensive NP battery in their respective language.

Results : For both groups, the strongest predictor of complaints on the PAOFI was BDI score (English: $Rho=.61$, $p<.0001$; Spanish: $Rho=.51$, $p<.0001$). There were much more modest correlations between documented NP impairment and PAOFI as well, that were significant among English-speakers but not Spanish-speakers (perhaps resulting from sample size). High PAOFI scores were evident among depressed participants (BDI ≥ 10) of both groups, irrespective of NP status. Among non-depressed participants, NP impaired subjects endorsed about twice as many complaints as NP normal subjects (English: 4.2 vs. 2.5, $p=.09$; Spanish: 4.0 vs. 1.4, $p=.03$).

Conclusions : Findings are consistent with previous literature showing strong relationships between subjective report of cognitive complaints and depressive symptoms. Relationships among these variables and actual NP performance are largely similar between these culturally and linguistically different groups. Among non-depressed individuals, PAOFI scores above 3 may be suggestive of cognitive impairment.

Correspondence: *Paola A. Suarez, M.A., Psychiatry, UCSD, 150 W. Washington St 2nd Floor, 0603H, San Diego, CA 92103. E-mail: mcherner@ucsd.edu*

K.A. LONER, A.N. CERNICH, R. OUAOU, M.H. KABAT, E.E. LASHER & R.L. KANE. Evaluating Premorbid Level of Function in Dementia: The Influence of Ethnicity and Cognitive Status.

Objective: The purpose of this study was to evaluate the discrepancy between reading level and reported level of education as a function of ethnicity and cognitive status in consecutive outpatients referred to a dementia assessment clinic.

Participants and Methods : Of 157 participants referred to the clinic, 128 had complete data for included variables (African-American, N=51 and Caucasian, N=77). An analysis of covariance was performed on the discrepancy score (the difference between age-adjusted WRAT-3 reading scores and reported level of education) with ethnicity as the fixed factor and general cognitive status as the covariate. Impaired general cognitive status was defined as MMSE < 21.

Results : The overall F for the model was significant ($(3, 124) = 5.838$, $p<.01$). No significant interaction effects were found. There was a statistically significant main effect ($F(1, 124) = 3.747$, $p=.01$) of ethnicity. African Americans demonstrated a greater negative discrepancy between WRAT reading score and reported level of education than Caucasians. However both groups had individuals with substantial discrepancy scores both positive and negative. For African Americans, this range was from +8 to -12 grade levels.

Conclusions : Irrespective of cognitive status, African Americans demonstrated a greater average negative discrepancy between reading achievement and actual level of attained education, such that the reported level of education was higher than the WRAT-Reading achievement score. These results underscore the importance of using ethnicity based norms. However, individuals in both groups had significant discrepancy scores in both directions complicating the estimation of their pre-morbid baseline.

Correspondence: *Kara A. Lonser, M.A., Mental Health, VA Maryland Healthcare System, Baltimore Campus, 10 N. Greene Street, Baltimore, MD 21201. E-mail: kalonser@hotmail.com*

M. KRISHAN & E.J. MOES. The Effect of Socioeconomic Variables and Gender on Executive Tasks in Asian Indian Children: A Cross-Cultural Replication.

Objective: Armengol (2001) found significant differences in performance on the Stroop test (a measure of inhibition) in Mexican children, depending on their socioeconomic status (SES). In this study, sixty (30 male and 30 female) schoolchildren in India, ages 9 to 11, were tested on measures of executive functioning that have previously been applied in studies of Mexican (Armengol, 2001) and U.S. children (Comalli, Wapner, & Werner, 1962; Delis, Kaplan, & Kramer, 2001).

Participants and Methods : Following Armengol, SES was defined by parental education, and school attended (high SES versus low SES). The two schools in this study were private and matched on language used (English) and syllabus, but differed substantially in tuition. While the children from the two schools did not differ in age, HSES children performed better on the Raven's Colored Progressive Matrices, which was covaried in subsequent analyses. Parental education did not differ across the two schools and was unrelated to children's performance on executive tasks

Results : While the children from the two schools did not differ in age, HSES children performed better on the Ravens Colored Progressive Matrices, which was covaried in subsequent analyses. Parental education did not differ across the two schools and was unrelated to children's performance on executive tasks. Children in the high SES school (HSES) were more proficient on the 100 item trial version of the Color Word Interference (CWIT) subtest of the Delis-Kaplan Executive Function System (D-KEFS), being faster on Color Naming, Word Reading and Inhibition conditions and demonstrating less interference (Inhibition minus Color Naming).

Conclusions : No differences were found on the Interference/Switch condition, possibly because this is a harder task for all children (with a proportionately larger standard deviation). Developmental trends in performance are further discussed in relation to normative data from the U.S. and Mexico, together with gender effects.

Correspondence: *Elisabeth J. Moes, Ph.D., ABPP, Suffolk University, 280 Chestnut Ave, Boston, MA 02130. E-mail: elisabethmoes@yahoo.com*

J.T. WONG, C. ROBINSON, J. BURCIAGA & J. RAZANI. The effects of acculturation on language performance in a group of ethnically diverse individuals.

Objective: The purpose of the current study was to investigate language performance in groups of ethnically diverse and Anglo-Americans. The BNT (Kaplan, Goodglass, & Weintraub, 1983) is the single most frequently used test of visual confrontation naming in the United States. Verbal fluency (e.g., FAS) is also a very commonly administered test. We examined the performance of 100 fluent English-speaking bilingual individuals from ethnically diverse backgrounds (Hispanic/ Latino, Middle Eastern and Asian descent) to that of 77 monolingual English-speaking Anglo-Americans on tests of confrontational naming and language ability.

Participants and Methods : Participants were between 20-75 years of age. The 60-item Boston Naming Test (BNT), the FAS, and animal category fluency tests were administered to all participants as part of a larger battery of the neuropsychological tests. The ethnically diverse participants were also administered an adapted version of the Acculturation Rating Scale for Mexican Americans (Cuellar, Harris, & Jasso, 1980).

Results : The results revealed that the Anglo-Americans outperformed the ethnically diverse group on BNT correct ($p < .01$), FAS ($p < .05$), and animal category fluency ($p < .05$). For the bilingual group, Pearson r bivariate correlations determined a statistically significant relationship between acculturation level and BNT as well as FAS fluency test.

Conclusions : These findings suggest that tests of confrontational naming and language abilities may be more demanding for ethnically diverse individuals and that performance on these tests is related to the degree of acculturation to the Anglo-American culture.

Correspondence: *Jennifer T. Wong, MA, Psychology, University of Detroit Mercy, 24519 Rensselaer Street, Oak Park, MI 48237. E-mail: jenniferwong1@cs.com*

Imaging: Structural

S. BAVA, R.J. THEILMANN & D.A. TRAUNER. Characterization of Visuospatial Impairment in a Genetic Metabolic Disorder using Diffusion Tensor Imaging.

Objective: Neurodevelopmental disorders with specific genetic etiologies provide a window into the study of gene-brain-behavior relationships. Infantile nephropathic cystinosis is a genetic metabolic disorder with known neurobehavioral sequelae. Cognitive deficits are particularly evident in the visuospatial domain and are accompanied by impairments in arithmetic and tactile recognition. While the genetic causes and behavioral expression of this disorder are well characterized, the underlying neuropathological features are only grossly defined.

Participants and Methods : This study focused on characterization of the structural markers of visuospatial dysfunction in a young group of children (ages 3-7 years) with cystinosis ($n = 7$) in reference to an age-matched group of typically developing children ($n = 7$) to determine whether the previously identified "where" pathway may be a potential locus of dysfunction in the pathophysiology of visuospatial impairment observed in this group. Diffusion tensor imaging (DTI) was employed as a means of exploring white matter integrity. Diffusion parameters including fractional anisotropy (FA) and average diffusivity (D_{av}) were calculated using a voxel-based analysis.

Results : The cystinosis group demonstrated significantly lower FA in white matter tracts of the right superior and inferior parietal regions ($p = .001$) compared to controls. A similar pattern was evident in the left superior parietal region ($p = .001$). Comparison of D_{av} did not reveal significant differences between groups. Low anisotropy was not associated with high diffusivity in the cystinosis group.

Conclusions : We speculate that a lack of such a correlation may reflect white matter disintegrity in the form of incomplete myelination or breakdown of membrane microstructure.

Correspondence: *Sunita Bava, Neurosciences, UCSD, Division of Pediatric Neurology, 9500 Gilman Dr. 0935, La Jolla, CA 92093-0935. E-mail: sbava@crl.ucsd.edu*

Psychopathology: Depression

F. CONSTANTINIDOU & M.A. SARAP. Presentation Modality Effects in Children with Major Depressive Disorder and in Non-Depressed Cohorts.

Objective: Research suggests that major depressive disorder (MDD) may affect working memory performance. List learning tasks are typically

used to assess working memory. Studies with patients with memory impairments, such as TBI, indicate that visual presentation enhances memory and learning. Stimulus presentation preferences have not been explored in children with MDD. This study investigated the effects of presentation modality (Auditory, Visual, and simultaneous Auditory & Visual) on the verbal learning performance of inpatients with MDD and in non-depressed children. It was hypothesized that pictures would facilitate working memory performance.

Participants and Methods : Subjects: 9 children hospitalized for MDD ages 8-12 (mean age=10.53 years, SD=1.44) were matched with 13 children without depression (mean age=10.53, SD=1.44) on variables such as age, socioeconomic status, intelligence, and educational attainment. Procedures: The California Verbal Learning Test-Children and an experimental multitrial free-recall paradigm were implemented. The experimental task incorporated three modalities: Auditory, Visual, and simultaneous Auditory & Visual.

Results : Mixed model MANOVA demonstrated that depressed subjects learned significantly fewer words than their non-depressed cohorts across the three modalities ($p=.026$). However, the rate of learning was similar between the 2 groups ($p=.214$). Both groups improved during the repeated learning trials ($p<.001$), and learned more items during the visual presentation ($p=.004$) compared to the auditory presentation alone. Children with MDD did not demonstrate a significant retroactive interference (RI) effect ($p=.445$)

Conclusions : 1. The visual (pictorial) presentation (with or without the simultaneous presentation of names) facilitates verbal learning in school age children with or without MDD.

2. MDD interferes with information encoding during verbal learning.

3. Children with MDD are able to maintain information and don't show increased levels of RI.

Correspondence: *Fofi Constantinidou, Ph.D., Speech Pathology & Audiology, Miami University, 2 Bachelor Hall, Oxford, OH 45056. E-mail: constaf@muohio.edu*

Poster Symposium 1

12:30–2:00 p.m.

Neuroethics in Clinical and Research Practice

P. FORD. *Autonomy, Ulysses, and Limits: Revoking Consent During Brain Surgery.*

Respecting patient/client autonomy is fundamentally intertwined with persistent and consistent desires and goals. This means that we must be concerned with the challenges posed when patients express choices that appear inconsistent during circumstances that may be transient. Although this problem arises in many instances, such as MRI or schizophrenia research, the most interesting type of case arises when a patient asks for a surgery to be discontinued in the midst of an awake craniotomy. A variety of interesting ethical challenges become most acute in this type of surgical instance. I will briefly describe a case of intraoperative revocation of consent by a Parkinson's disease patient undergoing Deep Brain Stimulator placement. Can current tools reliably predict a revocation? Is a Ulysses contract permissible if the patient is at risk? Should all patients at risk be excluded from beneficial therapy? Are there tests that can be administered intraoperatively to test the capac-

ity of a patient to revoke consent? What degree of "informed revocation" would be necessary in order for the surgeon to be obligated to discontinue the procedure? I will draw connections between these questions and the presentations of the first three panelists in terms of justice, informed consent (autonomy), doing no harm, and professional obligations.

Correspondence: *Cynthia S. Kubu, PhD, Psychiatry and Psychology, The Cleveland Clinic Foundation, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: kubuc@ccf.org*

C.S. KUBU. *Who Decides Who Should have Surgery? Neuroethics on a Functional Neurosurgery Multidisciplinary Team.*

Many functional neurosurgery teams rely on a multidisciplinary team assessment and consensus conference to help determine a patient's candidacy for surgery. Neuropsychology is often an important member of this team. This presentation will focus on multidisciplinary decision-making in a Deep Brain Stimulation (DBS) team. DBS for the treatment of movement disorders is gaining in popularity. In general, the available reports suggest that relatively little cognitive morbidity is associated with DBS. However, virtually nothing is known about neurobehavioral outcome in "borderline" cases such as patients with cognitive deficits and/or neuropsychiatric difficulties. Most often it is the neuropsychologist who identifies the cognitive and neuropsychiatric behaviors that might preclude a patient's candidacy for surgery. However, in the absence of good outcome data, who should be included in making this decision? Does the possibility of increased risk of cognitive deficits and/or neuropsychiatric decline outweigh the high probability of significant improvement in motor symptoms? Often these scenarios result in tension between the principles of respect for autonomy (allowing the patient and family to make the ultimate decision, "informed consent"), beneficence, malfeasance and the team's fiduciary role with the patient/family. In addition, implicit within these discussions are differing perspectives regarding the importance of various characteristics that define personhood. These ethical principles and assumptions will be discussed in the context of an emerging neurotherapy that can significantly alter brain function and behavior.

Correspondence: *Cynthia S. Kubu, PhD, Psychiatry and Psychology, The Cleveland Clinic Foundation, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: kubuc@ccf.org*

C. GRIGGINS. *The Diagnosis and Treatment of ADHD: A Social Justice Critique.*

The diagnosis of ADHD, especially in adolescents and young adults, not only provides access to prescribed stimulant drugs, but also entitles one to accommodations in the classroom and on standardized tests. The purpose of accommodations such as note-takers, extended time on tests, and testing in a private room is to "level the playing field" for those with a disability. But epidemiological data suggests that the diagnosis of ADHD (and access to such accommodations) is far more prevalent in affluent, white communities, thus raising serious questions of social justice. What are the ethical responsibilities of neuropsychologists in testing children and adults for ADHD? Does this responsibility extend beyond the patient who seeks (and can afford) our services? When does "treatment" become "enhancement"? These and other ethical dilemmas in diagnosing ADHD will be explored, as well as neuropsychologists' roles as gatekeepers in accessing medications and academic accommodations.

Correspondence: *Cynthia S. Kubu, PhD, Psychiatry and Psychology, The Cleveland Clinic Foundation, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: kubuc@ccf.org*

Symposium 6

2:00–3:30 p.m.

**Honouring Marcel Kinsbourne,
Demolisher of Walls**

S.E. PARLOW, M. HISCOCK, M. KINSBOURNE, D. DENNETT, E. TULVING, J. LIEDERMAN, J. SWANSON & F. WOOD. Honouring Marcel Kinsbourne, Demolisher of Walls.

Symposium Description : The social psychologist Elliot Aronson once observed that some scientists demolish walls, others sweep up the debris. This symposium honours Marcel Kinsbourne, demolisher of walls, iconoclast extraordinaire. Few individuals can boast of having impacted on so many disciplines and subjects. His wide-ranging interests link to fundamental questions like, “What is the basis of conscious experience?”; “How does the brain work?”; “Why is the nervous system crossed?” From early in his career, Kinsbourne saw the brain as a dynamic and self-stabilizing network of localized circuits influencing each other in adaptive and maladaptive ways, reflecting our evolutionary history. He developed powerful heuristics for understanding normal and abnormal brain (e.g., cross-talk, functional distance, dominant focus, co-activation, approach/withdrawal, positive vs. negative emotions), as well as innovative research techniques (e.g., adapting dual-task interference and lateral eye movement methodologies for neuropsychological use; a protocol for determining best therapeutic drug dosage for treatment of ADHD). Many of Kinsbourne’s ideas seemed so radical at first as to provoke strong resistance. Over the years, however, they have been tested, supported, modified, and integrated into the neuropsychological mainstream. Ironically, one result of this assimilation process is that the ideas have survived but their origin has become obscure, especially to younger neuropsychologists. Our speakers will remind the audience of the man behind the bold ideas. They will paint a warm picture of the man, his work, and his influence. We focus today on four topics: consciousness, memory, ADHD and learning disabilities.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

D. DENNETT. Since “Time and the Observer”: Thinking About Consciousness.

Marcel Kinsbourne’s iconoclastic thinking about consciousness has been inspiring and provoking philosophers and other theory-builders for decades. Our 1991 article on consciousness in the brain was voted one of the Ten Best Philosophical Essays of that year. Kinsbourne’s contributions to this area of study will be reviewed and evaluated, focusing on the fifteen years since that paper appeared.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

E. TULVING. Episodic Memory: A Special Kind of Consciousness.

Episodic memory is an aspect of memory that requires a special kind of consciousness for its own functioning in the real world and for its scientific understanding. Kinsbourne’s early insights into, and contributions to the development of ideas about, episodic memory, will be reviewed and discussed.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

J. LIEDERMAN & J. LIEDERMAN. The CNS as a “CNS” (Competitive Network System).

Where others confined themselves to the localization of autonomous modules, Kinsbourne envisioned sweeping multisystem population effects, exquisitely sensitive to the relative degree of activation of closely connected systems. Their amount of connectivity or “functional distance”, rather than physical adjacency, both explained known phenomena and predicted novel ones. A variety of examples will be presented. These include effects observed in laboratory studies with normal subjects (e.g., direction of gaze, covert shifts of attention, hemisphere-specific priming and dual task interference, benefits of projecting confusable inputs to separate hemispheres) and also effects observed clinically (e.g., articulatory suppression silences schizophrenics’ hallucinated voices, bilateral simultaneous neglect after split brain surgery, language transfer in severe aphasia, roles of the anterior cortices in mood disorders). Finally, the experience of consciousness is viewed as an emergent phenomenon, reflecting reciprocal interactions between multiple foci of activity, such that from moment to moment, the most activated network dominates the content of awareness.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

F. WOOD. Remembering the ‘70’s: Kinsbourne’s Influence on Psychology Graduate Students at Duke University.

I will provide a personal account of Kinsbourne’s influence on psychology graduate students in the mid 1970’s at Duke, noting particularly that — like Charcot — he made his most lasting impact with vivid case demonstrations of neuropsychological patients. Certain key strands in the evolution of Kinsbourne’s work will be traced from those days, including the episodic-semantic memory distinction in neuropsychology, the impact of his distinctive attentional model of laterality on psychopathology, learning disorders, and behavioral styles, his unique contributions to forensic behavioral neurology, and — more than any other — his evolving effort to conceive a chaotic mathematical model of brain and behavior. In Kinsbourne’s case, this overlaps quite considerably with his well-known sense, and intellect, of humor.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

J. SWANSON. Laboratory Assessments of Stimulant Medication: The Impact of the Toronto Studies.

The history and influence of laboratory assessments of stimulant medications will be discussed. This approach was initiated by Kinsbourne in Toronto, and extended by me at UC Irvine. Today they are used in “proof of concept” and “proof of product” studies for many pharmaceutical companies. This application of Kinsbourne’s insightful ideas and theoretical proposals was important for the development of controlled-release formulations of the stimulants Concerta, Adderall XR, and Metadate CD. These are now the primary drugs prescribed for ADHD and are used to treat millions of children each day in the USA and other countries.

Correspondence: *Shelley E. Parlow, PhD, Psychology, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S 5B6, Canada. E-mail: shelley_parrow@carleton.ca*

Symposium 7

2:00–3:30 p.m.

Living With Amnesia: The Story Of Clive Wearing

B.A. WILSON, M. MOSCOVITCH, M. KOPELMAN, E. BIGLER & B.A. WILSON. Living With Amnesia: The Story Of Clive Wearing.

Symposium Description : Clive Wearing was a world class musician and musical scholar. He played at the wedding of Prince Charles and Diana Spencer. In 1986 he contracted herpes simplex encephalitis which left him densely amnesic but with his musical skills intact. His wife has written a book about the personal side of living with amnesia entitled “Forever Today” reflecting the fact that Clive constantly believes he has just woken up. In this symposium we describe Clive, the nature of his memory functioning including both strengths and weaknesses, the anatomical structures affected by the virus, his contribution to our understanding of memory and his place in memory research. We also look at changes over the twenty year period since he first became ill and his response to rehabilitation.

Correspondence: *Barbara A. Wilson, Ph.D, Cognition and Brain Sciences Unit, Medical Research Council, Box 5S, Addenbrooke’s Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

B.A. WILSON. The Man Who Has Just Woken Up: A Twenty Year Follow Up Study.

CW survived Herpes Simplex Viral Encephalitis in 1985. He was left with extremely severe amnesia. For the past twenty years he thinks he has just woken up and this is one of the major themes in his conversation. He also records this moment of just awakening in his diary and has done so many times each day over the years. Although his scores on standardised memory tests have changed little since he was first assessed and he has failed to learn new linguistic terms such as ‘e-mails’ and ‘mad cow disease’ that have entered the English language since the onset of his amnesia, there have been improvements in his behaviour and his mood. This paper addresses four issues. First we establish the stability of CW’s episodic memory impairments since he was assessed in 1985 a few months after his illness. Second, we consider the almost total lack of new semantic learning when this is assessed in a standardised way (his wife, however, can elicit some new semantic knowledge when she asks leading questions). Third, we look at his implicit memory which appears to be relatively intact given that he can benefit from an errorless learning procedure. The fourth and final issue addresses CW’s response to rehabilitation. Given the severity of his amnesia and the fact that he has additional cognitive difficulties, the most effective rehabilitation approach is that which involves modifications to CW’s physical and verbal environment. These are described and considered within a recent model of rehabilitation.

Correspondence: *Barbara A. Wilson, Ph.D, Cognition and Brain Sciences Unit, Medical Research Council, Box 5S, Addenbrooke’s Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

E. BIGLER. The Neuropathology of C.W.

In this patient with a dense amnesia, clinical magnetic resonance imaging (MRI) revealed extensive bilateral medial temporal lobe damage, more so on the left where essentially the entire medial temporal lobe had

atrophied. Complete atrophy of the left hippocampal formation and amygdala were present, with near complete loss of both structures on the right. Some nonspecific, generalized atrophic changes affecting the entire brain were also evident, manifested by a dilated ventricular system and prominence of cortical sulci. Quantitative analyses demonstrated whole brain volume reduction, atrophic corpus callosum and severe bi-temporal atrophy, greater on the left. There was some sparing of the left superior temporal gyrus. Three-dimensional (3D) modeling of the brain is used to demonstrate areas of damage as well as intact brain structure in relationship to the patient’s neuropsychological and neurobehavioral functioning.

Correspondence: *Barbara A. Wilson, Ph.D, Cognition and Brain Sciences Unit, Medical Research Council, Box 5S, Addenbrooke’s Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

M.D. KOPELMAN. CW: His Place in Memory Research.

CW is a profoundly amnesic patient, who experienced an acute episode of herpes encephalitis in 1986. There was severe damage to the medial temporal lobes bilaterally as well as atrophy and signal alteration elsewhere in the cortex, including the frontal lobes. The severity of CW’s amnesia resembled and corroborated many of the features described in the early accounts of HM, and is similar to other profoundly amnesic patients such as SS, EP, RFR, and KC. In particular, CW had preserved short-term memory with profound long-term memory impairment, such that he would forget having met his wife only a few minutes earlier. His retrograde amnesia was severe and extensive. By contrast, procedural skills, notably his musical ability, were well preserved even though he was not ‘explicitly’ aware of this. In this, he can be contrasted with PKC, another musician with encephalitis. A notable feature was CW’s often repeated statement that he had “just woken up”. Particularly interesting are his preserved emotional responsiveness, the interaction between his emotions and his cognitive state, and the slow improvements noted over a very long time-period.

Correspondence: *Barbara A. Wilson, Ph.D, Cognition and Brain Sciences Unit, Medical Research Council, Box 5S, Addenbrooke’s Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

M. MOSCOVITCH. Discussant.

Discussant

Correspondence: *Barbara A. Wilson, Ph.D, Cognition and Brain Sciences Unit, Medical Research Council, Box 5S, Addenbrooke’s Hospital, Cambridge CB2 2QQ, United Kingdom. E-mail: barbara.wilson@mrc-cbu.cam.ac.uk*

Symposium 8

2:00–3:30 p.m.

A Critique of the Compensatory Hypothesis: Survey of Functional MRI Studies Across Neuropsychological Disorders

B.A. CROSSON. Compensatory Reorganization in Recovery from Aphasia After Stroke.

Functional imaging evidence consistently indicates that perilesional areas assume language functions in good recovery from aphasia after stroke,

while the right hemisphere exhibits increased activity in chronic moderate to severe aphasias. One interpretation of these data is that in poor recovery from aphasia, right-hemisphere activity results from disinhibition of right-hemisphere mechanisms and hampers recovery. However, evidence also indicates that in poor recovery, increased right-hemisphere activity occurs in the context of larger left-hemisphere lesions, suggesting that extent of left-hemisphere injury may account for poor recovery of function. Indeed, loss of language function in aphasia patients during anesthesia of the right hemisphere or after a second, right-hemisphere stroke indicates that the right hemisphere plays a role in recovery of language function for at least some patients. An increasing number of studies indicate that both left- and right-hemisphere mechanisms play a role in the language of aphasia patients. The contribution of the right hemisphere appears to lie in areas homologous to the damaged left-hemisphere mechanisms. At the same time re-engagement of intact left-hemisphere mechanisms also seems to play an important role in recovery. Evidence will be discussed indicating that strategies to increase and/or focus right-hemisphere activity during language processing are beneficial in aphasia therapy. Thus, development of aphasia therapies should focus both on recruiting right-hemisphere mechanisms to compensate for damaged left-hemisphere ones and on engaging intact left-hemisphere mechanisms to improve language performance. Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

M.W. BONDI, W.S. HOUSTON & S. HAN. Learning by APOE Genotype Among Nondemented Older Adults: Review of FMRI Evidence for the Compensatory Hypothesis.

Objective: A growing body of functional MRI studies suggests that older adults at risk for Alzheimer's disease (AD) demonstrate a compensatory response during learning, with the typical directionality implicating over-recruitment of brain resources among risk groups to maintain equivalent behavioral performance levels. Bookheimer et al.'s (2000) study first demonstrated this possibility, and subsequent studies from our group among others have replicated and extended these initial findings. Nevertheless, there are a number of possible confounds that continue to cloud work in this area, including-but not limited to-poorer memory among risk groups, phenotypic differences unrelated to disease, interpretability of signal change via the subtraction method, differential atrophy or blood perfusion, and standard space renderings of regions of interest. Moreover, directionality of signal change itself has also been conflicting across studies.

Methods and Results: This presentation will highlight our recent work that attempts to control for, or formally examine, these confounding factors. Two separate FMRI learning studies of older adults at risk for AD by virtue of the APOE susceptibility gene will be presented alongside other similar studies in this area. Twenty subjects completed picture encoding (10 $\epsilon 4$; 10 $\epsilon 3$), and 25 other subjects (12 $\epsilon 4$; 13 non- $\epsilon 4$) completed a verbal paired-associate encoding study. Both studies found greater extent and patterns of brain response during learning among APOE $\epsilon 4$ groups in the absence of any structural, cognitive or demographic differences. **Conclusions:** Conclusions, vis-a-vis the compensation hypothesis, and directions for future studies will be discussed.

Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

A.J. SAYKIN, T.W. MCALLISTER, L.A. FLASHMAN, B.C. McDONALD, H.A. WISHART, S.J. GUERIN, H. RHODES & G.J. TSONGALIS. Allocation of Memory Processing Resources after Mild TBI: Integrating Imaging, Pharmacologic Challenge and Genetic Approaches to Mechanism.

Problem: We previously reported evidence of altered working memory activation patterns on FMRI as a function of processing load in

MTBI patients during the first post-injury month (McAllister et al 1999, 2001). We and others have hypothesized that alterations in the catecholaminergic system might underlie cognitive deficits after MTBI (McAllister et al., 2004). Allelic variation in genes coding for proteins that modulate catecholaminergic tone could be moderators of functional changes after MTBI, as could other genes related to plasticity/repair, microvascular and neuroinflammatory processes.

Participants and Methods: We recruited several cohorts of patients with MTBI and controls that have been studied with auditory verbal or visual working and episodic memory FMRI probes, as well as with structural MRI, cognitive testing and genotyping for candidate alleles. One series of MTBI patients and healthy controls was studied with fMRI after a challenge with bromocriptine, a dopaminergic (DA) agonist compared to placebo. Genotyping was performed for several DA genes including DRD2, DAT and COMT; polymorphisms for APOE, BDNF, CHRM2 and IL-6 were also assessed.

Results: Our initial studies found similar task performance but altered load dependent FMRI activation in MTBI patients compared to controls. On the bromocriptine challenge study, the control but not MTBI group showed improved performance and increased left prefrontal activation on drug vs. placebo. Preliminary analyses suggests that genetic variation can contribute to interpretation of FMRI activation patterns.

Conclusions: Cognitive and pharmacological FMRI challenges and genetic analysis can clarify the neural basis of MTBI related compensatory changes and inform treatment development and evaluation.

Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

J.A. BOBHOLZ, S. DURGERIAN, A.B. GLEASON, J. KANZ, C. ELSINGER & S.M. RAO. Relationship Between Lesion Burden and Memory Activation Patterns In Relapsing Remitting Multiple Sclerosis: An FMRI Study.

Objective: Studies that have examined the relationship between structural MRI indices and cognitive functions in multiple sclerosis (MS) have consistently demonstrated modest associations. It is possible that traditional structural neuroimaging measurement is unable to fully measure MS pathology; however, recent fMRI findings suggest the brain may be compensating with disease activity. This study examined the relationship between disease pathology (T2 lesion burden) and FMRI activation patterns during encoding and retrieval of episodic information (words).

Participants and Methods: Thirty-six patients with relapsing-remitting MS were enrolled in this study (mean age of 44 years). In addition to neurologic and neuropsychological exams, all subjects completed both structural and functional MR imaging. The FMRI task consisted of two conditions, encoding and recognition of visually presented words.

Results: Significant positive associations between T2 lesion burden and FMRI activation (regression based analyses) were evident during the recognition phase of this task, while no regions showed significant correlations during the encoding phase. Regions of significance included bilateral inferior and middle frontal gyri, thalamus, left inferior parietal, cingulate, and insula regions. Highest associations were noted in the left precentral gyrus ($r=.76$), left inferior frontal gyrus ($r=-.75$), and right medial frontal gyrus ($r=.72$). Lesion load correlated with performance on the PASAT ($r=-0.52$, $p<.001$) but did not correlate with other cognitive measures including the memory task performed in the scanner.

Conclusions: These data suggest that increased lesion burden is associated with greater activation in regions often seen in memory paradigms, as well as in regions that may reflect neural compensation.

Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

G.G. BROWN. Potential Vascular Confounds in FMRI Studies of Brain Compensation in Schizophrenia.

Objective: Findings from several functional magnetic resonance imaging studies, measuring blood oxygen level dependent (BOLD) contrast, support the existence of compensatory brain responses when schizophrenia patients perform some cognitive tasks. Investigators reporting these findings wish to attribute any observed differences in BOLD response to differences in neural mechanisms. However, BOLD signals are not a direct reflection of neural activity. Rather they are expressed through a hemodynamic system that might be disordered in schizophrenia. Moreover, the baseline and dynamic properties of the hemodynamic system can be affected by prescribed medications and by recreational drugs more prevalent in schizophrenia patients than in healthy volunteers. The objective of this presentation is to use computer simulations, to show that regional variation in the hemodynamic baseline or in the range of hemodynamic response can mask or masquerade as compensatory BOLD response.

Methods: Perfusion and BOLD data from an acetazolamide study will be used to demonstrate the impact of baseline perfusion on BOLD response. Next, BOLD signal maps from FMRI studies of schizophrenia patients will be altered in computer simulations that change BOLD signals to reflect reported regional variations in levels of baseline cerebral blood flow, baseline cerebral blood volume, and hemodynamic responsiveness. The use of physiological measurements, hemodynamic challenges, magnetic resonance methods to measure blood volume and flow, statistical models, and appropriate experimental designs to correct for hemodynamic effects will be discussed.

Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/ Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

M.W. BONDI, J.A. BOBHOLZ, A.J. SAYKIN, B.A. CROSSON, J.A. BOBHOLZ, M.W. BONDI, G.G. BROWN & S.M. RAO. A Critique of the Compensatory Hypothesis: Survey of Functional MRI Studies Across Neuropsychological Disorders.

Symposium Description : For over a decade, researchers have used functional magnetic resonance imaging (FMRI) to advance our understanding of brain responsivity to neuropsychological performance in healthy, diseased, and brain injured individuals. Results from diseased or injured populations have often shown activation patterns extending beyond those observed in healthy individuals. With such findings, researchers have invoked a compensation hypothesis, suggesting that the brain is compensating for the neural damage sustained in order to function optimally. This symposium is designed to survey and critique the compensation hypothesis across a range of neuropsychological disorders. Dr. Andrew Saykin will explore evidence for compensatory mechanisms following mild traumatic brain injury; Dr. Bruce Crosson will examine language recovery following stroke; Dr. Julie Bobholz will explore ramifications of the compensatory hypothesis in multiple sclerosis; Dr. Mark Bondi will examine over-recruitment of brain resources among older adults at genetic risk for Alzheimer's disease; Dr. Gregory Brown will present findings related to compensatory brain responses in schizophrenia as well as possible vascular confounds to this notion; and Dr. Stephen Rao will serve as discussant. In all, presentations will explore the following questions: Does the evidence across a spectrum of disorders provide converging support for the compensation hypothesis? Do alterations in brain response reflect redundant neural systems? Does the evidence support a plasticity hypothesis? These specific theoretical notions, along with potential confounding variables, will be discussed.

Correspondence: *Mark W. Bondi, Ph.D., Psychiatry/ Psychology, UCSD / VASDHS, VASDHS (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: mbondi@ucsd.edu*

Symposium 9

2:00–3:30 p.m.

Neuropsychological Perspectives on Skilled Motor Deficits in Children

K. RADONOVICH, M.B. DENCKLA, M.B. DENCKLA, K.J. RADONOVICH, K.M. HEILMAN & S.H. MOSTOFSKY. Neuropsychological Perspectives on Skilled Motor Deficits in Children.

Symposium Description : This symposium is designed to illustrate the importance of systematic motor assessment in neuropsychological settings. Abnormalities on motor examination have often afforded valuable insights into acquired and developmental disorders of the brain. However, systematic motor assessments are relatively uncommon, either in the clinical or research setting. Further, characterization of skilled and unskilled motor problems is often vague. The panel will discuss basic motor skills testing and testing of skilled motor abilities [praxis]. We will explore theoretical and empirical bases for the relationship of motor, cognitive, and praxis abilities throughout development. Findings from studies in children with autism will be presented as a model for assessing these skills in a variety of developmental disorders.

Martha Denckla will discuss some of the history of motor testing in developmental neurology and the development of her assessment battery, the PANESS. She will also begin to explore the theoretical foundation and neurological systems involved in motor and cognitive development. Krestin Radonovich will present data from an ongoing study examining motor and cognitive development in preschoolers with and without autism. This protocol is using biomechanics and applied kinesiology to assess gait patterns in these children, in conjunction with a variety of cognitive measures and praxis assessment. Ken Heilman will discuss the history of praxis assessment and how these findings can guide assessment of praxis development in children. Stewart Mostofsky will present data on praxis abilities in older children with autism and will discuss how apraxia/dyspraxia may be related to problems in motor sequencing or procedural learning. Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradorov@ufl.edu*

M.B. DENCKLA. Developmental Neurological Examination of the Motor System: Creation of the PANESS.

The developmental perspective puts into the spotlight, via a neurological "systems/circuits" analysis, the close scrutiny of motor control (MC). Neurologists and developmental neuropsychologists have historically appreciated the parallel developmental status of MC and cognitive control. Connections between these systems have been recognized in formal and informal diagnostic entities and empirical research: Minimal Brain Dysfunction; ADHD; Developmental Motor Coordination Disorder; and Disorders of Attention, Motor, and Perception. Because the examination of basic movement capabilities, disappearance of primitive reflexes, and appearance of age-appropriate motor coordination attainments is at the core of developmental neurology, historical distinctions leaned heavily on indicators of "organicity." Out of these observations grew a distinction between abnormalities of MC (strength, tone, reflexes, and certain qualitative types of incoordination or involuntary movements) and developmental "delays," or immaturities. It remains unknown whether such delays, either all of them or some of them, disappear with maturation. The clinical-pragmatic situation inspired this academic neurologist to design and study relatively brief and portable quantified motor coordination examinations, which evolved into the Physical and Neurological Examination for Subtle Signs (PANESS). Some motor signs from this exam suggest subcortical anomalies of development (basal ganglia or cerebellum), whereas others

suggest frontal inadequacies. We may infer from signs of impaired MC that adjacent cognitive control circuits might be powerfully interactive with more conventionally emphasized cognitive systems, such as language, perception, and widely distributed attentional components. The discussion will address the historical developments in this area and how it relates to conceptualization and empirical study of praxis development.

Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradonor@ufl.edu*

K.J. RADONOVICH & K.A. FOURNIER. Gait Analysis in Young Children with and without Autism.

Studies have shown that as many as 50-100% of individuals with autistic disorders demonstrate some type of motor impairment. Reported impairments include: clumsiness, motor incoordination, postural instability, and poor performance on standardized tests of motor functioning. The current study is utilizing applied kinesiology and biomechanics technology to record temporal and spatial parameters of subject gait patterns in young children (ages 2-7) with autism and controls. Additionally, force platform data is being analyzed to examine ground reaction forces during walking. Preliminary results indicate that children show developmental changes in several aspects of gait (e.g., velocity, stride parameters, and stance time) such that adult-like patterns are observable by 7 years in typically developing children, and possibly as early as 5 years of age. Preliminary results suggest that children with autistic disorders do not reach adult-like patterns by this age. These early results indicate slower self-selected walking speeds and immature gait patterns in nearly all measures assessed in young children with autism. Further, children with autism show more asymmetry in their gait. We will continue to assess children with autism, as well as TD controls, and children with MR who do not have autism. Our plan is to better characterize the reported "clumsiness" in autism in order to provide researchers and clinicians with more information about motor and neural functioning in these children. Discussion will include the utility of these techniques in neuropsychological assessment, as well as early indicators of the relationship of motor and cognitive development in young children.

Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradonor@ufl.edu*

K.M. HELLMAN. The Acquired Apraxias: An Overview.

Children might appear clumsy because they have poor development of their praxic programs. These programs instruct the pyramidal motor system and motor units, how to successfully interact with the environment. Limb apraxia, the inability to correctly perform learned skilled movements, in the absence of elemental sensory-motor deficits, can be developmental or induced by focal brain lesions and degenerative diseases. There are 5 major forms of limb apraxia: limb-kinetic (LKA), ideomotor (IMA), dissociation, ideational and conceptual. Each of these forms of apraxia are defined by the nature of errors made by the patient. For example, people with LKA have a loss of deftness and patients with IMA apraxia make spatial and temporal errors. Each of these disorders also has a different neuropsychological mechanism. This lecture will describe these two most common forms of apraxia as well as discuss the pathophysiology of these disorders.

Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradonor@ufl.edu*

S.H. MOSTOFSKY. Developmental Dyspraxia and Procedural Learning in Autism.

While autism has been historically characterized and defined by symptoms and signs of impaired socialization and communication, impairments in motor development are a common, if not consistent, finding. Several groups of investigators have documented impairments in performance of skilled motor gestures. Impairments in imitation of skilled gestures have been most often reported, although several investigators have also documented impairments in pantomime in response to verbal

command or during actual tool use, prompting hypotheses that autism is associated with a developmental dyspraxia. In a study examining performance on praxis examination, we found high-functioning children with ASD produced significantly fewer correct responses during gesture-to-command, gesture-to-imitation, and gesture-with-tool-use (all $p < 0.01$). Similar impairment was seen in both children with high-functioning autism (HFA) and those with Asperger's syndrome. Analyses of error types during praxis examination, not previously reported in the autism literature, revealed that spatial errors made the largest contribution to increased errors in ASD. The pattern of findings is similar to that observed in adults with acquired ideomotor apraxia; however as applied to a developmental disorder such as autism, the observed pattern of errors suggest that deficits in performance of skilled motor tasks, may be secondary to delayed acquisition/learning of spatial representations of movement and/or the motor sequence programs necessary to execute them, rather than loss of previously acquired skills and previously reported procedural learning deficits in autism (Mostofsky et al., 2000) may help to explain impaired acquisition of basic motor skills as well as complex gestures assessed during praxis testing.

Correspondence: *Krestin Radonovich, PhD, University of Florida, 9402 SW 90 ST, Gainesville, FL 32608. E-mail: kradonor@ufl.edu*

K. PRICE, K.A. KERNS, N. VIRJI-BABUL, D. EDGELL & C.A. MA-TEER. Dorsal Visual Stream Deficits in Asperger Syndrome.

Objective: Although up to 80% of people with Asperger Syndrome (AS) are clumsy, the causes and characteristics of clumsiness are unknown. This study tested whether clumsiness in AS implicates the dorsal visual stream, which Milner and Goodale (1995) refer to as "vision for action".

Participants and Methods : There were 14 AS participants (7 to 23 years old), and an age and gender matched group of 16 normal controls with no group IQ differences. Participants completed measures of (1) visual perception of static patterns, (2) movement perception incorporating a random dot kinematogram, (3) human movement perception incorporating point-of-light walkers with normal or abnormal gaits, and (4) postural stability in a virtual reality environment that provided visual cues suggesting movement of the room.

Results : Visual perception of static patterns and movement on the random dot kinematogram were comparable between groups. However, the AS group had more difficulty perceiving human movement accurately, with less sensitivity to normal movements than the control group. They were also less stable, swaying in the moving virtual reality environment; and appeared hypersensitive to the initiation of motion.

Conclusions : Although pattern perception, a ventral stream task (Milner and Goodale, 1995), and movement perception were unaffected, human movement perception and postural stability appear affected in AS. While social experience might account for deficits in human movement perception, it could not account for hypersensitivity to virtual movement, potentially implicating abnormalities in the dorsal visual stream. Human movement perception and postural stability both correlated with clinical indices of clumsiness.

Correspondence: *Kelly Price, M.Sc., Psychology, University of Victoria, Department of Psychology, PO Box 3050 STN CSC, Victoria, BC V8W 3P5, Canada. E-mail: kprice@uwic.ca*

Poster Session 5/2:30–4:00 p.m.

Epilepsy

K.A. DAWSON, M. SCHOENBERG, M. WERZ, P. LANG & G. RAO. The Cognitive Effects of Zonisamide; Influences on Attention, Memory and Verbal Fluency: A Case Study.

Objective: Limited research suggests zonisamide negatively affects cognitive functioning (Ojemann et al., 2001). We present a patient with

medically intractable complex partial seizures initially treated with zonisamide. This patient's neuropsychological test scores improved when tested 3 weeks after zonisamide was discontinued. The change in neuropsychological functioning is discussed within the context of the Reliable Change Index, a method to evaluate changes in test scores.

Participants and Methods : The patient was a 50 year-old female with seizures since she was 44 years old. She has had 3-5 seizures/week. She was initially evaluated while taking 100 mg of zonisamide 8 times per day. The patient was re-evaluated 3 months after her initial assessment 3 weeks after zonisamide was discontinued and she had been titrated to levetiracetam, 750 mg twice per day. Measures included 32 variables across 12 measures: WAIS-III, WMS-III, BNT, COWAT, MCG Complex figure, Trails A and B, Finger Tapping, Grip Strength, NAART, BDI-II, WCST and the STAI. Reliable Change Indexes were computed for each test.

Results : Significant change in the patient's cognitive scores was observed after the discontinuation of zonisamide. There was no change in performance on symptom validity tests. There were marked changes in attention, memory, and verbal fluency performances. Improvements range from 13 to 43 standard score units. Despite changes in neuropsychological functioning, there was no change in WADA performance when repeated after the discontinuation of zonisamide. Declines were limited to Trails B and grip strength. Applications of Reliable Change Indexes suggest improvement in cognitive performance greater than can be attributed solely to practice effects.

Conclusions : For this patient, these data are consistent with previous studies suggesting zonisamide may adversely affect cognitive functioning. The application of the Reliable Change Indexes within this context can assist clinicians in identifying significant change in cognitive functioning.

Correspondence: *Kyra A. Dawson, MA, Neurology, UNiversity Hospitals of Cleveland, 11100 Euclid Avenue, HH 5, Cleveland, OH 44106. E-mail: kyra.dawson@uhhs.com*

M. KEISKI, D. FUERST, C. WATSON, A. SHAH & J. SHAH. Hippocampal Volumes and Wisconsin Card Sorting Test Performance in Temporal Lobe Epilepsy.

Objective: Several studies suggest a role of the hippocampus in successful completion of the Wisconsin Card Sorting Test (WCST), and deficits on this test are sometimes observed in temporal lobe epilepsy (TLE). Using quantitative MRI, we sought to determine whether hippocampal atrophy predicted card-sorting deficits in TLE.

Participants and Methods : The sample included 60 surgical candidates with TLE, after excluding those with extratemporal lesions. Hippocampal volumes were corrected for total intracranial volume. Correlation coefficients were computed to examine the relationship of hippocampal volumes to demographic-corrected scores on the WCST.

Results : The results showed significant associations between card-sorting performance and right hippocampal volume, but not left hippocampal volume. Specifically, right hippocampal volumes were correlated with T scores for perseverative responses ($r = 0.327, p = 0.011$), perseverative errors ($r = 0.335, p = 0.009$) and percent perseverative errors ($r = 0.256, p = 0.048$), as well as the raw number of categories completed ($r_s = 0.272, p = 0.036$). These correlations failed to reach statistical significance in those with left TLE. In contrast, right hippocampal volumes predicted perseverative responses ($r = 0.385, p = 0.043$) and perseverative errors ($r = 0.380, p = 0.046$) in those with right TLE. Hippocampal volumes were unrelated to performance on other tests sensitive to frontal lobe integrity (i.e., Trails B or CFL).

Conclusions : The findings suggest a deleterious effect of right hippocampal atrophy on WCST performance. There may be a specific association between right hippocampal atrophy and perseverative responding, particularly in right TLE.

Correspondence: *Michelle Keiski, M.A., Neurology, Wayne State University, 4201 St. Antoine, 4J UHC - Detroit Medical Center, Detroit, MI 48201. E-mail: keiski@uwindsor.ca*

J. KATZENSTEIN, L. MATHIEU, P. FASTENAU, D. DUNN & J. AUSTIN. The Relationship Between Seizure Focus, Age of Onset, and Rapid Naming in Pediatric Epilepsy.

Objective: Rapid naming (RN) is a necessary component of reading that becomes automated between ages 5 and 7. Disruption to the brain early in life might affect this skill. We hypothesized that seizure onset before age 7 in the left hemisphere would be associated with lower RN compared to a right-hemisphere focus and/or later seizure onset.

Participants and Methods : Participants were 36 children with epilepsy with unilateral epileptiform discharges on EEG, ages 8-15 years ($M = 11.5, SD = 2.0$), 49% female, 90% Caucasian, and of mixed seizure types. Mean IQ was 95.3 ($SD = 12.2$). Children with IQs below 75 on the Kaufman Brief Intelligence Test and with seizure onset before age 1 were excluded. Children completed the Stroop Color trial (RN measure). Age of seizure onset was dichotomized by splitting onset at age 7 (early < 7, $n = 17$; late ≥ 7 , $n = 19$).

Results : A 2 x 2 (Side of Seizure Focus x Age of Onset) ANOVA yielded a significant interaction on the Stroop Color T score, $F(1, 32) = 6.4, p = 0.02$. Post-hoc analyses indicated that for early seizure onset, children with a left focus scored lower ($M = 33.5, SD = 12.0$) than children with a right focus ($M = 44.9, SD = 7.3$), $t(15) = 2.4, p = 0.03$, supporting the hypothesis. Among older children there was no difference between seizure foci.

Conclusions : An early onset left-hemisphere seizure focus might be a risk factor for RN deficits, which could contribute to reading challenges in this population.

Correspondence: *Jennifer Katzenstein, Indiana University Purdue University Indianapolis, 402 N. Blackford Street, Indianapolis, IN 46202. E-mail: jkatzens@iupui.edu*

G.P. LEE, J.M. POLITSKY, A.M. MURRO, C.L. CLASON, J.A. WILSON & J.R. SMITH. False Recognition Errors During Wada Memory Assessment Are More Frequent in Patients with Frontal Lobe Seizures.

Objective: Although patients with frontal lobe lesions generally have normal, or near normal, recent memory functions, such patients may have elevated false positive recognition rates during memory testing. Since false recognitions have not yet been thoroughly studied in frontal lobe epilepsy patients, we reviewed results of Wada memory assessment to determine if patients with frontal lobe seizures have more false recognition errors.

Participants and Methods : 528 epilepsy surgery patients with complete preoperative Wada memory assessment results who subsequently had focal cortical resections in either frontal ($N = 116$) or non-frontal ($N = 412$) regions served as subjects. There were no significant differences between groups with regard to age, handedness, gender, language laterality, seizure type, laterality of onset, duration of seizures, amobarbital dose, or baseline memory ability.

Results : Patients with frontal lobe seizures produced more false recognitions during Wada memory testing after both left ($p = .02$) and right ($p = .04$) amobarbital injections than patients with non-frontal seizures. These results cannot be due to demographic, seizure history, or Wada procedural variables since groups were equivalent on these otherwise potentially influential variables.

Conclusions : False positive errors during Wada recognition memory testing may assist with seizure onset localization in some epilepsy surgery patients when considered in conjunction with other medical and behavioral test data.

Correspondence: *Gregory P. Lee, Ph.D., Department of Neurology, Medical College of Georgia, BA 327S, 1120 15th Street, Augusta, GA 30912-3275. E-mail: glee@mccg.edu*

R. DOSS & G. RISSE. Auditory Naming Performance in Temporal Lobe Epilepsy.

Objective: Auditory naming (AN) may be a more ecologically valid method of assessing word-finding deficits than confrontational visual

naming procedures. Focal left temporal lobe epilepsy (TLE) patients have consistently shown reduced visual naming as compared to right TLE patients. Several authors have reported on AN performance in TLE, although this task remains little studied. The objective of this study is to add to the knowledge base about AN. In particular, the predictive value of AN will be compared to other neuropsychological tests used to determine focality of function.

Participants and Methods : The sample consisted of 19 left TLE and 8 right TLE patients. There were no significant differences between the two groups with respect to gender, handedness, education, WAIS-III FSIQ, age of seizure onset, or number of anti-epileptic drugs. The left TLE group was significantly younger than the right TLE group ($p < .01$). **Results :** The left TLE group scored significantly lower than the right TLE group on the AN total correct (Mean SS = 63.3 vs. 101.0; $p < .01$). A discriminant function analysis (DA) was conducted to determine which measures best predict group membership (left or right TLE). The following measures were entered into the DA equation simultaneously: AN, Boston Naming Test, WAIS-III VCI, Animal Fluency, and WMS-III Auditory Immediate Index. Taken together, the variables provided an overall correct classification rate of 89% with AN being the strongest individual predictor of group membership.

Conclusions : These results further support the finding that AN is impaired in a focal neurologic group (left TLE) at risk for language compromise. Moreover, AN appears to best discriminate left and right TLE patients among a number of common neuropsychological measures. These findings support a broader role for AN in the routine evaluation of language disorders in neuropsychology.

Correspondence: *Robert Doss, Psy.D., Minnesota Epilepsy Group, P.A., 310 Smith Avenue North, Suite 300, St. Paul, MN 55102. E-mail: rdoss@mnepilepsy.net*

J.L. HALL, T.M. BROWN, S.J. SWANSON, E.R. LARSON & T.A. HAMMEKE. Prediction of Seizure Focus Using a Neuropsychological Lateralization Rating Scale in the Pre-Surgical Evaluation of Children with Medically Intractable Epilepsy.

Objective: Determination of the hemisphere of seizure origin is critical to successful surgical treatment of epilepsy. Previous work from our group reported on use of a Laterality Rating Index (LRI) derived from test scores in several neurocognitive domains (language, visuospatial, memory, and sensorimotor functions) in adult patients. The current study investigates accuracy of LRI in prediction of hemispheric seizure focus in a sample of pediatric epilepsy patients.

Participants and Methods : Participants were 35 children (age 6-18) with medically intractable epilepsy. Epileptogenic focus was established for each patient (16 right hemisphere, 19 left hemisphere) based on combination of electrodiagnostic and radiological procedures (e.g., EEG, MRI). All participants were left hemisphere dominant for language as verified by Wada. LRI was calculated for each patient on a scale that ranged -3 to +3, corresponding to strongly right to strongly left sided lateralization of test findings.

Results : Optimal clinical classification with the LRI in this study was 71% (69% right hemisphere, 74% left hemisphere). For patients with $LRI < 0$ (suggesting right hemisphere dysfunction) 67% had right-sided seizures. For patients with $LRI > 0$ (suggesting left hemisphere dysfunction) 74% had left-sided seizures.

Conclusions : Overall, the classification hit rate of the LRI in pediatric epilepsy is comparable to that in adult epilepsy and comparable to clinician accuracy; however, in adult patients the LRI more accurately identifies a seizure focus in the right hemisphere, whereas in pediatric patients the classification accuracy is marginally greater in the left hemisphere.

Correspondence: *Tanya M. Brown, Ph.D., Neurology/Neuropsychology, Medical College of Wisconsin, 9200 W. Wisconsin Ave., Milwaukee, WI 53226. E-mail: tbrown@neuroscience.mcu.edu*

N.S. CHAYTOR, D.L. DRANE, E.S. STROUP, G.A. OJEMANN, E. KÖRNER, M. JUNG & J.G. OJEMANN. Evidence of Improved Executive Functioning in Patients Undergoing Temporal Lobe Resection for the Control of Intractable Epilepsy: Exploration of the Nociferous Cortex Hypothesis.

Objective: While considerable attention has been paid to changes in memory functioning following anterior temporal lobectomy (ATL), less is known about changes in other cognitive domains. Given the interconnections between the temporal lobes and other areas of the brain, disruption in these networks could impact cognitive domains mediated by distant brain regions (i.e., nociferous cortex hypothesis). This study explored pre- and post-ATL executive functioning in a temporal lobe (TL) epilepsy sample.

Participants and Methods : The sample consisted of 38 adults with intractable TL epilepsy who underwent ATL. Executive functioning was assessed with the Trail Making Test, the Stroop Test (Dodrill version), Digit Span Backwards, and the Controlled Oral Word Association Test, both prior to surgery and at 12 months post-surgery.

Results : 81.6% of the sample was impaired on at least one executive measure and 50% were impaired on at least two executive measures, pre-operatively. Post-operatively, 71.1% were impaired on at least one measure and 39.5% were impaired on at least two measures. Of those patients who were impaired on at least one measure pre-operatively, 48.4% regained normal range performance on at least one executive measure following ATL. Improved performance following surgery was associated with a later age of seizure onset [$t(29) = 2.43, p < .05$] and shorter duration of illness [$t(29) = -2.37, p < .05$].

Conclusions : Our study adds to mounting evidence that TL epilepsy patients often experience pre-operative executive dysfunction and suggests that a subset of such patients will show improvement in some of these areas following ATL.

Correspondence: *Naomi S. Chaytor, Ph.D., Neurology, University of Washington, Regional Epilepsy Center, Box 359745, 325 9th Ave, Seattle, WA 98104-2499. E-mail: chaytor@u.washington.edu*

M.F. DULAY, H.S. LEVIN, M.K. YORK, D. YOSHOR, A. VERMA, I.L. GOLDSMITH, A. GOLDMAN, R.G. GROSSMAN & E.M. MIZRAHI. Rates of Intra-individual Change on Three Tests of Nonverbal Recall Following Right Anterior Temporal Lobectomy.

Objective: To date, results are equivocal regarding decline in nonverbal recall and learning after right anterior temporal lobectomy (RATL) with studies reporting significant reduction, no change or improvement compared with before surgery. Problematically, group norms were routinely used to quantify change, which masked individual differences. When individual change has been reported, the main focus has been on one memory method. We assessed the rates of clinically significant intra-individual change on 3 tests of nonverbal recall from before to after RATL using the Reliable Change Index method.

Participants and Methods : Forty-nine right-handed patients with intractable epileptic seizures (mean age 30.5 years; 65% female) were tested on average at 12.5 months following RATL on tests of spatial learning (8 trials; Nonverbal Selective Reminding Test), recall of simple geometric designs (Benton Visual Retention Test), and recall after drawing a complex geometric figure (Rey-Osterrieth Complex Figure Test).

Results : Thirty-one percent of the sample had a significant reduction after surgery in spatial learning, 32% in recall of simple designs, but only 6% in recall of a complex geometric figure. Logistic regression indicated that uncontrolled seizures following RATL, older age at surgery, and absence of Ammon's horn sclerosis predicted worsening of nonverbal memory ($\chi^2 = 9.2, p = 0.002$; better pre-surgery nonverbal memory approached significance, $p = 0.08$). In contrast, 16% had significant improvement in spatial learning, 10% in simple design recall and 36% in recall of a complex figure. Lower pre-surgical nonverbal IQ and recall abilities were the only significant predictors of improvement in recall after surgery ($\chi^2 = 5.0, p = 0.02$).

Conclusions : Results highlight concerns with using group means given that individual changes include both improvements and impairments following RATL. Results provide data to help clinicians and patients make better informed decisions about risks associated with undergoing RATL. Correspondence: *Mario F. Dulay, Ph.D., Baylor College of Medicine, 190 S. Cochrans Green Circle, The Woodlands, TX 77381. E-mail: mariodulay@aol.com*

S. AKDAG, C.L. GROTE, E. NELSON, R. BYRNE, A. BALABANOV, D. BERGEN, A. KANNER, S. PALAC, M. ROSSI & M. SMITH. Memory Outcome Following Tailored Temporal Lobe Resection for Patients with Epilepsy.

Objective: We investigated changes, and predictors of change, in memory functioning following temporal lobe surgery for treatment of intractable seizures. We hypothesized that this series of patients who received tailored resections would show less postoperative memory decline than other published series of patients undergoing standardized temporal lobe resections.

Participants and Methods : Thirty-nine patients met criteria for inclusion, which included pre- and postoperative neuropsychological assessments using the WMS-III, Wada testing, and having gone to surgery for either a left (n=23) or right (n=16) temporal lobe resection. Data was analyzed using both group averages and reliable change indices (RCIs).

Results : Use of RCI methodology showed that 96% of the left temporal patients showed either no change or a significant improvement in delayed auditory memory following surgery. Ninety-four percent of the right temporal lobe patients showed either no change or a significant improvement in delayed visual memory following surgery. Changes in verbal memory following left temporal resection could not be easily predicted, whereas changes in visual memory scores among right temporal lobe patients was significantly inversely correlated with preoperative memory scores

Conclusions : Relatively few studies have investigated memory outcome following tailored temporal lobe surgeries. This study showed fewer patients with a significant postoperative memory decline when compared to other published series from centers using standardized temporal lobe resections. This suggests that tailored resections for epilepsy surgery patients may remove relatively less brain tissue that is still functional, and this may result in better preservation of memory abilities following epilepsy surgery.

Correspondence: *Christopher L. Grote, Ph.D., Psychology, Rush University Medical Center, 1650 W. Congress Parkway, Chicago, IL 60612. E-mail: cgrote@rush.edu*

A. VAN WINKLE, T.G. BURNS, D. BAKER, S.M. RUMBLE & R.J. HUDGINS. The Impact of Learning on Children Diagnosed with Early Onset Epilepsy.

Objective: The effects of early onset epilepsy remain a controversial topic. Some researchers have indicated children whose seizures began prior to the age of 5 demonstrate more impairments on a variety of intellectual functions than children whose seizures developed after the age of 5 (O'Leary et al., 1983; Vasconcellos et al., 2001). However, other research has documented no statistical difference between these groups (Williams et al, 2001). Fewer studies have looked at the effects of early onset seizures and memory. The current study investigated the onset of seizures and its correlation with memory in a group of children diagnosed with epilepsy using the California Verbal Learning Test-Children's Edition (CVLT-C). **Participants and Methods :** Forty-seven children with epilepsy (aged 5-16 years of age; average age of seizure onset = 5.13 years) were matched on variables of age, gender, and race with 47 controls from the standardized sample from the CVLT-C (N=94).

Results : An independent sample t-test indicated that children whose seizures started prior to the age of 5 performed significantly below those children whose seizures started after 6 years of age on intrusions and delayed free recall of the list learning task ($p < .05$). Further, the patients with epilepsy performed worse than controls on both tasks.

Conclusions : Although past research investigating the age of onset and its effects on cognitive functioning are controversial, the present study supports the study from O'Leary and colleagues (2001) that children with early onset seizure activity have significant impairments in memory functioning, particularly amount of intrusions and delayed free recall of verbal information.

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*

P.S. FOSTER, K. THOMPSON, V. DRAGO & K.M. HEILMAN. Lateral differences in psychomotor speed among patients with left and right temporal lobe epilepsy.

Objective: Studies of patients with strokes have revealed that right (versus left) hemispheric injury is more like to induce a contralateral (left) akinesia, hypokinesia and bradykinesia. No study, however, has attempted to learn if a similar asymmetry exists in patients who have right (RTLE) versus left temporal lobe epilepsy (LTLE).

Participants and Methods : Thus, this study investigated fine motor functioning in 10 RTLE and 12 LTLE participants (as determined by EEG and MRI) by having them perform the Lafayette Grooved Pegboard and the Finger Tapping tests.

Results : The results indicated a significant Hand x Group interaction. Subsequent multiple comparisons revealed that the RTLE patients performed significantly worse with the left hand ($M = 121.47$, $SD = 92.40$) as compared to the right hand ($M = 78.96$, $SD = 34.75$), but the LTLE participants did not show this asymmetry. No other contrasts were significant.

Conclusions : Although these results mirror the asymmetry found with stroke patients, the temporal lobes contain no systems that control motor functions. Structures such as the entorhinal cortex do connect with premotor cortex and the motor asymmetry we observed might be related to the effect of repeated focal seizures on these motor areas. Alternatively, the same type of developmental abnormalities that lead to temporal lobe epilepsy might also affect other areas of the same hemisphere. Further studies will have to be performed to discriminate between these possibilities.

Correspondence: *Paul S. Foster, Ph.D., Neurology, University of Florida, 8001 SW 56th Avenue, Gainesville, FL 32608. E-mail: paul.foster@neurology.ufl.edu*

J.S. HAUT, R.M. BUSCH, P.A. KLAAS, R.I. NAUGLE, P. KOTAGAL & W. BINGAMAN. Cross-Validation of a Regression Equation for Predicting WISC-III FSIQ Scores after Epilepsy Surgery.

Objective: To cross-validate the regression equation that Sherman et al. (2003) developed to predict postoperative WISC-III Full Scale IQ (FSIQ) in children with epilepsy.

Participants and Methods : Sherman's regression equation used baseline FSIQ and number of antiepileptic drugs (AEDs) to predict postoperative FSIQ based on data from 23 children awaiting epilepsy surgery. The resulting R^2 was .92. We attempted to cross-validate that equation in two independent samples of children (Sherman's surgery sample n=22, new sample n=91) tested pre- and post surgery. There was no difference in number of AEDs, age of onset or duration of epilepsy. The new sample had a shorter test-retest interval than Sherman's wait list and surgical samples (.9 vs. 2.5 vs. 1.5 years, $p < .0001$).

Results : Cross-validation of the equation with Sherman's surgical sample revealed a correlation between predicted and observed FSIQ of .92 ($R^2 = .846$) with the difference scores ranging from -24.24 to 16.28

(mean=-2.46, SD=9.99). Cross-validation in the new sample revealed a correlation of .949 between the predicted and observed FSIQ ($R^2=.90$) with difference scores ranging from -20.10 to 16.75 (mean = -4.93, SD = 7.16). In Sherman's surgical sample, the equation resulted in one clinically meaningful over prediction (retest = 57, predicted = 73). In three of the 91 new cases, the actual post-surgery FSIQ score was judged to be meaningfully lower than the predicted score (93 vs. 110; 84 vs. 98; 78 vs. 92, respectively). Shrinkage values were .07 for Sherman's surgical sample and .02 for the new sample.

Conclusions : These findings provide evidence of adequate cross-validation of Sherman's regression equation in two independent samples, suggesting that this equation may be applied to other cases with confidence. Creation of a new equation using combined patient data from these samples may provide even greater stability in predicting postoperative FSIQ in children with epilepsy. Double cross-validation is indicated to ultimately confirm the equation.

Correspondence: *Jennifer S. Haut, PhD, Psychiatry & Psychology, The Cleveland Clinic Foundation, 9500 Euclid Avenue, P57, Cleveland, OH, OH 44195. E-mail: hautj@ccf.org*

J.J. LOYDEN, B. SCHEFFT, D. BEEBE & S. HOWE. Predictors of Seizure, Cognitive, and Psychological Outcome Post ATL.

Objective: Anterior temporal lobectomy (ATL) has become a widely used form of treatment for adults with medically uncontrolled seizures. Previous studies have found hippocampal atrophy, side of surgery, duration of seizures, and higher preoperative IQ and lower preoperative verbal memory scores to predict seizure control after ATL. Mood and personality may also be relevant to seizure remission but this has not been empirically tested. Moreover, similar pre-operative variables may also play a role in determining cognitive and psychological post-surgical outcome. The goal of this study was to identify predictors of favorable seizure, cognitive, and psychological post-surgical outcomes.

Participants and Methods : Data from 38 patients who underwent ATL for relief from medically intractable seizures were included in this study. All participants underwent prolonged video/EEG monitoring and pre- and post-surgical neuropsychological evaluations.

Results : Multiple regression analyses demonstrated that pre-surgical cognitive scores were significantly predictive of seizure outcome, accounting for 59% of the variance. Further, right sided surgery predicted improvements in verbal memory scores post surgery. Psychological functioning improved in 64% of patients following surgery, with the majority being seizure-free. The only pre-surgical variable predictive of post-surgical psychological well-being was years since the first seizure.

Conclusions : Higher pre-surgical cognitive scores were predictive of seizure relief post surgery. Individuals with right rather than left ATL performed better on postoperative verbal memory tests. Psychologically, most patients improve after ATL, particularly those who are seizure free. Lastly, the longer seizures persist prior to surgery, the more psychological problems patients appear to have following surgery.

Correspondence: *Jennifer J. Loyden, M.A., Psychology, University of Cincinnati, 209 Willow St., #2, Southgate, KY 41071. E-mail: loydenjj@email.uc.edu*

N. LAMBERT, S.J. GRAYSON, A. BLEASEL, E. SHORES & L.A. MILLER. Comparison of Preoperative Measures in Predicting Cognitive Outcome After Temporal Lobectomy.

Objective: The pre-surgical evaluation of epilepsy patients often includes the Wada test; however, debate continues regarding its ability to predict material-specific memory functioning after temporal lobectomy. Less invasive tests, such as standard neuropsychology, may provide as much information as the Wada in the majority of patients. The aim of this project is to investigate whether the Wada provides additional information to neuropsychology measures in predicting cognitive outcome post temporal lobectomy at both the group and individual level.

Participants and Methods : Subjects comprise 37 patients who had undergone a temporal lobectomy (Left: n= 20; Right: n= 17), and who had a preoperative neuropsychological assessment, a bilateral Wada test, and a postoperative neuropsychological assessment at least 6 months following surgery. The Wada protocol used was based on that of the Cleveland Clinic Foundation, and involved memory for objects, line drawings of objects, abstract words and abstract designs.

Results : Results obtained for the WMS-III, WMS-R and BNT indicated that the preoperative neuropsychological scores, but neither Wada score (ipsilateral or contralateral), were significant predictors of postoperative change (controlling for test-retest effects). A higher level of preoperative performance was associated with greater decline post-surgery. Further exploration of the data indicated that neither Wada score correlated with outcome on a comprehensive battery of tests.

Conclusions : Preliminary results suggest limited utility of the Wada test for predicting memory outcome. Comparison of the predictive ability of the various neuropsychological measures will also be explored.

Correspondence: *Natalie Lambert, Psychology, Macquarie University, 2/2 Shoalhaven Dr, Woy Woy, NSW 2256, Australia. E-mail: natalielambert@optusnet.com.au*

D.W. COLLINS, B.P. ROURKE, R. ROTHERMEL & H. CHUGANI. Psychosocial Subtyping and Brain Metabolism in Children with Epilepsy.

Objective: The main goal of this study was to investigate a typology of psychosocial functioning in children with epilepsy based on their Personality Inventory for Children-Revised (PIC-R) profiles. Because little is known regarding the neurological correlates of psychosocial difficulties, a second goal was to examine the relation between subtype assignment and patterns of cerebral glucose metabolism in these children.

Participants and Methods : Participants were 108 children diagnosed with epilepsy. In Study 1, PIC-R behavioural ratings were subjected to cluster analyses. In Study 2, the relation between PET indices of brain metabolism and the subtypes derived in Study 1 were examined in 45 of the participants.

Results : Based on their PIC-R profiles, participants were classified into six reliable subtypes of psychosocial functioning: Cognitive-Somatic, Cognitive-Internalized, Cognitive-Externalized, Cognitive-Social Isolation, Internalized Psychopathology, and Somatic Concern. A relation was found between the subtype to which children were assigned and the age of seizure onset. Findings from the PET study indicated that four of the psychosocial subtypes were differentiated from controls by decreased glucose metabolism, mainly in right frontal, bilateral cerebellar, and to a lesser extent right temporal regions.

Conclusions : The present findings provided support that children with epilepsy can be meaningfully categorized into subtypes based on their PIC-R profiles. Psychosocial difficulties in these children appear to be associated with specific patterns of cerebral metabolic dysfunction, characterized by decreased glucose utilization, that vary as a function of psychosocial profile.

Correspondence: *David W. Collins, Ph.D., Rehabilitation, CHEO, CHEO - Rehab. PSU, 401 Smyth Rd, Ottawa, ON K1H 5L1, Canada. E-mail: dcollins@cheo.on.ca*

S.J. HUNTER, A. RUBINSTEIN, A. GRIEVE, K. HECOX & M. KOHRMAN. Neuropsychological change associated with levetiracetam (Keppra) when treating children with Epilepsy.

Objective: Children with epilepsy are often prescribed multiple medications to control seizures. Many drugs negatively effect cognition and behavior, contributing to psychosocial morbidity. Keppra is a recent ad-

dition to epilepsy treatment. Research with adults suggests it does not contribute to cognitive impairment. This study examined functioning of children prescribed Keppra as an adjunct medication. Controlling for impact of epilepsy and medication, we examined the impact Keppra had on cognition and behavior.

Participants and Methods : 13 patients, aged 7-17, participated. All had complex-partial epilepsy nonresponsive to single drug intervention. Assessment of current functioning, following one month treatment with Keppra, was conducted. Patients were administered tests of language, attention, memory, visuospatial processing, executive functioning, and behavior regulation. School performance records were obtained. Each subject was a case control, allowing for an examination of change in performance, to identify an additive impact of Keppra on functional change.

Results : The addition of Keppra contributed to no decrement in neurocognitive functioning. Positive changes in attention and memory were observed for a majority ($n = 10$) of patients. Positive behavioral changes were also reported. The addition of Keppra led to increased seizure activity in 3 children. The majority of children showed a predominant positive effect of the addition of Keppra, both in terms of seizure control and neurocognitive functioning.

Conclusions : Keppra has been identified as an adjunctive medication for seizure control in children with complex-partial epilepsy. Retrospective analysis, using patients as their own controls, highlighted positive impact for Keppra; a small set of this sample experienced negative response, but the majority showed improvement in seizure control and no decrement in functioning. Importantly, some patients showed improvement in both attention and memory functions.

Correspondence: *Scott J. Hunter, Ph.D., Psychiatry, University of Chicago, 5841 S. Maryland Ave., MC 3077, Chicago, IL 60637. E-mail: shunter@uchicago.edu*

N.C. CUNNINGHAM, J.K. AUSTIN & D.W. DUNN. **Neuropsychological Factors as Predictors of Social Competence in Adolescents With Epilepsy.**

Objective: Adolescents with epilepsy have social competence problems. Neuropsychological factors have only minimally been investigated in the literature in regards to this area of functioning. This study explores the relationship between neuropsychological variables and social competence in an epilepsy sample.

Participants and Methods : Data from a longitudinal study investigating behavioral and neurological outcomes in adolescents with epilepsy were used for the current analyses. Participants were 125 adolescents (48% female) ages 11-18 years ($M=13.6$, $SD=1.9$). Mean age of onset was 5.5 ($SD=3.6$). Participants with another chronic illness or mental retardation were excluded. Participants were given a neuropsychological battery assessing the domains of: processing speed, attention, psychomotor skills, visual-spatial skills, language, memory, learning, and executive functioning. Parents completed the Child Behavior Checklist (CBCL) and the social problems T-score was used as a social competence measure.

Results : Results of factor analyses from a previous study indicated three latent factors: Factor 1, Verbal/Memory/Executive, Factor 2, Rapid Naming/Working Memory and Factor 3, Psychomotor. A hierarchical linear regression model indicated Factor 1 was the best predictor of social competence scores in this sample after controlling for age and IQ. Higher levels of VME were associated with fewer social competence problems $\beta = -.35$, $p < .01$.

Conclusions : These results suggest that verbal, memory, executive function, and attention skills could have a significant influence on social competence in adolescents with epilepsy. It is possible these domains are central in helping them assess social situations and learning how to respond properly.

Correspondence: *Natalie C. Cunningham, M.S., Psychology, Indiana University Purdue University Indianapolis, 402 N. Blackford St., LD 124, Indianapolis, IN 46219. E-mail: naccunni@iupui.edu*

E. SHERMAN, N. WILDE, D.J. SLICK & K. EYRL. **Frontal Lobe Epilepsy in Children and the Utility of CVLT-C Process Scores in Detecting Executive Dysfunction.**

Objective: The California Verbal Learning Test, Children's version (CVLT-C) is a well-known memory test for children. One of its unique strengths is that it allows parallel assessment of quantitative (performance level) and qualitative (strategy use) dimensions of verbal memory, including examination of semantic clustering, serial clustering, and recall consistency — strategies that are thought to depend in part on executive functioning. This study examined the validity of CVLT-C process scores as measures of executive functioning in children with epilepsy, and whether children with frontal lobe epilepsy (FLE) show syndrome-specific deficits in CVLT-C process scores compared to children with temporal lobe epilepsy (TLE).

Participants and Methods : CVLT-C and Behavior Rating Inventory of Executive Function (BRIEF) data were collected for 75 children with focal epilepsy seen through a tertiary care seizure clinic (mean age = 11.8 years, $SD = 3.0$).

Results : CVLT-C process scores did not differentiate between children with FLE ($N = 30$) and TLE ($N = 45$), nor were any process scores correlated to the BRIEF. However, almost all the performance level CVLT-C scores were at least moderately related to executive function as measured by the BRIEF; in particular, number of CVLT-C intrusions was highly correlated to the BRIEF Behavioral Regulation Index ($r = .52$, $p < .001$), and moderately correlated to the Working Memory Index ($r = .41$, $p < .003$).

Conclusions : Compared to performance level scores, CVLT-C process scores showed limited utility in the assessment of memory-related executive dysfunction in children with epilepsy. Results are discussed with regard to the syndrome-specificity of executive deficits in FLE.

Correspondence: *Elisabeth Sherman, PhD, Psychology, BC Children's Hospital, 4480 Oak Street, Vancouver, BC V6H 3V4, Canada. E-mail: esherman@cw.bc.ca*

M. KEISKI, D. FUERST, C. WATSON, A. SHAH & J. SHAH. **Hypomania Scores Predict List Recall in Right Temporal Lobe Epilepsy.**

Objective: Given reports of temporal lobe abnormalities and memory deficits in depression and bipolar disorder, we examined the possibility that mood symptoms were associated with exacerbated memory deficits in temporal lobe epilepsy (TLE).

Participants and Methods : Seventy-nine surgical candidates (40 left TLE; 39 right TLE) with valid MMPI-2 profiles were administered the CVLT and the WMS-R (Logical Memory and Visual Reproductions). Correlation analyses were conducted to evaluate the relationship of memory performance to scores on the hypomania, depression, and Harris-Lingoes subjective depression scales.

Results : The results failed to show significant correlations between MMPI-2 elevations and memory performance in the combined sample or in the left TLE group. In the right TLE group, depressive symptoms were unrelated to performance on the CVLT or the WMS-R. However, hypomania elevations were correlated with scores on the CVLT, including trial 1 ($r = -0.451$; $p = 0.004$), trials 1-5 ($r = -0.385$; $p = 0.015$), short delay cued recall ($r = -0.373$; $p = 0.019$), long delay free recall ($r = -0.399$; $p = 0.012$), and long delay cued recall ($r = -0.362$; $p = 0.043$). ANOVA analyses further showed an interaction of hypomania group and lateralization of seizure focus in predicting delayed list recall, whether the trial was cued ($F = 4.470$, $p = 0.038$) or uncued ($F = 4.579$, $p = 0.036$).

Conclusions : The findings suggest an association between hypomanic symptoms and reduced recall on the CVLT, but only in individuals with right TLE. Analyses failed to demonstrate any relationship between severity of depressive symptoms and memory.

Correspondence: *Michelle Keiski, M.A., Neurology, Wayne State University, 4201 St. Antoine, 4J UHC - Detroit Medical Center, Detroit, MI 48201. E-mail: keiski@uwindsor.ca*

E. STROUP, N. CHAYTOR, D. DRANE, E. COADY & M. HOLSMAN. PAI vs. MMPI in the Classification of Patients with Epileptic and Psychogenic Nonepileptic Seizures: Overall Accuracy and Advantages.

Objective: The Personality Assessment Inventory (PAI) and Minnesota Multiphasic Personality Inventory (MMPI) are currently utilized at numerous epilepsy centers in an effort to evaluate patients' emotional functioning. There is also growing evidence to support use of these measures as an adjunctive diagnostic tool in differentiating patients with psychogenic nonepileptic seizures (PNES) from those with epileptic seizures (ES). However, few reports have compared these two measures' ability to discriminate between patients with PNES and ES.

Participants and Methods : In this study, we examined 58 patients with video EEG-confirmed ES and 41 patients with video EEG-confirmed PNES, all of whom completed both the PAI and MMPI as part of their routine neuropsychological evaluation. The NES group had a higher incidence of psychiatric history compared to the ES group (78% vs. 51%). PAI profiles were designated "PNES" if either the Somatic Complaints-Conversion subscale or the Depression-Physiological subscale was elevated at a T-score of 70 or higher. In like fashion, MMPI profiles were labeled "PNES" if they met the criteria established by Wilkus et al. in 1984.

Results : Overall classification accuracy using the PAI was 75%, while accuracy with the MMPI was 69%. Combining the profiles in two ways (i.e., designating PNES if either measure met criteria, or if both measures met criteria) did not improve accuracy (72% in both cases). Overall, the PAI performed comparably to the MMPI at predicting which patients would be classified as having PNES.

Conclusions : Given the administration advantages of the PAI (e.g., faster time, lower reading level), and its comparability to the MMPI in differentiating ES from PNES, it would appear an excellent measure for use in diagnostic epilepsy centers.

Correspondence: *Elizabeth Stroup, UW Regional Epilepsy Center, Harborview Medical Center, Box 359745, 325 Ninth Ave, Seattle, WA 98104. E-mail: stroup@u.washington.edu*

C.M. ZAROFF, Y. GRANADER, C. MORRISON, R. NASS, M. NICHOLSON & O. DEVINSKY. Psychopathology in non-mentally retarded children with Tuberous Sclerosis Complex.

Objective: Tuberous Sclerosis Complex (TSC) is a genetic disorder associated with cerebral lesions, epilepsy, and high rates of mental retardation and psychiatric illness, including autism. In adults lacking frank mental retardation, varying cognitive deficits are observed, most frequently in executive functioning and attention, and psychopathology, particularly anxiety, is common. While autism has been reported in intellectually intact individuals with TSC, the behavioral profile of non-retarded children with TSC has otherwise not been examined.

Participants and Methods : The present study examined psychopathology in eight non-mentally retarded (IQ M = 81, SD = 10.9, range 71-103) male children with TSC eight to 17 years of age. The Child Behavior Checklist (CBCL) and Gilliam Autism Rating Scale (GARS) were administered to parents of all children as part of a routine clinical evaluation at the NYU Comprehensive Epilepsy Center and results were compared to the normative sample of each measure.

Results : On the CBCL, at least one score for each child fell in the Borderline clinical range. The most commonly elevated scales were the Anxious/Depressed and Social Problems scales, elevated in four subjects. The Probability of Autism on the GARS fell in the Very Low range for seven of eight subjects and in the Low range for one other subject.

Conclusions : Psychopathology may be common in non-mentally retarded children with TSC. The co-existence of social difficulties and anxiety in the absence of a definitive diagnosis of autism suggests that in TSC, Pervasive Developmental Disorder (PDD) behaviors may occur on a continuum, with more subtle expression in non-retarded individuals likely lacking gross neurological dysfunction.

Correspondence: *Charles M. Zaroff, PhD, Comprehensive Epilepsy Center, NYU Medical Center, 403 East 34th Street 4th Floor, NY, NY 10016. E-mail: charles.zaroff@med.nyu.edu*

D.D. EISENMAN, L.H. LACRITZ, P.C. VAN NESS, S.R. WHYTE, C.W. HUGHES & C.M. CULLUM. Validation of a Neuropsychological Wada Procedure.

Objective: The Intracarotid amobarbital procedure (IAP) is widely used in epilepsy centers throughout the country, though there is great variability in how IAP memory testing is conducted. This study validated a standardized IAP memory measure.

Participants and Methods : Subjects included 90 individuals who underwent comprehensive evaluation of their seizure disorder including the IAP procedure, which consisted of three different forms of the memory measure (18 items each) composed of written words and pictorial items. Form I was used with the first injection (ipsilateral) to seizure focus, Form II with the second (contralateral) injection, and Form III was used as the baseline measure. The reliability and validity of the IAP memory measure was examined.

Results : The IAP memory measure had good overall reliability (Cronbach's Alpha = .85 for Form I, .83 for Form II, and .69 for Form III). The majority of items on Forms I and II had acceptable item difficulty values, item discrimination values, and item-total correlations. In terms of construct validity, correlations with other memory tests provided some evidence of convergent validity for the IAP memory measure, but were generally low ($r = -.03-.55$). When utilizing a left-right discrepancy score to predict lateralization in subjects with temporal lobe epilepsy ($n = 64$), 92% of subjects with either left or right TLE were correctly classified after applying a correction factor for left injection scores.

Conclusions : Overall, the IAP memory measure demonstrated good psychometric properties as well as clinical utility for seizure lateralization in temporal lobe epilepsy.

Correspondence: *Dan D. Eisenman, Ph.D., Psychology, UT Southwestern Medical School, 5323 Harry Hines, Dallas, TX 75390. E-mail: d.eisenman@att.net*

R.D. JONES, J.D. WRIGHT & E.K. ST. LOUIS. Left Hemisphere Dominance for American Sign Language in a Congenitally Deaf Subject During Intracarotid Sodium Amytal Testing.

Objective: Lesion studies and functional imaging suggest that language skills in American Sign Language (ASL) are mediated by left hemisphere structures. To our knowledge this issue has been investigated twice using intracarotid sodium amytal testing (ISAT), and only one of these cases was a deaf subject. Here we report a second case of ISAT in a congenitally deaf subject.

Participants and Methods : 3155 is a right handed 34 year old male carpenter with a high school education and history of intractable seizures since age 26 following mild head trauma. History was remarkable for complete loss of hearing at three days of age associated with meningitis. Medical workup included video EEG monitoring, resting PET, structural MRI, and neuropsychological assessment, all of which indicated right hemisphere dysfunction/seizure focus. Right temporal lobectomy for epilepsy control was planned.

Results : During ISAT an ASL interpreter was used. Following right hemisphere injection, 3155 was able to reliably name/sign pictures, sign words, and follow signed commands. Following left hemisphere injection he became clearly aphasic, with marked inability to name/sign pictures, sign words, or comprehend signed commands. After 4-5 minutes the aphasia dissipated, and language abilities in ASL were normal after 6-7 minutes. Three months following right temporal lobectomy he was seizure-free, and neuropsychological and ASL performances were stable relative to preoperative assessment.

Conclusions : This case adds to current knowledge regarding the neural underpinnings of language in congenitally deaf subjects who communicate with ASL, and is consistent with previous findings suggesting that the left hemisphere plays an important role in language in this group. Correspondence: *Robert D. Jones, Ph.D., Neurology, University of Iowa, 200 Hawkins Drive, Iowa City, IA 52240. E-mail: robert-jones@uiowa.edu*

M.M. BERL, E.N. MOORE, D. WEBER, L. YARGER, K. OHARA, L. MACK, N. RATNER, C.J. VAIDYA, G.A. GIOIA & W.D. GAILLARD. Effect of Seizure Chronicity on Working Memory and Receptive Language.

Objective: To assess receptive language functioning in patients with new onset and chronic epilepsy compared to healthy controls and determine the role of working memory on receptive language competence.

Participants and Methods : 50 children (25 localized epilepsy, 25 healthy controls), aged 6-12, participated. 16 patients (14 L focus, 2 R focus) were classified as chronic (onset>3yrs) and 9 patients (8 L focus, 1 R focus) as new onset (onset<1yr). Neuropsychological measures included receptive language (CELF4) and working memory (Digits Backward, BRIEF) tasks.

Results : Multivariate analysis of variance demonstrated significant overall differences among groups ($p<.01$) with chronic epilepsy patients exhibiting compromised receptive language ($p<.01$) compared to healthy controls. Children with new onset epilepsy performed at an intermediate level on receptive language and were not different from either the control ($p=.15$) or chronic group ($p=.15$). For both patient groups, working memory performance was lower compared to healthy controls for recalling sentences ($p<.05$ new onset, $p<.01$ chronic) and digits backward ($p<.05$ new onset, $p<.01$ chronic). Parent reports indicated differences in everyday behavioral manifestations of working memory ($p<.06$ new onset, $p<.01$ chronic) compared to healthy controls. Linear regression indicated that poor working memory skills partially accounts for decreased receptive language performance (R^2 Change = .095, $p<.05$).

Conclusions : Receptive language skills differed among epilepsy groups and healthy controls, suggesting that receptive language skills decline with chronicity of seizure disorder. Localized epilepsy was associated with lowered working memory regardless of time since seizure onset. Results suggest that weak working memory skills place limitations on receptive language ability.

Correspondence: *Madison M. Berl, PhD, Neuropsychology, Children's National Medical Center, 111 Michigan Avenue NW, Department of Psychology, Washington, DC 20010. E-mail: mberl@cnmc.org*

H.B. CLEAVINGER, B.C. MCDONALD, J.D. GOLDSTEIN, B.C. JOBST, V.M. THADANI, P.D. WILLIAMSON, D.W. ROBERTS, A.C. MAMOURIAN & A.J. SAYKIN. Material Specific Patterns of Brain Activation During Novelty Detection in Temporal Lobe Epilepsy.

Objective: Pathologic and functional neuroimaging studies have demonstrated that medial temporal lobe (MTL) structures are critical to episodic memory processing. Differences in MTL activation have been demonstrated between temporal lobe epilepsy (TLE) patients and healthy controls during memory processing using functional MRI (fMRI), such that TLE patients show diminished task-related activation on the side of seizure focus. We examined fMRI brain activation during verbal and nonverbal episodic memory processing in left TLE (LTLE) and right TLE (RTLE) patients and healthy controls. The goal of the investigation was to examine ipsilateral and contralateral brain activation profiles with regard to material specificity (i.e., laterality effects for verbal versus nonverbal stimuli).

Participants and Methods : Subjects completed visually administered event-related repetition-suppression fMRI probes in which habituation stimuli (words or abstract designs) were initially repeated, then intermixed with new stimuli to assess novelty detection. Groups were equivalent for age, education, and handedness.

Results : LTLE subjects showed increased left MTL activation and broader left frontal activation when engaged in novelty detection for verbal stimuli, while RTLE subjects showed increased right MTL and right frontal activation when encoding designs.

Conclusions : These findings do not support the argument for material specific reorganization of cognitive functions away from the epileptogenic zone, but may indicate compensatory increases in spatial extent of activation within the affected hemisphere. Further investigation in a larger sample will help elucidate the relationship between memory processing of verbal versus nonverbal information, side of seizure focus, and risks factors for epilepsy (e.g., age at seizure onset, first risk factor).

Correspondence: *Howard B. Cleavinger, Ph.D., Psychiatry, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001. E-mail: Cleavinger@Dartmouth.edu*

B.M. HAMPSTEAD, J. GESS & A.Y. STRINGER. Memory Test Performance After Hours as Opposed to Minutes is Better Associated with Hippocampal Dysfunction in Temporal Lobe Epilepsy.

Objective: Previous research suggests that commonly used memory tests are unreliable in localizing seizure focus in patients with epilepsy, especially with a right hemisphere focus. However, most of these tests utilize relatively short delays that may not be as sensitive to hippocampal dysfunction as tests with longer delays (4-hours). Therefore, we compared performances of individuals with epilepsy on standard memory tests (CVLT-II, Taylor Complex Figure (TCF)) with those utilizing a longer delay (Story Memory Test (SMT), Figure Memory Test (FMT)) to determine whether the increased delay was more sensitive to hippocampal dysfunction.

Participants and Methods : The memory performances of twenty-one right handed patients (66% female) with either left (n=10) or right (n=11) temporal lobe epilepsy were examined. There were no group differences in age, education, time since seizure onset, or IQ. Learning (trial-5 CVLT-II, trial-4 TCF, learning scores on SMT and FMT) and percent memory loss were compared using MANOVA.

Results : There were no significant differences in learning between groups on any test. However, percent memory loss was significantly different between groups for only the SMT ($F(1,15)=4.89$, $p=.043$), although the CVLT-II approached significance ($p=.084$). Although neither visuospatial test approached significance, inspection of the data suggests that FMT memory loss may be more sensitive to right hippocampal dysfunction than the TCF.

Conclusions : Despite the relatively small sample size, the results suggest that memory tests utilizing longer delays may be better at lateralizing hippocampal dysfunction than those using more traditional delays. Future work with a larger sample should examine the predictive validity of these measures in individual patients.

Correspondence: *Benjamin M. Hampstead, M.S., Department of Psychology, Drexel University, 3141 Chestnut Street, Philadelphia, PA 19104. E-mail: bmh24@drexel.edu*

G.J. REY, J. LUNDMARK, C. DUNOYER, T. RESNICK, S. FIELDSTONE, P. JAYAKAR & M. DUCHOWNY. The WISC-IV in the Assessment of Children with Intractable Epilepsy.

Objective: a) To determine if WISC-IV VCI-PRI split scores in subjects with lateralized epileptogenic foci differed from those with non-lateralized foci. b) Examine the influence of demographic and clinical variables on these WISC-IV index scores.

Participants and Methods : We studied 29 children with intractable epilepsy being evaluated for surgical candidacy. All children had video-EEG telemetry and MRI imaging and were classified as having lateralized or non-lateralized epileptogenic foci. Hemispheric dominance was established by handedness and functional MRI. All subjects were administered the WISC-IV. VCI-PRI split scores were compared to the lateralization and dominance using t-test.

Regression procedures were used to analyze the relation between the WISC-IV index scores and clinical and demographic variables.

Results : VCI-PRI split of >14 points was present in 20% children with non-lateralized foci compared to 40% of children with lateralized foci. Lateralized foci involving the non-dominant hemisphere resulted in lower scores for all indexes. Clinical and demographic variables were not related to the index scores.

Conclusions : 1) A higher percentage of VCI-PRI splits are observed in cases with lateralized epileptogenic foci. However, the finding that this dissociation in index scores was also seen in cases without clearly lateralized foci is another indication of the inadvisability of making neuropsychological inferences based solely on these index differences.

2) Children with lesions in the non-dominant hemisphere had lower scores in the three indexes examined and particularly so for the PRI. These findings suggest that, in this population, non-dominant hemispheric dysfunction may create greater overall intellectual morbidity. Additional studies with a larger patient sample is needed in order to control for disease related factors that may have been contributory.

3) Clinical and demographic variables were not related to the WISC-IV index scores.

Correspondence: *Gustavo J. Rey, Ph.D., Neuroscience, Miami Children's Hospital, 3100 SW 62nd Avenue, Miami, FL 33155. E-mail: gustavo.rey@mch.com*

D.A. CAHN-WEINER, H.E. KIRSCH & G.A. WOO. Stability of Executive Function following Temporal Lobectomy.

Objective: Significant change in aspects of executive function (EF) following temporal lobectomy for the treatment of intractable epilepsy has been reported. Use of absolute change scores in earlier studies may have inflated reported frequency of change in patients who underwent surgery. This study investigated EF change following temporal lobectomy on two tests, Trail Making (Part B) and Verbal Fluency.

Participants and Methods : Subjects included 70 epilepsy patients (mean age = 44.0 ± 11.1 years, 52% female) who underwent temporal lobectomy (50% right, 50% left). Patients were assessed prior to and approximately one year following surgery. Change in EF was determined by calculating standardized regression based (SRB) change scores. SRB change scores that exceeded a z-score value of ± 1.64 SD were considered significant.

Results : Most subjects did not show significant change in Trail Making (73.3 %) or verbal fluency (80%). When SRB scores were analyzed as a function of seizure outcome and surgery side, there were no significant differences. Correlational analyses revealed that age, seizure duration, baseline mood status, and education were not associated with change in EF. Verbal fluency change was associated with baseline FSIQ.

Conclusions : These findings suggest that change in certain elements of EF following temporal lobectomy is a rare phenomenon. There were no effects of surgery side or seizure outcome on the measures examined. These results stand in contrast to previous findings of a significant effect of post-operative seizure status on verbal fluency performance (Martin et al., 2000). Future studies are needed to examine those patient characteristics (e.g., demographic, neuropathologic, medications) that lead to improvement in EF, as reported in earlier studies.

Correspondence: *Deborah A. Cahn-Weiner, Ph.D., Neurology, UCSF, 400 Parnassus Avenue, San Francisco, CA 94143-0138. E-mail: dcahn@itsa.ucsf.edu*

E. BALDWIN, A.Y. STRINGER, T. HENRY, R. GROSS & A. ABOSCH. The Role of the Hippocampus in Confrontation Naming: Outcome Following Selective Amygdalohippocampectomy.

Objective: A hippocampal role in naming has been hypothesized from observations after left temporal lobectomy; however, confirmation requires demonstration with resections confined to the mesial temporal lobe (i.e., amygdalohippocampectomy - AH). We present four patients with left AH. The study provides preliminary evidence of a hippocampal role in naming and explores reasons for variability in surgical outcome.

Participants and Methods : Participants were seen pre and 6-months post left AH for refractory epilepsy (mean age 45.5, education 15 years, FSIQ 105.8, all right-handed, time since epilepsy onset 25.8 years). Two participants (group 1) reported decreased naming and two (group 2) reported no decrease. Groups were compared with structural MRI, PET, and neuropsychological testing.

Results : Groups did not differ significantly on demographic variables, time since epilepsy onset, time since surgery, or seizure frequency. Group 1 showed a Boston Naming Test score decline [$F(1,2)=40.692, p=.02$]. Repeated measures ANOVA showed an interaction effect [$F(1,2)=32, p=.03$] for delayed recall on the California Verbal Learning Test - II, with the groups being equivalent before surgery, and group 1 showing greater decline after surgery. The groups did not differ in extent of mesial temporal sclerosis or hippocampal resection, but presurgical PET scans showed greater left temporal hypometabolism in group 2.

Conclusions : Results support a specific role of the left hippocampus in naming, with greater decline associated with greater decrease in verbal memory and less temporal hypometabolism before surgery. Patients with a lesser degree of functional hippocampal pathology may be at greater risk of postsurgical decline in naming.

Correspondence: *Erin Baldwin, MA, Psychology Department, Georgia State University, P.O. Box 5010, Atlanta, GA 30302-5010. E-mail: eballdwin1@student.gsu.edu*

Y. CHANG, R.L. GILMORE, S.N. ROPER, S. EISENSCHENK & R.M. BAUER. Level of Preoperative Frontal Functioning Predicts Postoperative Memory Change in Adults with Temporal Lobe Epilepsy.

Objective: Anterior temporal lobectomy (ATL) has been associated with decrements in memory, particularly for patients with left ATL. The goal of the present study was to further investigate whether level of preoperative frontal/executive skills could be used to predict memory changes following unilateral ATL. It was hypothesized that neural noise originating from the temporal lobes may secondarily affect frontal functioning, thereby affecting pre- and postoperative memory scores. Furthermore, undergoing ATL may result in improvements on memory tests in patients with preoperatively lower frontal/executive skills by removing noise originating from the temporal lobes. In contrast, patients with higher presurgical frontal/executive functioning may not demonstrate this effect, and may even show deterioration in memory function after ATL.

Participants and Methods : Patients with unilateral ATL (25 left and 14 right ATL selected from a total of 65 unilateral ATL) were divided into two groups based on whether they scored high or low on a composite measure of executive function. Pre-postoperative memory changes were calculated using simple difference scores.

Results : Results suggested that, after surgery, left ATL patients with high-frontal functioning demonstrated significant deterioration and left ATL patients with low-frontal functioning demonstrated significant improvement on verbal memory measures, including WMS-R Logical Memory I and II, and on several CVLT variables. In contrast, right ATL patients with low-frontal functioning demonstrated significant improvement on Rey-Osterrieth Complex Figure-immediate recall and on CVLT recognition.

Conclusions : These findings highlight the clinical impact of preoperative frontal/executive functioning on the memory prognosis of temporal lobe epilepsy patients after surgery.

Correspondence: *YU-LING CHANG, Clinical and Health Psychology, University of Florida, 101 South Newell Drive, Room 3151, Gainesville, FL 32611. E-mail: ychang@pshp.ufl.edu*

P.A. KLAAS, R.M. BUSCH, J.S. HAUT, R.I. NAUGLE, P. KOTAGAL & W. BINGAMAN. Dissociation In Memory for Faces and for Dot Location in Children With Temporal Lobe Epilepsy: Pre and Post Surgery. Objective: In 2003, Chiravalloti and Glosser examined pre-surgical non-verbal memory performance in adults with anterior temporal lobe epilepsy (TLE) and found that patients did not demonstrate clear lateralization of function on a test of spatial location. However, patients with right TLE had lower scores on a face memory task than patients with left TLE. The goal of the current study was to further examine the relationship between visuospatial memory and seizure lateralization in a sample of children with TLE.

Participants and Methods : Pre- and post-surgical scores from the Dot Location (DL) and Faces subtests of the Children's Memory Scale were analyzed. The sample consisted of 33 children with intractable TLE (Left=21, Right=12) ranging in age from 5-15 (Mean=10.8, SD=2.9). T-tests determined that there were no significant differences between the two groups in age at time of testing, age of seizure onset, seizure duration, or Full Scale IQ. Two-way (time x group) mixed ANOVAs were conducted on each of the memory subscales to examine differences in test performance over time.

Results : There was a significant difference across the presurgical group on the long delay recall of DL and delayed recall of the Faces subtests ($p < .01$), with DL having higher mean Scaled Scores. No significant difference was seen between short delay of DL and immediate recall of Faces. ANOVA results revealed no main effects of time or side of surgery. There were also no significant interaction effects.

Conclusions : This study did not demonstrate any significant differences between children with right and left TLE on either subtest before or after surgery. These results do not support the findings of Chiravalloti and Glosser (2003). This may be due to the difference in measures or developmental factors.

Correspondence: *Patricia A. Klaas, Ph.D., Psychiatry and Psychology, Cleveland Clinic Foundation, 9500 Euclid Ave., P5-7, Cleveland, OH 44195. E-mail: klaasp@ccf.org*

D.T. PULSIPHER, E. GEARY, J.B. PARRISH, B. HERMANN & M. SEIDENBERG. Duration of Temporal Lobe Epilepsy and Caudate Nucleus Volumes.

Objective: The most common pathology in temporal lobe epilepsy (TLE) is hippocampal sclerosis, however, the presence of brain abnormalities throughout the limbic system has been noted by several investigators. Of particular interest is the role of seizure duration and brain atrophy in relation to the evolution of extrahippocampal brain abnormalities in TLE. In this study, we present quantitative MRI findings for the caudate nucleus as it has been shown to play a role in seizure propagation and seizure modulation.

Participants and Methods : 71 subjects (28 controls, 23 right TLE, 20 left TLE) underwent quantitative MRI. TLE patients had a mean age of 38 years and mean epilepsy duration of 23 years. The caudate was manually traced for all subjects.

Results : Ipsilateral and total caudate volumes were significantly lower than controls for the right TLE group ($p < .05$), but not for the left TLE group ($p > .05$). There was a significant association between epilepsy duration and ipsilateral, contralateral, and total caudate vol-

umes for both the right and left TLE groups, controlling for ICV. Longer duration was associated with smaller caudate volumes. A stepwise regression analysis including age of onset, duration, and number of current medications confirmed that duration was the strongest predictor of caudate volumes.

Conclusions : Longer duration of epilepsy is significantly associated with smaller caudate volumes in TLE. Given the role of the caudate in seizure modulation, these findings may have implications for the development of refractory TLE.

Correspondence: *Dalin T. Pulsipher, BS, Psychology, Rosalind Franklin University, 3333 Green Bay Road, North Chicago, IL 60064. E-mail: dalin.pulsipher@rfums.org*

G.J. REY, L. GERTZMAN, C. DUNOYER, M. DUCHOWNY, S. FIELDSTONE, E. SULI, T. RESNICK & P. JAYAKAR. Behavioral Disorders in Children with Epilepsy: Relation to Clinical and Demographic Variables.

Objective: The objectives of this study are: a) To examine the incidence of behavioral disorders in children with epilepsy. b) Evaluate clinical and demographic factors related to these behavioral disorders.

Participants and Methods : Ninety-two pediatric patients with epilepsy aged 4-18 were recruited at Miami Children's Hospital. Patients were divided into intractable ($n=57$) and non-intractable ($n=35$) groups. Presence/absence of behavioral disorders was evaluated with the CBCL. Regression procedures were used to evaluate the contribution of clinical and demographic variables to the subscales of the CBCL. T-test comparisons were performed between the two sub-groups for each CBCL sub-scales.

All participants were consented following institutional guidelines.

Results : The frequency of behavioral disorders for the sample ranged from 9-10% (acting out and aggressiveness) to 30-36% (attention, thinking and social problems). Intractability was the only clinical variable that accounted for a significant portion of the variance for the CBCL sub-scales ($p < 0.001$). For the intractable group seizure type, inter-ictal EEG abnormalities, and EEG localization were related to behavioral problems. T-test analysis revealed that the intractable group had significantly higher scores in 9 of the 11 CBCL subscales ($p < 0.0001$). Demographic and other clinical variables were not significantly related to CBCL scores for either group.

Conclusions : 1) Children with epilepsy have a higher incidence of behavioral disorders than what has been documented for the general population.

2) The presence of intractable epilepsy represents a significant risk factor for behavioral pathology and, for this group, there are select clinical variables that are related to these disorders of behavior.

Correspondence: *Gustavo J. Rey, Ph.D., Neuroscience, Miami Children's Hospital, 3100 SW 62nd Avenue, Miami, FL 33155. E-mail: gustavo.rey@mch.com*

J. WOLKIN, W. BARR, K. ALPER & O. DEVINSKY. Rates of SCID-Diagnosed Axis I Disorders in a Large Cohort of Patients with Epilepsy.

Objective: Many patients with epilepsy are diagnosed with comorbid psychiatric conditions. The etiology of these is multifactorial as a result of a range of clinical, biological and social factors. The following study records the rate of DSM-Axis-I disorders in a sample of 524 patients with epilepsy.

Participants and Methods : All patients were evaluated while undergoing VEEG monitoring and 95.2% were found to have partial epilepsy. The psychiatric diagnosis was based on results of the Structured Clinical Interview for DSM-III-R with Psychotic Screen (SCID-P) administered by a single rater. Patients for this study ranged in age from 18-71 with an average of 13.4 years of education. The sample characteristics were 53.7% female, 79% Caucasian, and 49.1% never married. A total of 12.4% of the sample had a history of previous psychiatric hospitalization. Over half (53.3%) had a history of outpatient psychiatric treatment.

Results : The majority of the sample (53.6%) met diagnostic criteria for at least one Axis I diagnosis. A large number (29.2%) of participants met criteria for two or more diagnoses. The organic mental syndromes were found to be the most common category of diagnosis (25.6%) with Organic Personality Syndrome as the most frequent (17.9%) of that category. This was followed by anxiety disorder (22.3%), mood disorder (13.9%), psychotic disorder (4.2%), and adjustment disorder (2%).

Conclusions : This is the largest study to date of psychiatric diagnosis identified by structured interview in a large single cohort of patients with well-defined epilepsy.

Correspondence: *Jennifer Wolkin, M.A., Ferkauf Graduate School of Psychology, 1165 Morris Park Avenue, Bronx, NY 10461. E-mail: Jenwolkin@gmail.com*

K.A. HAGGERTY, R.M. BUSCH, T.W. FRAZIER, A.D. MCGILL, J.S. HAUT, P.A. KLAAS & P. KOTAGAL. Changes in Anxiety Symptoms in Children Following Surgical Intervention for Treatment of Intractable Epilepsy.

Objective: Studies have demonstrated increased anxiety in pediatric patients with epilepsy, with estimates ranging from 16-31%. However, we are unaware of any studies that have investigated changes in anxiety following surgical intervention. The current study examined post-surgical changes in anxiety symptoms in children and investigated whether observed changes are related to surgery side.

Participants and Methods : The Revised Children's Manifest Anxiety Scale (RCMAS) was administered to 49 children (age range 6-15) with intractable epilepsy both pre- and post-surgically (left=22; right=27). There were no significant differences between the groups in age at time of testing, age of seizure onset, or duration of seizures. Two-way (time x group) mixed ANOVAs were conducted on each RCMAS subscale to examine differences in anxiety scores over time between patients who underwent right- and left-sided surgery.

Results : Consistent with prior research, 22% of the children in this sample produced elevated pre-surgical anxiety scores. There were no significant pre-surgical differences in anxiety scores between patients as a function of side of seizure focus. ANOVA results revealed trends toward a main effect of time ($p=.055$) on the Total Anxiety and Worry/Oversensitivity scales, with an overall reduction in Total Anxiety scores post-surgically (means 52.70 vs. 48.44; $d=.29$). No significant main effects or interactions were found for side of surgery (largest $F=.13$, $p>.70$).

Conclusions : This study supports previous research demonstrating that anxiety in children with epilepsy is common. This study also suggests that anxiety scores tend to improve in children following surgical resection for treatment of epilepsy, regardless of surgery side. Future studies should evaluate post-surgical changes in larger samples and examine other factors that may be related to changes in anxiety following surgery (e.g., seizure freedom, resection site). It is also recommended that parent ratings of anxiety and differences in state/trait anxiety be examined.

Correspondence: *Kathryn A. Haggerty, BS, Psychiatry and Psychology, Cleveland Clinic Foundation, 9500 Euclid Avenue, P 57, Cleveland, OH 44195. E-mail: haggerk@ccf.org*

W. LAFRANCE, J. DAVIS, G. TREMONT, A.S. BLUM, C. RYAN, J. KELLEY & G.I. KEITNER. Family Functioning in Medically Controlled Versus Intractable Epilepsy.

Objective: Family members of patients with epilepsy show family functioning in the unhealthy range. Little is known about potential differences in family functioning between epilepsy patients with managed versus intractable epilepsy. This study investigated family functioning in individuals with medically controlled epilepsy versus individuals with intractable epilepsy who are candidates for surgery.

Participants and Methods : Participants were 16 intractable epilepsy patients undergoing pre-surgical evaluation for temporal lobectomy and 33 medically controlled epilepsy patients. Epilepsy was diagnosed by history, physical examination, and EEG. Family functioning was assessed using the Family Assessment Device (FAD). The FAD is a 60-item self-report questionnaire that assesses the six dimensions of the McMaster Model of Family Functioning, including problem-solving, communication, roles, affective responsiveness, affective involvement, behavioral control, and general functioning.

Results : Pre-surgical patients with epilepsy scored in the unhealthy range in communication, affective responsiveness, affective involvement, behavioral control, and general functioning. Independent samples *t*-tests showed that patients with intractable epilepsy showed statistically greater family dysfunction than patients with medically controlled epilepsy in the areas of affective involvement ($p=.02$) and general functioning ($p=.01$), with a trend toward differences in behavioral control, ($p=.06$).

Conclusions : Findings indicate that patients with intractable epilepsy show family functioning in the unhealthy range in several domains and that family functioning is significantly worse in this group compared to patients with medically controlled epilepsy. Results suggest that assessment of family functioning may be important to include in the epilepsy pre-surgical evaluation. It may also be useful to include a family component in psychosocial interventions with this group.

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*

H. BENDER, C. ZAROFF & S. VARDY. Comparing the Diagnostic and Clinical Utility of the BASC-PRS and the CBCL in Children with Epilepsy.

Objective: Historically, there has been a dearth in the literature concerning the methods of assessing psychopathology in children with epilepsy. Parent-report rating scales, such as the Behavior Assessment System for Children - Parent Rating Scale (BASC-PRS) and the Child Behavior Checklist (CBCL), a commonly administered symptom checklist within this population, are often used to measure subtypes of emergent psychopathology in children. The present study examined the extent to which like-minded broad-band (e.g., internalizing and externalizing behaviors) and narrow-band syndrome scales (e.g., anxiety, depression, inattention, delinquent and aggressive behaviors, and socialization difficulties) on the BASC-PRS and CBCL measure similar behaviors in children with epilepsy.

Participants and Methods : Twenty-three subjects 6 - 17 years of age (Mean = 11.3 years, SD = 3.59) comprised the sample. All subjects had a confirmed diagnosis of epilepsy based on clinical history and/or EEG findings; children with FSIQ scores <70 were excluded. In order to estimate the degree of agreement, a coefficient of determination was computed for each like-minded scale of the BASC-PRS and CBCL (e.g., BASC-PRS Somatization Scale and CBCL Somatic Complaints Syndrome Scale).

Results : For the broad-band scales of these instruments, correlations were high ($r^2 = .52$ & $.56$). In contrast, association between the narrow-band scales varied considerably (range: $r^2 = .04$ - $.50$).

Conclusions : Low correlations between some narrow-band scales may reflect differences in the clinical conceptualization of childhood disorders and divergent methodological approaches of test constructions between the CBCL and BASC. As such, both the CBCL and BASC have their own unique diagnostic and clinical utility in assessing behavior problems in children with epilepsy.

Correspondence: *Heidi Bender, M.A., Neurology - Comprehensive Epilepsy Center, NYU School of Medicine, 403 East 34th Street, 4th Floor, New York, NY 10006. E-mail: heidibender@aol.com*

L.E. OELKE, L.C. BUTTERFIELD, I. FISHMAN, L. HERIAUD, S. BENBADIS & C.R. CIMINO. Self and Informant Reports of Subjective Memory in Temporal Lobectomy Patients.

Objective: Memory difficulty is commonly associated with temporal lobe epilepsy. After temporal lobectomy surgery for treatment of epilepsy, many patients underestimate memory problems despite a decline on objective tests. Informant reports may serve as an alternative indicator of status. However, there has been little study of the relationship between patient and informant reports of memory performance in this population.

Participants and Methods : In the present study, 22 temporal lobectomy patients (8 males and 14 females) completed the Memory Observation Questionnaire (MOQ; McClone, Gupta, & Humphrey, 1988) one to six years post-surgery. Relatives of these patients also completed an adapted version of the MOQ. Data were analyzed using correlational analyses and dependent t-tests.

Results : A significant positive correlation was found between patient and informant ratings ($r=.580$, $p<.01$). Mean patient and informant ratings did not appear to be significantly different. This suggests that patient and informant estimates of patient memory abilities are comparable. Additional analyses revealed a significant correlation between patient and informant ratings for females ($r=.591$, $p<.05$) but not for males. Ratings of younger patients correlated significantly with informant ratings ($r=.627$, $p<.05$), yet this was not the case for older patients. Finally, there was significant correspondence between patient and informant ratings for those that had surgery performed recently ($r=.618$, $p<.05$). This relationship only approached significance in patients that had surgery conducted over two years ago.

Conclusions : This information is preliminary and more data is in the process of being collected. However, results suggest that informant reports may be particularly useful for certain subgroups.

Correspondence: *Lynn E. Oelke, B. S., Psychology, University of South Florida, 14535 Bruce B. Downs Blvd Apt#928, Tampa, FL 33613. E-mail: loelke@mail.usf.edu*

H. PENG, B.P. HERMANN & K. ARFANAKIS. Voxel-based Analysis of Diffusion Anisotropy in Temporal Lobe Epilepsy.

Objective: The purpose of this study was to investigate the diffusion anisotropy characteristics of white matter in patients with focal temporal lobe epilepsy (TLE).

Participants and Methods : Eleven patients with TLE and fourteen age matched healthy controls were scanned with diffusion tensor MRI (DT-MRI). Maps of fractional anisotropy (FA) were constructed for each subject and smoothed (FWHM = 6 mm). All maps were normalized to the FA volume from a normal control. A general linear model was used in each voxel to model FA as a function of: a grouping variable for the two populations, age, age at onset and duration of epilepsy.

Results : The results of the voxel-based analysis were in agreement with our previously published findings using region of interest (ROI) analysis. FA was significantly reduced ($p<0.005$) in the posterior corpus callosum and external capsule of the patient group compared to the healthy subjects. Controlling for the effects of age and duration, significant positive correlation ($p<0.005$) of FA with the age at onset was detected in the posterior corpus callosum.

Conclusions : This study verifies our previous findings suggesting that abnormalities in focal temporal lobe epilepsy patients are not restricted in the temporal lobes but extend in other regions of the brain as well. In addition, the significant positive correlation of FA with the age at onset suggests that early onset of seizures may be associated with adverse effects on the structural integrity of white matter.

Correspondence: *Huiling Peng, Biomedical Engineering, Illinois Institute of Technology, 3100 S Michigan Ave, Apt S06, Chicago, IL 60616. E-mail: penghui@iit.edu*

L.C. BUTTERFIELD, L.E. OELKE, I. FISHMAN, L. HERIAUD, S. BENBADIS & C.R. CIMINO. Quality of Life Following Temporal Lobectomy.

Objective: Quality of life (QoL) and worry about epilepsy are often not considered in long-term follow-up of patients with few or no recent seizures. Few studies have investigated QoL beyond two years post-surgery in patients who have undergone temporal lobectomy for treatment of epilepsy. Further, studies have not typically compared QoL in patients who are early post-surgery with those who are late post-surgery.

Participants and Methods : Twenty-one patients status post temporal lobectomy were examined using the Quality of Life in Epilepsy - 31 (QOLIE-31). Participants were grouped by median split into early post-surgery (1-2.5 years post-surgery; $n=11$) and late post-surgery (> 2.5 years post-surgery; $n=10$). Data was analyzed using independent t-tests.

Results : No significant differences were found on the Overall Score nor on the QoL subscales (Seizure Worry, Overall QoL, Emotional Well-Being, Energy/Fatigue, Cognitive, Medication Effects, Social Functioning). However, Seizure Worry approached significance, indicating that concern over seizures may diminish over time post surgery.

Conclusions : These preliminary findings suggest that QoL may not largely differ in temporal lobectomy patients 1-2.5 years post-surgery as compared to patients more than 2.5 years post-surgery. We plan to evaluate whether the trend for group differences in seizure worry will be supported with increased sample size.

Correspondence: *London C. Butterfield, BA, Psychology, University of South Florida, 4202 E. Fowler Ave., PCD 4118G, Tampa, FL 33620. E-mail: londonbutterfield@hotmail.com*

C. CHICOTA, S. ROGERS, J. HORSEFALL & S. BOOKHEIMER. Passing the Wada Test as it Relates to Non-Verbal Memory Performance.

Objective: This study examined if there is a significant difference in memory and language on neuropsychological testing between those who pass (at or greater than 63% recall) or fail (less than 63% recall) the Intracarotid amobarbital procedure (IAP/Wada). Specifically, we investigated if individuals who pass versus fail the IAP have different performances on neurocognitive tests of memory.

Participants and Methods : A sample of 71 patients at the UCLA Seizure Disorder Center (40 female, 31 male; M age = 34.78, SD = 11.95) received comprehensive neuropsychological memory assessment and subsequently underwent the IAP to determine candidacy for resective surgery for the treatment of medically refractory temporal lobe epilepsy. Composite Z scores were calculated to determine overall verbal and non-verbal memory scores.

Results : ANCOVA analyses controlling for hemisphere of lesion revealed that those who passed the IAP had significantly better overall visual memory than those who failed the IAP, $F(1, 56) = 4.23$, $p < .05$. They had significantly better overall delayed visual memory than those who failed the IAP, $F(1, 56) = 5.93$, $p < .02$. Moreover, there was a significant level of asymmetry between the verbal and nonverbal memory measures (with nonverbal measures comparatively better) between those who passed and those who failed the IAP, $F(1,56) = 4.71$, $p < .05$.

Conclusions : These results suggest that visual memory, particularly delayed visual memory, and asymmetry in memory performance (with greater non-verbal) may be sensitive indicators for determining a passing performance on the IAP/Wada procedure. This may inform the use of IAP/Wada and suggest the viability of visual memory measures in environments where IAP/Wada are unavailable.

Correspondence: *Cammy Chicota, Ph.D., Psychiatry & Biobehavioral Sciences, UCLA, 760 Westwood Plaza #CS-737, Los Angeles, CA 90095. E-mail: Cchicota@mednet.ucla.edu*

Executive Abilities/Frontal System

D. ROTH & L. BURTON. Interrelationships of Intelligence, Memory and Executive Functions.

Objective: The objective of this study was to evaluate interrelationships between intelligence, memory, and executive functions in a neurological sample of participants with temporal lobe epilepsy.

Participants and Methods : Forty-three participants with temporal lobe epilepsy were evaluated with measures of intelligence, memory, and executive functions to evaluate interrelationships between these variables. The Wechsler IQ and Memory scales, the Wisconsin Card Sort (WCS), and the Controlled Oral Word Association verbal fluency test were used.

Results : Significant correlations were found among the measures of intelligence, memory, and executive functions. When FSIQ was partialled out, correlations between Visual Memory and the executive function measures of verbal fluency, WCS number of categories, and number of perseverative errors remained. No relationships between Verbal Memory and the executive measures remained. Additionally, there were no significant differences for any of the measures of intelligence, memory or executive functions for the subset of participants with predominantly left vs. right sided epilepsy.

Conclusions : These findings are discussed in terms of the literature indicating interrelationships between executive functions and memory subtypes.

Correspondence: *Leslie Burton, Ph.D., Psychology, Fordham University, 441 E. Fordham Rd., Bronx, NY 10458. E-mail: burton@fordham.edu*

Forensic Neuropsychology

L.I. REICKER. The Effects of Differential Cognitive Demands on Malingering.

Objective: The present study evaluated how situational variables influence malingering. Two experiments were performed to test the hypothesis that performance would be significantly affected by situational factors experienced within the testing session.

Participants and Methods : In both experiments the Computerized Tests of Information Processing (CTIP), a measure of speed of information processing that has been shown to be sensitive to malingering, was administered to a control and simulator group. Experiment I (N=40) factorially combined effort (control vs malingerer) with cognitive demand (increasing vs decreasing). Cognitive demand was manipulated by administering the least cognitively complex task first to half the participants and administering it second to the remaining half. In experiment II (N=49) a test of intermediate difficulty was added. Effort was factorially combined with number of tests (two vs three) and all tasks were administered in ascending order of cognitive complexity.

Results : Factorial MANOVAs with repeated measures revealed malingerers performed worse than controls but performance was not affected by order of administration or the introduction of an intermediate task. Thus, the results failed to support the original hypothesis. Coefficients of variability revealed malingerers showed greater variability than controls, with the difference being greatest for the most cognitively demanding task. Inclusion of an intermediate task did not produce any significant differences in variability.

Conclusions : It was concluded the CTIP is sensitive to malingering and that malingerers entered the testing session with a preconceived strategy that was not affected by the manipulations, possibly because of insufficient strength of the manipulations or because malingerers were insensitive to them.

Correspondence: *Lindsay I. Reicker, BSc., Psychology, Carleton University, Dept. of Psychology, Carleton University, Ottawa, ON K1S 5B6, Canada. E-mail: lreicker@connect.carleton.ca*

C.M. SMART, N.W. NELSON, J.J. SWEET & R.L. HEILBRONNER. Identification of Secondary Gain Using the MMPI-2: An Optimal Classification Tree Analysis.

Objective: Sensitivity of traditional MMPI-2 validity indicators (e.g., the *F*-family: *F*, *Fb*, *Fp*) in detecting feigned somatic, cognitive, and emotional symptoms among litigants has been questioned. Validity indicators unaffected by secondary gain (SG) are not useful. Previous research has suggested that the Fake Bad Scale (*FBS*), either alone or in combination with clinical scales, is more sensitive to non-psychotic feigning of conditions (e.g., PTSD, chronic pain, brain injury) likely to be the subject of litigation. The current study investigated the comparative utility of MMPI-2 validity and clinical scales in identifying secondary gain.

Participants and Methods : Classification tree methodology (Optimal Discriminant Analysis: ODA; Yarnold & Soltysik, 2004), which makes recurrent dichotomous discriminations and develops an optimized linear decision tree, was employed. MMPI-2 results of 205 individuals evaluated neuropsychologically at an institutionally-based outpatient practice, either in an SG context ($n = 120$) or a routine clinical context with no associated secondary gain (NSG; $n = 85$), were examined via ODA.

Results : 76.6% of the sample were accurately classified in terms of SG (80%) or NSG (71.8%) status, with *Hs*, *FBS*, and *Fp* emerging as significant predictors, and *Hs* having temporal priority. Individuals in the SG group scoring below the *Hs* cutoff ($T = 62.5$) had *Fp* scores of $T = 41.5$ or greater. Similarly, individuals in the SG group scoring above the *Hs* cutoff had an *FBS* raw score of 23.5 or greater.

Conclusions : Among neuropsychological referrals, SG can be reasonably identified in terms of somatic and other non-psychotic (*Hs* and *FBS*) complaints and psychiatric (*Fp*) complaints.

Correspondence: *Colette M. Smart, M.A., Department of Psychology, Loyola University Chicago, 417 E. 70th Street, Apt. #11, New York, NY 10021. E-mail: smartmobile@yahoo.com*

N. SILVERBERG, J. WERTHEIMER & N. FICHTENBERG. An Effort Index for a Cognitive Screening Battery: The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Objective: Brief screening batteries such as the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) are indispensable in various clinical situations. Poor effort and response bias are at least somewhat prevalent in most of these situations, suggesting a need to screen for cognitive impairment and insufficient effort simultaneously. The present study aimed to satisfy this need by developing an internal validity indicator for the RBANS.

Participants and Methods : Two subtests of the RBANS, Digit Span and List Recognition, were predicted to be relatively resilient to a wide array of cognitive disorders on the basis of previous research. An Effort Index (EI) was created by combining these subtest scores via a scaling system. The derivation sample ($N = 103$) included patients with a variety of bona fide neurological and psychiatric disorders. The cross-validation samples were mild traumatic brain injury patients ($n = 32$), healthy controls ($n = 28$), clinically identified malingerers ($n = 15$), and simulated malingerers ($n = 53$).

Results : The frequency of EI scores was first examined in the derivation sample. In a subsequent cross-validation study, the EI achieved good sensitivity and specificity at discriminating between genuine and feigned traumatic brain injury, comparable to other response bias indicators. The EI's high correlation with the Test of Memory Malingering, a well-established symptom validity test, supported its construct validity.

Conclusions : The EI appears to be a clinically useful tool for detecting insufficient effort on a cognitive screening battery. It also adds value to using the RBANS as the "core" of a comprehensive semi-flexible neuropsychological battery.

Correspondence: *Noah D. Silverberg, Department of Psychology, University of Windsor, 401 Sunset Ave., Windsor, ON N9B 3P4, Canada. E-mail: noahsilverberg@hotmail.com*

G.J. LARRABEE. Malingering Formulae for The Continuous Visual Memory Test and Continuous Recognition Memory Test.

Objective: The goal of this study was to identify items on the Continuous Visual Memory Test (CVMT; Trahan and Larrabee, 1988) and Continuous Recognition Memory Test (CRM; Hannay, Levin and Grossman, 1979) that were rarely failed by patients with moderate or severe traumatic brain injury (TBI), but frequently failed by patients identified as manifesting definite Malingered Neurocognitive Dysfunction (MND). Item responses for the CVMT and CRM were contrasted for the TBI and definite MND subjects, with cross-validation on groups of probable MND, mixed neurologic and psychiatric diagnoses.

Participants and Methods : CVMT and CRM scores of 24 litigants with definite MND (< chance on PDRT) were contrasted with those of 27 patients with moderate (n=12) and severe (n=15) TBI. Cross-validation employed 17 litigants with probable MND (failure on > 1 symptom validity test) and non-litigating psychiatric (n=14) and neurologic (n=13) patients.

Results : Chi square identified 20 CVMT and 33 CRM items that discriminated the definite MND from the TBI cases. Sensitivity and specificity were 83% and 89% for the CVMT, and 87.5% and 93% for the CRM. On cross-validation, sensitivity and specificity were 35% and 93% for the CVMT, and 52.9% and 96% for the CRM.

Conclusions : Malingering formulae were developed for the CVMT and CRM that have good specificity and sensitivity for discriminating definite MND and TBI. Specificity remained high, but sensitivity dropped on cross-validation, suggesting the formulae work better for detecting definite vs. probable malingering. The CRM discriminates malingering better than the CVMT.

Correspondence: *Glenn J. Larrabee, Ph.D., Independent Practice, 630 South Orange Ave., Suite 202, Sarasota, FL 34236. E-mail: GLarrabee@aol.com*

C.L. YANTZ, L. BAUER, B.E. GAVETT, J.E. HORWITZ, R. MACHER, J.K. LYNCH, J.M. FISHER & R.J. MCCAFFREY. Passing or Failing Symptom Validity Measures: The Differential Impact on Memory Functioning in a Sample of Litigants.

Objective: This study compares performance differences of symptom validity passers and failers using the Word Memory Test (WMT), Test of Memory Malingering (TOMM), Victoria Symptom Validity Test (VSVT), and the Rey-15 Item Test (Rey-15) on the Memory Assessment Scales (MAS).

Participants and Methods : Archival data from 103 litigants administered both the MAS and one or more of the WMT, TOMM, VSVT, and Rey-15 were used. The failure rate for WMT was 60%, TOMM 28%, VSVT 18%, and Rey-15 23% (n for each SVT ranged from 57 to 103). Independent-samples t-tests were used to compare group means of four MAS summary scores (Global, Verbal, Visual, and Short-Term Memory) for passers and failers on each SVT.

Results : All SVT passers had significantly better MAS scores than SVT failers (p ranged from <.001 to .04), except one nonsignificant difference for Visual Memory for VSVT passers and failers. The mean difference for Global and Verbal Memory was greater than 1 SD for the TOMM, WMT, and the Rey-15. The mean difference for Visual Memory was greater than 1 SD only for the TOMM and Rey-15. The mean difference for Short-Term Memory was greater than 1 SD for all of the SVTs used.

Conclusions : This study demonstrates that passers of all of the examined SVTs had better MAS scores than failers. The TOMM and Rey-15 consistently had the greatest mean differences, suggesting that people

who fail these tests perform more poorly than people who pass across all areas of memory summarized by the MAS. The WMT had a mean difference greater than 1 SD for three of four summary statistics. Passers and failers of the VSVT performed similarly on the MAS, in that mean differences generally did not exceed 1 SD on the MAS.

Correspondence: *Christine L. Yantz, MA, Psychology, University at Albany, 369 Social Sciences, University at Albany, Albany, NY 12222. E-mail: cy2030@albany.edu*

N.W. NELSON, J.J. SWEET & G.J. DEMAKIS. Meta-Analysis of the MMPI-2 Fake Bad Scale.

Objective: Clinical researchers have disagreed regarding the clinical utility of the MMPI-2 Fake Bad Scale (FBS) within forensic settings. The present meta-analysis summarizes effect size differences among the FBS and other commonly used validity scales (L, F, K, Fb, Fp, F-K, O-S, Ds2, Dsr2) in groups that either over-reported psychological symptoms or did not.

Participants and Methods : Forty studies that included the FBS were identified through exploration of online databases, perusal of published references, and communication with primary authors. Nineteen of the 40 studies met stringent inclusion criteria, resulting in 1550 over-reporting participants, and 1560 comparison participants. Of the 19 studies, 16 were articles published in peer-reviewed journals, two were posters presented at national conferences, and one was an unpublished dissertation.

Results : The largest grand effect sizes were observed for the FBS (.94), followed by O-S (.86), Dsr2 (.79), F-K (.68), and the F-scale (.62). Significant within-scale variability was observed for seven validity scales, including the FBS ($Q = 113.58, p < .001$). Most subsequent FBS moderator analyses yielded moderate to very large effect sizes, and were statistically significant for level of cognitive effort, study group composition (litigant/claimant, simulator, or combined), context of group comparisons (e.g., over-reporting context with evidence of feigning versus over-reporting context only), gender proportion, and condition associated with over-reporting (e.g., traumatic brain injury, post-traumatic stress, chronic pain).

Conclusions : Findings suggest that the FBS performs as well as, if not superior to, other validity scales in discriminating over-reporting and comparison groups; the preponderance of the present literature supports the scale's use within forensic settings.

Correspondence: *Nathaniel W. Nelson, Ph.D., Department of Psychiatry and Behavioral Sciences, Evanston Northwestern Healthcare, 909 Davis Street, Ste 160, Evanston, IL 60201. E-mail: nnelson2@enh.org*

L.A. WAGNER, B.R. WILLIAMS, E.C. CIAMPA, M.L. GONEN & P.J. DONOVICK. Is There a Relationship Between Motor Speed and Intelligence?: Correlations in Large Samples of Incarcerated and Nonincarcerated Individuals.

Objective: According to theories of general intelligence one would expect a strong positive correlation between motor speed and IQ, but findings from previous research in this area have been equivocal. The present study sought to better understand this relationship by examining the performance of adults on two motor speed tasks and a standard IQ measure.

Participants and Methods : Data was collected on a large sample of adults, including participants from two state prison mental health units (n=281), a civilian community hospital (n=399), a private practice (n=209), and an outpatient mental health clinic (n=35). These participants were referred for neuropsychological evaluation and were given Trails A and B, the Purdue Pegboard, and either the WAIS-III or K-BIT as part of a larger neuropsychological test battery. It is important to note that the prison group had significantly fewer years of education and lower IQ scores than the other three groups.

Results : There were strong positive correlations between scores on motor speed tasks and IQ. These results were not only found in correlations between motor speed tasks and performance subtests, but were also seen between motor speed tasks and verbal subtests.

Conclusions : The results support theories of general intelligence and suggest that even simple tasks reflect higher level cognitive functioning. Correspondence: *Lori A. Wagner, B.S., Clinical Psychology, Binghamton University (SUNY), PO Box 6000, Binghamton, NY 13902. E-mail: bj92174@binghamton.edu*

B.R. WILLIAMS, L.A. WAGNER, E.C. CIAMPA, M.L. GONEN & P.J. DONOVICK. A Comparison of the Relationship Between IQ and Verbal Fluency in Incarcerated and Nonincarcerated Individuals.

Objective: To examine performance differences between incarcerated and nonincarcerated individuals on tasks of verbal fluency. Little research has been conducted regarding the relationship of IQ to measures of cognitive ability in an incarcerated sample. We compared an incarcerated sample of below average IQ individuals to a nonincarcerated sample of average IQ individuals and assessed the relationship between IQ and letter and semantic fluency tasks for both groups.

Participants and Methods : K-BIT ($n=255$), FAS ($n=175$), and animal naming ($n=115$) data were extracted from a larger data set ($n=659$) and analyzed on individuals either evaluated at a civilian community hospital or private practice ($n=154$), and two mental health units associated with New York state prisons ($n=101$). All tests were administered as part of a comprehensive battery of tests.

Results : The nonincarcerated group performed in the average IQ range ($M=93$, $SD=17$) and had typically graduated high school. The incarcerated group performed in the below average IQ range ($M=74$, $SD=16$) and typically completed less than 10 years of schooling. The incarcerated group produced significantly fewer words than the nonincarcerated group on the letter and semantic fluency tasks. Despite group differences on IQ, FAS, and animal naming, within group correlational analyses indicate that verbal and composite IQ are significantly related to performance on FAS and animal naming for both groups.

Conclusions : The results of this study underscore the influence of IQ on verbal fluency performance not only for groups of average intelligence, but also those who perform in the below average range on measures of IQ.

Correspondence: *Bethany R. Williams, BA, Clinical Psychology, Binghamton University (SUNY), 55 Riale Avenue, Johnson City, NY 13790. E-mail: builliaS@binghamton.edu*

L.J. SCHIPPER & D.T. BERRY. A Meta-Analytic Review of Objective Procedures for the Detection of Feigned Psychiatric Symptom Reports During Forensic Neuropsychological Examinations.

Objective: Diagnosis of psychiatric disorders is heavily dependent on self-reported symptoms, making it imperative to evaluate the accuracy of such statements during forensic evaluations. Although much research has focused on detecting inadequate effort during neuropsychological evaluations, little has been published on identifying feigned psychiatric symptoms in this context.

Participants and Methods : To address this issue, a meta-analytic review of currently available psychiatric feigning scales was undertaken with attention to methodological quality of published support and the availability of neurologic control groups.

Results : Results suggest that the MMPI-2 F, F(p) & FBS scales (Cohen's $d = 1.6, 1.7, 2.0$) as well as the SIRS ($d = 1.6$) have adequate support for this purpose and results from neurologic control groups. Other promising tests include the M-FAST ($d = 2.4$), PAI NIM & MI scales ($d = 1.1$ & $.70$), and the SIMS ($d = 2.6$), although these 3 lack data from neurologic controls. Mean sensitivity and specificity data at recommended cutting scores were: MMPI-2 F ($Sn = .67$, $Sp = .89$), F(p) ($Sn = .49$, $Sp = .93$), FBS ($Sn = .80$, $Sp = .85$); SIRS ($Sn = .58$, $Sp = .97$); M-FAST ($Sn = .80$, $Sp = .85$); PAI NIM & MI ($Sn = .57$, $Sp = .87$; $Sn = .48$, $Sp = .90$); SIMS ($Sn = .95$, $Sp = .75$). Available data on the MCMI-3 were not supportive.

Conclusions : Forensic neuropsychological examiners should always use well-validated, objective instruments to detect feigned psychiatric symptom reports, and results from this review may assist in making prudent choices.

Correspondence: *David T. Berry, Ph.D., Psychology, Univ. of Kentucky, 125 Kastle Hall, Lexington, KY 40506-0044. E-mail: dtrb@uky.edu*

J.E. HORWITZ, C.L. YANTZ & R.J. MCCAFFREY. Interplay of Examinee Anxiety and Presence of Third Party Observers on Tests of Executive Function.

Objective: The purpose of this study was to determine how state and trait anxiety may mediate the effects of third party observation on tests of executive functioning. We hypothesized that the presence of a third party observer (TPO) would be associated with performance decrements among all subjects; however, the impact of a TPO would be greater among high state- and trait-anxious individuals.

Participants and Methods : Seventy undergraduate students were administered phonemic and categorical verbal fluency tests (using FAS and animal naming), Trail Making Tests, the Tactual Performance Test, and the State-Trait Anxiety Inventory. The test battery was administered by a trained examiner who was blind to the hypothesis. An observer, whose purpose in the testing room was not revealed, was present for 35 of the testing sessions while the remaining 35 were conducted with no TPO present. Gender, age, and years of education did not differ significantly between the two groups.

Results : Significant interactions between presence of a TPO and trait-anxiety were found on the categorical fluency test. Examination of this interaction indicates that high trait-anxiety is associated with better performance in the no TPO condition and worse performance in the TPO condition, as compared with low trait-anxiety.

Conclusions : Performance on a test of executive functioning in the presence of a TPO is mediated by trait-anxiety. The findings from this study suggest that anxious individuals may be particularly prone to impaired performance on neuropsychological testing in the presence of a TPO.

Correspondence: *Julie E. Horwitz, Psychology, University at Albany, SUNY, Social Sciences 369, 1400 Washington Avenue, Albany, NY 12222. E-mail: juliehorwitz77@hotmail.com*

J.E. HORWITZ, C.L. YANTZ, B.E. GAVETT, L. BAUER, R.B. MACHER, J.K. LYNCH, J.M. FISHER & R.J. MCCAFFREY. Are Measures of Symptom Validity All Equal? Preliminary Findings.

Objective: This study was designed to investigate the constructs measured by five commonly used symptom validity tests (SVTs). Given the unique nature of the Fake Bad Scale (FBS) from the MMPI-2, we hypothesized that the FBS assesses a different construct than other SVTs.

Participants and Methods : We used archival data from 42 patients who were administered the Word Memory Test (WMT), Victoria Symptom Validity Test (VSVT), Test of Memory Malingering (TOMM), and Rey-15, in addition to the MMPI-2, as part of a larger battery. Principal components analysis was performed to determine whether scores on the four aforementioned symptom validity tests, in addition to the FBS, load onto the same or unique components.

Results : Principal components extraction with varimax rotation was performed on 10 variables. Three components with Eigenvalues over one were extracted. The second and third trials of the TOMM, all three subscales of the VSVT, and the Rey-15 loaded onto the first component. The three subscales of the WMT loaded onto a second component, and the FBS loaded onto a third component. The first trial of the TOMM did not load cleanly onto any of the three components, using a cutoff of $.40$ for variable inclusion on a component.

Conclusions : The findings in the present study suggest that the indices of symptom validity load onto different components. While this is an exploratory study, it suggests that practitioners may want to select SVTs that load on different components in order to more broadly assess the validity of their neuropsychological data.

Correspondence: *Julie E. Horwitz, Psychology, University at Albany, SUNY, Social Sciences 369, 1400 Washington Avenue, Albany, NY 12222. E-mail: juliehorwitz77@hotmail.com*

D. WHITESIDE, P. DUNBAR-MAYER & L. SWANSON. Detection of Decreased Effort in Neuropsychological Assessment: A Pilot Study.

Objective: Detection of decreased effort and malingering is of major concern in neuropsychological assessment. Numerous instruments exist that are designed to detect decreased effort, such as the Test of Memory Malingering (TOMM; Tombaugh, 1996). However, sometimes assessment requirements preclude utilizing formal measures of effort, such as in brief assessment. Thus, neuropsychological assessment instruments designed to detect memory deficits, have been investigated for their utility in detecting decreased effort.

Participants and Methods : One approach is the Rarely Missed Index (Scott-Killgore and DellaPietra, 2000) which uses items from the Wechsler Memory Scale-III (WMS-III; Psychological Corporation, 1997) Logical Memory Recognition subtest. Another instrument that utilizes a recognition format is the Rey Auditory Verbal Learning Test Recognition (RAVLTR; Rey, 1941; Schmidt, 1996), although the RAVLTR uses a non-forced choice format with an answer sheet of correct items interspersed with distracter items. The current study investigated the relationship between the TOMM Trial 2 and the RAVLTR hits and false positives. Correlational analysis was conducted on 20 clients referred for evaluation in potential secondary gain situations, primarily personal injury and criminal forensic cases. All clients received both the RAVLTR and TOMM as part of a comprehensive neuropsychological assessment battery.

Results : Correlational analysis indicated a trend toward significance between TOMM and RAVLTR hits, indicating promising results ($r=0.42$, $p=.065$). A statistically significant relationship was not observed between the TOMM and RAVLTR false positives.

Conclusions : These results indicate potential utility of the RAVLTR in detecting decreased effort, but additional research with larger sample sizes is required to evaluate this potential further.

Correspondence: *Douglas Whiteside, Ph.D., Clinical Psychology, Argosy University, 1019 5th Avenue N, Seattle, WA 98109. E-mail: dougnp@msn.com*

D. STONE, K.B. BOONE, B. CARLA & I.M. LESSER. Somatization and malingering of cognitive deficit in six cases of "toxic mold" exposure.

Objective: In spite of recent growth in personal injury claims due to mold, numerous reviews of the literature have failed to document an association between environmental exposure to mold and neuropsychiatric damage. Two recent empirical reports have described neuropsychological declines in patients claiming mold exposure, but these publications suffered from various methodological flaws including failure to adequately rule out malingering, somatoform conditions, or depression.

Participants and Methods : We present the results of cognitive effort tests, MMPI-2 and FBS data, and neuropsychological test results on six litigants claiming cognitive impairment due to toxic mold exposure.

Results : All six cases were found to have evidence of somatization based on medical record review as well as presence of significant elevations on scales 1 and 3 on the MMPI-2, but two were also documented to be malingering as determined by multiple indicators of non-credible cognitive performance.

Of the four nonmalingerers, neuropsychological dysfunction was only observed in the patients with concurrent depression; the other two somatoform patients were cognitively normal. FBS was elevated in all 4 somatoform patients but only 1 of 2 malingerers, suggesting that this scale may be as or more sensitive to hysterical, as compared to malingered, presentations.

Conclusions : These six cases argue for consideration of two subtypes of mold litigants: primarily somatoform (with or without depression) or primarily malingering. Given that these cases represent the total of all toxic mold litigants examined by the authors, it is probable that these cases are representative of the larger toxic mold litigating population.

Correspondence: *Kyle B. Boone, Ph.D., Psychiatry, Harbor-UCLA Medical Center, 1000 W. Carson Street, Building F-9, Torrance, CA 90509. E-mail: kboone@labiomed.org*

M. POWELL, J.S. SMIGIELSKI, C. SLETTEN & M.R. LAWRENCE. TOMM Performance in a Mixed Chronic Pain Treatment Seeking Sample is Unrelated to Mood, Memory, and Common Variables Associated with Suboptimal Effort.

Objective: To examine the relationship between litigation, disability status, depression, pain severity, memory, and narcotic medication use and performance on the Test of Memory Malingering (Tombaugh, 1996) in a mixed chronic pain rehabilitation-seeking sample.

Participants and Methods : Participants included 72 chronic pain patients seeking intensive outpatient pain rehabilitation at a mid-western hospital (96% Caucasian, 68% female, mean age = 43 years, mean education = 15 years). Mean duration of chronic pain is 7.8 years. All participants completed the TOMM Trial 2 as a measure of cognitive effort. They also completed the Center for Epidemiological Studies-Depression Scale (Radloff, 1977), the Multidimensional Pain Inventory (Kerns et al., 1985) and a verbal learning task (Rey, 1964). Relevant demographic and personal data was collected via questionnaire.

Results : Not one of the 72 participants performed below expectations (45/50) on Trial 2 of the TOMM. Factors such as litigation related to pain problem, receiving and/or applying for disability, and narcotic pain medication use were unrelated to TOMM trial 2 mean performance or failure rates. Moreover, pain severity, depression and memory retention had no relationship with mean performance or failure rates on the TOMM.

Conclusions : Cognitive effort was unrelated to many important patient variables in this chronic pain treatment-seeking sample. While the lack of relationship between cognitive effort, depression, pain severity and memory is not surprising given previous findings, the minimal impact of litigation or disability status on effort was unexpected, even in a treatment seeking sample (Cragar et al., 2004).

Correspondence: *Matthew Powell, Geisinger Medical Center, 100 N. Academy Avenue, Danville, PA 17822. E-mail: mrpowell@geisinger.edu*

G.J. CHELUNE & Y. SUCHY. Effects Of Intervention For Incomplete Testing Effort Among Patients With Multiple Sclerosis (MS).

Objective: Effort testing is an accepted practice in clinical and forensic evaluations. However, the objective impact of confronting patients who show incomplete effort is not well understood. We studied whether challenging patients after questionable responding on the Victoria Symptom Validity Test (VSVT) would have an impact on subsequent memory testing.

Participants and Methods : Of 530 consecutive patients with clinically definite MS, 507 were administered the VSVT, and 56 (11%) were observed to have suspect effort ("hard" items < 16). Initially, patients with suspect effort did not receive any specific VSVT feedback (NFB:n=28). However, over time a protocol emerged in which patients with suspect effort (FB: n=28) were counseled prior to proceeding with additional testing, and the VSVT was readministered followed by the Wechsler Memory Scale-III (WMS-3).

Results : The FB and NFB groups did not differ on demographic factors, disease course or duration, FSIQ, or initial VSVT testing. However, readministration of the VSVT in the FB group resulted in significant improvements on both the “easy” ($p=.042$) and “hard” ($p < .000$) items. Repeated measures ANOVA showed a significant between-group effect ($p=.018$) for WMS-3 demographically adjusted T-scores, with the FB group performing better on both the Immediate Memory (37.9 vs 31.0) and General Memory (39.0 vs 32.9) Indexes; no differences were observed for Working Memory. Using scores of 1 SD below demographic expectation as a sign of impairment, the NFB group was significantly more likely to have impaired Immediate and General Memory scores than the FB group (Odds Ratios of 4.6 and 4.5, respectively).

Conclusions : Formal effort testing not only helps identify potential incomplete effort on testing, but also provides an opportunity to actively intervene. Our results suggest that challenging suspect effort during testing, including readministration of the VSVT, not only improved performance on the WMS-3 but also resulted in a decreased frequency of impaired performance on the WMS-3.

Correspondence: *Gordon J. Chelune, Ph.D., Mellen Center (U-10), Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195. E-mail: cheluneg@ccf.org*

J.J. NEUDECKER. Evaluation of a Novel Malingering Detection Method Involving Symptom Validity Testing, Performance Curve Analysis, and Response Time.

Objective: The malingering of cognitive deficits due to alleged or actual brain injury is problematic for the multiple parties it affects. A number of researchers have attempted to develop malingering detection measures and techniques with limited success. The current project involved the development and evaluation of a new computer administered measure of malingering detection that utilizes multiple detection strategies, including symptom validity testing, performance curve analysis, and response time. It was hypothesized that multiple detection techniques would better address heterogeneity amongst malingering approaches, and thus demonstrate greater sensitivity and specificity than any single approach.

Participants and Methods : Seventy subjects were recruited from Central Michigan University Psychology courses and randomly assigned to one of two groups: a control group and an educated malingering group. The educated group was provided with information regarding head injury sequelae and asked to feign believable impairment. In order to evaluate the utility of the measure with genuinely impaired individuals, it was piloted on nine participants with documented moderate to severe brain injuries.

Results : Overall, the measure yielded a sensitivity of .71 and a specificity of .75 between the control and simulator groups, while falsely implicating two of nine members of the clinical group. The total scale was more successful than the individual scales.

Conclusions : These results suggest there is utility to combining detection techniques. The measure has potential, but is in need of further revision.

Correspondence: *John J. Neudecker, M.A., Central Michigan University, 8023 Upham Drive, Mount Pleasant, MI 48858. E-mail: jneudecker@yahoo.com*

M. GREIFFENSTEIN, W. BAKER & T.J. GOLLA. Validity Test Failure Prevalence in a Large Sample of Workers Compensation Applicants.

Objective: Calculate the base rate for three types of pseudoabnormalities (memory, motor, and subjective) using quantitative methods in a large sample of Michigan workers applying for benefits based on work-related head-neck trauma.

Participants and Methods : 255 injured workers seen from 2002-2005 through an occupational medicine clinic were given a symptom validity battery made up of the Test of Memory Malingering

(TOMM), finger tapping, and the Fake Bad Scale (MMPI-2). Males were 66% of the sample, Caucasians 64%, 75% had HS+ educations, and 94% had English as a first language. The mean post-injury duration was 26 months (range = 1-300) and mean age 44 years (19-72). The modal injury severity was minor head-neck injury (71% showing GCS = 15 in the ER), followed by 18% mTBI, and 9% moderate-severe TBI.

Results : Using $< 45/50$ on TOMM as the criterion, 41% failed Trial 2 and 40% failed Retention. Using a finger tapping score of < 66 (sum of hands), 36% failed. About 56% exceeded an FBS raw score of 24 when combining men and women. Pseudoabnormalities of any type were more frequent in minor injuries, an inverse dose-response relation.

Conclusions : The findings indicate neuropsychological pseudoabnormalities are common in work settings where compensation is sought for head injury, although not necessarily representative of all persons with head trauma. Our base rate of 41% failure on a simple memory test is nearly equivalent to the 40% base rate reported in other studies. Effort screening is crucial for better allocation of rehabilitation resources.

Correspondence: *Manfred Greiffenstein, Ph.D., Psychological Systems Inc., 26862 Woodward, Suite 103, Royal Oak, MI 48076. E-mail: mfgreifff@comcast.net*

J. WISE, M. LACY, M. OLIVEIRA, B. PYYKKONEN & D. HAN. Detecting Neuropsychological Malingering of Mild TBI: Effects of Internet Based Coaching.

Objective: The Internet currently offers detailed information regarding how neuropsychological tests are administered, scored, and interpreted (Ruiz et al, 2002). The purpose of this study was to assess the efficacy of studying Internet based neuropsychological information on response bias or malingering.

Participants and Methods : A sample of thirty, 18 to 21 year old students with a mean of 11.5 years of education, were randomly assigned to one of two groups. The experimental group ($n=15$) was asked to study information obtained from the Internet on the Rey Complex Figure, Wisconsin Card Sort Test, California Verbal Learning Test and the Word Memory Test, in addition to information on symptoms of mild TBI. This group was compared to a group of demographically similar controls ($n=15$), who were given no relevant information. Both groups were asked to malingering mild TBI on the tests (CVLT, WCST, RCF, WMT). Means, standard deviations and ranges were obtained for both groups. Confidence intervals were constructed around the mean score of each of the tests and plotted in comparison to both groups, and the existing norms for normal and TBI individuals.

Results : Insufficient effort was detected within both groups across all measures however, the test scores of the experimental group overall, were closer to those of true head injured individuals.

Conclusions : Results suggest that Internet coaching assists individuals in becoming more sophisticated in modifying their performance, but is not sufficient for successful, undetectable malingering.

Correspondence: *Jennifer Wise, Psychiatry/Neuropsychology, University of Chicago, 4133 Arbor Drive, Shrewsbury, MA 01545. E-mail: JLWise33@hotmail.com*

R. MACHER, L. BAUER, B. GAVETT, C. YANTZ, J. HORWITZ, J.K. LYNCH, J.M. FISHER & R.J. MCCAFFREY. The MMPI-2 Fake Bad Scale (FBS) for Detection of Incomplete Effort on Neuropsychological Testing: An Extension and Cross-Validation.

Objective: The MMPI-2 Fake Bad Scale (FBS) has been developed to detect exaggeration of symptoms in personal injury litigation. The present study sought to extend research on the FBS by analyzing the sensitivity, specificity, positive and negative predictive values of the FBS in detecting suboptimal effort as index by cognitive symptom validity tests.

Participants and Methods : Archival MMPI-2 and symptom validity test data were extracted from 202 personal injury litigants. Three different FBS cutoff scores were evaluated (20, 26, 30). Three criteria for suboptimal effort were used: (1) failure on the Test of Memory Malinger (TOMM; Tombaugh, 1996), (2) failure on the Word Memory Test (WMT; Green, 2001), and (3) failure on both the TOMM and WMT.

Results : Sensitivity of the FBS was greatest using a cut score of 20 (Larrabee, 2005) for litigants who failed both the TOMM and the WMT. Specificity was greatest using a cut score of 30 for all three analyses. Positive predictive values were generally below chance, with the exception of a PPV of 1.0 using a cut score of 30 for those failing the WMT. Negative predictive values were similar across all 3 analyses (NPV = .66 to .76).

Conclusions : In the present study, the negative predictive value of the FBS was demonstrated. Details of the sensitivity, specificity, negative predictive values, and positive predictive values by gender and across FBS cutoff scores will be presented.

Correspondence: *Rayna B. Macher, B.S., Psychology, University at Albany, 3060 Edgewood Ave, Rotterdam, NY 12306. E-mail: raynalynn7@yahoo.com*

J. DENBOER, S. HALL, K. HOFFMAN & J. JACOBSEN. TOMM vs. WMT vs. CARB: Specificity, Sensitivity, and Face Validity.

Objective: The majority of current methods for detection of cognitive feigning include the use of forced-choice symptom validity testing (SVT). The purpose of this study is to compare the specificity, sensitivity, and face validity of three frequently-utilized forced-choice symptom validity tests (the TOMM, WMT, and CARB).

Participants and Methods : Participants were undergraduate students (n=153). Malingerers (n=92) were asked to fake cognitive deficits; controls (n=61) were instructed to perform to the best of their ability. All participants were administered the TOMM, CARB, and WMT. At the conclusion of the study, the face validity of each test was assessed by telling participants that they were administered tests designed to detect faking and asking them to rate their confidence that each measure was a malinger-detection instrument on a scale of 0 (not a malinger test) to 10 (very certain that it was a malinger test).

Results : All three tests demonstrated similar face validity. The average face validity ratings for the TOMM, WMT, and CARB were 4.17, 4.44, and 4.62, respectively (5 = somewhat certain that the measure was an SVT). The sensitivity of the tests were not significantly different, with the CARB detecting 90% of malingerers, the WMT detecting 86%, and the TOMM detecting 84%. The CARB demonstrated the highest false positive error rate (13%), although this was not significant when compared to the WMT (3%; $p=.43$) and the TOMM (0%; $p=.23$).

Conclusions : These results suggest that there are not significant differences in sensitivity and specificity between the TOMM, WMT, and CARB. All measures also had relatively equivalent face validity.

Correspondence: *John DenBoer, M.A., Psychology, The University of Montana, Skaags Building, Missoula, MT 59801. E-mail: judenboer@yahoo.com*

J. DENBOER, S. HALL, J. JACOBSEN & K. HOFFMAN. Successful Simulated Malinger on Popular Symptom Validity Tests.

Objective: This study examined the performance characteristics of successful simulated malingerers (SSM) on three popular symptom validity tests (SVTs): the TOMM, WMT, and CARB, and two tests commonly used in neuropsychological assessment, the Trail Making Test and the Digit Symbol subtest of the WAIS-III.

Participants and Methods : Participants were undergraduate students. Malingerers were asked to fake cognitive deficits and controls were instructed to perform to the best of their ability. The TOMM, WMT, and

CARB were administered along with the Trail Making Test and WAIS-III Digit Symbol subtest (Coding & IL+FR). Participants from the malinger group that scored above the cut-off criteria for suboptimal effort on an SVT (i.e., escaped detection) composed the successful simulated malinger (SSM) group.

Results : SSM was observed for each SVT test and on every combination of these tests. Sixteen percent of the malinger participants escaped detection on the TOMM, 14% on the WMT, and 10% on the CARB. When combining the results of the TOMM and WMT, 10% escaped detection; 8% escaped detection on the combination of the TOMM and CARB, and 8% escaped detection on the combination of the WMT and CARB. Eight percent of the participants escaped detection when all three SVTs were combined (TOMM+WMT+CARB). In each case, regardless of which test or combination of tests were used to define SSM, the SSM participants scored significantly lower than controls on standardized measures.

Conclusions : Examining the characteristics and strategies used by SSM may help improve the ability to detect successful malinger and assist in the development of more sensitive SVTs.

Correspondence: *John DenBoer, M.A., Psychology, The University of Montana, Skaags Building, Missoula, MT 59801. E-mail: judenboer@yahoo.com*

P.H. LU, K.B. BOONE, A. THAMES & J. WEN. Cross-Validation of Four Measures of Suspect Effort.

Objective: To obtain cross-validation data for four previously published indicators of suspect effort in a new sample of patients.

Participants and Methods : Effort index scores that incorporate multiple variables within tests of effort were previously established and validated for the Dot Counting Test (DCT), the Rey-15 Item Test + Recognition and the Rey Complex Figure Test (RCFT) + Recognition. A discriminant function that includes the RCFT immediate recall score and trial 1 and recognition scores from the Rey Auditory Verbal Learning Test (RAVLT) were also reported. The recommended cutoff scores for these 4 effort indices were applied to a new sample of patients with suspect effort and neuropsychology clinic patients not in litigation or attempting to secure disability benefits.

Results : Group comparisons revealed significant differences on effort index scores in all four measures ($p<.0001$) with the suspect effort group displaying significantly worse performance than the clinic patients. Using previously published cutoff scores, excellent specificity (>96%) was achieved on the DCT, Rey-15 Item+Recognition, and the RCFT-RAVLT discriminant function with expected shrinkage in sensitivity (60.8%, 61.4%, and 62.2%, respectively). For the RCFT effort score, the previously recommended cutoff of <46 yielded a lower than expected specificity of 87.2% and sensitivity of 56.0%. Adjustment of the cutoff score to <45 improved specificity to 89.7% while maintaining the same sensitivity.

Conclusions : Cross-validation of four previously published effort indices in a new sample of patients yielded excellent specificity in 3 of 4 tests with acceptable declines in sensitivity. Minor adjustment in the cutoff score on the RCFT improved specificity while maintaining comparable sensitivity to the other tests.

Correspondence: *Po H. Lu, Psy.D., Neurology, UCLA, 710 Westwood Plaza, RNRC, 2-238, Los Angeles, CA 90095. E-mail: plu@mednet.ucla.edu*

K.R. HEBERT, R.S. ALLEN, M. MORTHLAND, J. CASTILLO & D.C. MARSON. A Growing Challenge: The Need for Functional Assessment of Decisional Capacity Among Older Adults Seeking Legal Services.

Objective: A joint commission of the American Bar Association and the American Psychological Association recently stressed impaired decisional capacity of older adults as a growing challenge faced by attorneys. Attorneys often make brief, informal determinations of older adults'

legal capacity to execute documents with little or no use of formal assessment measures. This study examined the performance of cognitively-intact, community-dwelling older adults seeking legal services on standardized psychometric measures of medical and financial decision-making.

Participants and Methods : Thirty older adults seeking legal assistance from a university-based elder law clinic were administered a modified Telephone Interview for Cognitive Status (TICS-m). Twelve (40%) participants were excluded due to possible cognitive impairment. Ten older adults scoring above the TICS-m cutoff score completed the Capacity to Consent to Treatment Interview (CCTI), a short form of the Financial Capacity Instrument (FCI-SF), and a brief neuropsychological battery.

Results : No significant association was found between the CCTI and FCI-SF, suggesting that medical decision-making and financial capacity are distinct and may be differentially affected in normal aging. No neurocognitive predictors emerged for the CCTI. For the FCI-SF, measures of verbal fluency and verbal abstract reasoning predicted understanding and use of coins and currency, whereas global cognitive function and information processing speed predicted understanding and use of a bank statement. Verbal fluency, information processing speed, and semantic knowledge emerged as neurocognitive predictors of overall financial capacity.

Conclusions : Results demonstrate the need for functional assessment in legal settings, offer insight into the interrelationship between specific functional capacities, and provide additional support for neurocognitive models of competency.

Correspondence: *Katina R. Hebert, M.S., Psychology, University of Alabama, 2575 G Mountain Lodge Circle, Birmingham, AL 35216. E-mail: heber002@bama.ua.edu*

K.W. GREVE, S. SPRINGER, K.J. BIANCHINI, F. BLACK, M.T. HEINLY, J.M. LOVE, T. IRVIN, D.A. SWIFT & M. CIOTA. The Prevalence of Malingering in Persons Reporting Exposure to Environmental and Industrial Toxins.

Objective: The rate of malingering in patients alleging toxic exposure may range from 30% to 50%. The purpose of this study was to extend this research by estimating the base rate of Malingered Neurocognitive Dysfunction (MND) in toxic exposure separately using the criteria of Slick et al. (1999) and performance on well-validated indicators of MND.

Participants and Methods : Data were obtained from the files of 135 persons referred for neuropsychological evaluation related to alleged exposure to environmental and industrial substances. All had financial incentive. The Slick et al. (1999) criteria were used to clinically classify each patient as malingering or not malingering. Statistical estimates of malingering were also derived from performance on a number of SVTs and clinical malingering indicators.

Results : Of the 135 patients, 8 lacked sufficient data for classification. Of the remaining 127, 51 (37.8%) met criteria Slick et al. criteria for a diagnosis of MND. The statistical approach resulted in estimated base rates ranging from 30% to 46% in the sample as a whole with some subgroups having higher rates. The rate of malingering depended the referral source (lower for attorney than doctor referrals) and the legal jurisdiction of the claim (higher for Federal than state jurisdictions).

Conclusions : The rates of malingering observed in this study are consistent with previous estimates in this population and with estimates in TBI. Malingering in alleged toxic exposure is a relatively high frequency event in general and the rate is influenced by greater potential compensation and possibly by coaching. Clinical implications are discussed. Correspondence: *Kevin W. Greve, Ph.D., Psychology, University of New Orleans, UNO-Lakefront, New Orleans, LA 70148. E-mail: kgreve@uno.edu*

M.T. HEINLY, K.W. GREVE, J.L. LOVE & K.J. BIANCHINI. Sensitivity and Specificity of Wisconsin Card Sorting Test Indicators of Potential Malingered Neurocognitive Dysfunction in Traumatic Brain Injury.

Objective: The present study examines the Specificity and Sensitivity to Malingered Neurocognitive Dysfunction (MND in traumatic brain injury (TBI) for various Wisconsin Card Sorting Test (WCST; Heaton et al., 1993) scores and indicators using well-defined TBI and non-TBI samples.

Participants and Methods : TBI patients (n = 377) were classified as either mild, moderate-severe, or chronic severe based on the severity of their injury. TBI patients in the mild and moderate-severe groups were classified as either a MND or non-MND based on the Slick et al. (1999) criteria. The WCST indicators included: categories completed, perseverative responses, perseverative errors, failures to maintain set, Unique responses, Bernard formula, Suhr formula, and King formula.

Results : Within mild TBI, persons who are malingering showed the most extreme scores. Tables are presented showing cumulative percentages for each score level within each group. In mild TBI, Specificity ranged from 91% to 97% with Sensitivity ranging from about 15% to 20% or greater. None of the indicators worked well in the moderate-severe group.

Conclusions : The present study demonstrated modest to good Sensitivity in the context of good Specificity to MND in mild TBI. However, scores for moderate-severe TBI patients did not demonstrate similar accuracy. The WCST variables are generally very influenced by cognitive ability as well as malingering. This does not mean that the WCST cannot be used in the diagnosis of malingering but it does emphasize the need for caution in applying it to that purpose.

Correspondence: *Kevin W. Greve, Ph.D., Psychology, University of New Orleans, UNO-Lakefront, New Orleans, LA 70148. E-mail: kgreve@uno.edu*

Poster Session 6/5:00–6:30 p.m.

Child - Acquired Disorder: Other

L. FERRETTI. Neuropsychological Function and Developmental Trajectories in Lead-Exposed Children: A Family Case Study.

Objective: Studies of lead-exposed children demonstrate adverse, lasting effects on neurobehavioral function. Ambiguity remains regarding the modulating influence of genetics and environment. The family case study approach enables control of potential confounds (parent IQ, familial disorders, SES, diet, and environmental stimulation), allowing a unique analysis of developmental trends. Hypotheses: 1) The child with more severe lead exposure shows greater neuropsychological impairment than less-exposed siblings; 2) Current adjustment is related to the child's history of educational service.

Participants and Methods : Participants are three siblings with onset of lead poisoning before age 6 years, peak blood lead 22-41 ug/dl, and exposure duration 19-41 months. The youngest sibling had a less favorable exposure history reflecting earlier onset, higher peak, and longer duration compared to her siblings. Comprehensive neuropsychological evaluation occurred 8-10 years after exposure onset. Behavioral trends are summarized, focusing on consistencies and discrepancies across sibling profiles.

Results : The more heavily-exposed child had more academic impairments but a less severe cognitive and behavioral profile than her siblings. The less-exposed siblings demonstrated broader cognitive difficulties and severe externalizing behavior. Early identification of special

education needs and continuing service was associated with adequate adjustment in the heavily-exposed sibling. In less-exposed siblings, later or absent identification of need, and interruption or withholding of service was associated with poor adjustment. Maturation differences may have contributed to the findings.

Conclusions : In conclusion, more severe lead exposure did not result in greater neurobehavioral impairment across all functional domains, and timely educational support appeared to forestall a negative developmental trajectory. Implications of these findings are discussed.

Correspondence: *Louise Ferretti, PhD, Dev Pediatrics/Rehab, Children's Hospital, 936 Delaware Ave, Buffalo, NY 14209. E-mail: ferretti@buffalo.edu*

M. BRIERE, J.C. SCOTT, R.Y. MCNALL-KNAPP, N.J. PASTOREK & R.L. ADAMS. Longitudinal Cognitive Outcomes in Pediatric Brain Tumors Survivors.

Objective: Treatment of childhood brain tumors has often been associated with long-term cognitive morbidity in children. Our previous research has examined the role of several treatment factors in neuropsychological outcome of children with cancer (Scott et al., 2000, 2001). The current study examined the course of long-term outcome in a heterogeneous sample of children with solid brain tumors, over a 10 year period.

Participants and Methods : Tumor types included 12 Medulloblastoma and 6 Astrocytoma/Glioma. ANOVA's for repeated measures were used to evaluate the changes in WISC-III scores.

Results : Consistent with previous findings, our results show the most deleterious effects for Performance IQ, Perceptual Organization Index and Processing Speed Index. Other indexes generally remained within normal limits on first testing, although below expected norm means. Analyses reveal that while Freedom from Distractibility Index remains higher than other IQ indexes on initial testing, it is the only index that subsequently declines over time. The statistical decline was attributable to a significant decline on the Arithmetic subtest only, as well as a non-significant trend for the Digit Span subtest. Dose of total brain radiation and age at diagnosis accounted for significant portions of the variance in follow up performance.

Conclusions : This study reveals that while most indexes remained stable over time, attentional skills continue to decline further. These findings suggest a decelerated development in auditory attention and working memory skills. Long-term outcome predictors are discussed in light of the high prevalence of attention and mathematic difficulties reported in these children and the need for preventive and remedial approaches. Correspondence: *Marie-Eve Briere, Ph.D., Psychiatry & Behavioral sciences, University of Oklahoma Health Sciences Center, 920 Stanton L. Young Blvd., WP 3440, Oklahoma City, OK 73014. E-mail: meb_04@yahoo.ca*

J.L. MICKLEWRIGHT, T.Z. KING, R.D. MORRIS & M.K. MORRIS. Learning and Memory in Children with Brain Tumors: The Role of the Third Ventricle Region.

Objective: There is strong support in the adult literature for the hypothesis that tumors in the structures of the third ventricle region are related to memory impairments. The primary objective of the current study was to examine learning and memory abilities in forty-two children (age 5-17) with cerebellar and third ventricle tumors using the Rey Auditory Verbal Learning Test.

Participants and Methods : It was hypothesized that children with cerebellar tumors would exhibit a greater impairment in auditory attention (list A,1), but that this would not impair their ability to learn in subsequent trials. Children with third ventricle tumors were hypothesized to exhibit: 1) greater impairment in learning across trials 2-5, 2) greater memory loss over a 20-minute delay, and 3) greater impairment across delayed memory tests than the cerebellar group, but to

demonstrate a greater benefit in performance on the recognition trial. Prior to completing the ANOVA's, participants' medical records were reviewed for potentially confounding variables including: time since diagnosis, and the presence of radiation/chemotherapy/surgery, hydrocephalus, seizure disorder, and hormone deficiency.

Results : The performance of the cerebellar group was consistent with expectation, demonstrating a role for the cerebellum in auditory attention and short-term memory. Participants with third ventricle tumors demonstrated impaired list learning over trials 2-5, significant memory loss following a 20-minute delay, and a greater impairment on delayed recall. However, on the recognition trial the third ventricle group improved to the average range.

Conclusions : The contribution of the cerebellum and third ventricle to attention and memory abilities in a pediatric sample will be discussed.

Correspondence: *Jackie L. Micklewright, M.A., Psychology, Georgia State University, 140 Decatur Street, PO Box 5010, Atlanta, GA 30302-5010. E-mail: jmicklewright1@student.gsu.edu*

P. KUSHALNAGAR, J. POYSKY & K.R. KRULL. A Case of Tourette's Syndrome with Ocular-Motor Abnormalities in a Deaf Male Adolescent Signer.

Objective: Gilles de la Tourette syndrome (TS) is a neuropsychiatric disorder characterized by motor and vocal tics. Motor tics may involve sudden oculomotor deviations, making continuous eye contact difficult. When the individual with TS is Deaf and uses sign language, oculomotor deviations can interfere with receptive communication/encoding. In this case review, we describe a pediatric Deaf male patient with TS who underwent a comprehensive neuropsychological assessment to address learning and psychosocial concerns.

Participants and Methods : The patient was a 13-year-old male with 4 years history of TS, academic difficulties and reported history of compulsive behavior. A comprehensive neuropsychological assessment, clinical interviews, and behavioral observations were examined to determine the impact of oculomotor tics on functioning.

Results : Objective measures indicated deficits in recall of rules presented in American Sign Language, and reduced organization and encoding of spatially presented visual information with time limits. Also noted was misunderstanding of signed instructions/questions conveyed to the patient. This appeared to coincide with oculomotor deviations, as focused and sustained attention were within normal limits. In contrast, he performed relatively well on tasks that provided immediate feedback or clarifications. This patient reported interference with learning and social communication secondary to oculomotor tics, which resulted in increased anxiety and avoidance.

Conclusions : These findings suggest that oculomotor tics have the potential to interfere with social and academic functioning in persons using sign language. Environmental modifications, "frequent checking-in", and increased feedback strategies should be considered in deaf patient signers who present with oculomotor tics.

Correspondence: *Poorna Kushalnagar, MA, Psychology, University of Houston, 9809 Summer Breeze Dr, Pearland, TX 77584. E-mail: neuropsychdeaf@gmail.com*

A. PAPAZOGLU, J.L. MICKLEWRIGHT, T.Z. KING & R.D. MORRIS. Measures of Language as Predictors of Later Adaptive Functioning in Children with Brain Tumors.

Objective: Children with brain tumors often display deficits in adaptive functioning in the context of average IQ performance. Little is known, however, about the ability of cognitive measures to predict adaptive functioning in this population. It was hypothesized that select subtests from

the Stanford-Binet Intelligence Scale, 4th edition (SB-IV) would differentially predict domain scores on the Vineland Adaptive Behavior Scale three to five years post-diagnosis in a pediatric brain tumor population. Specifically, it was hypothesized that those subtests which assess receptive and expressive language abilities would be the strongest predictors of adaptive functioning across domains.

Participants and Methods : Fifty-nine children between the ages of three and fourteen years ($M = 7.39$ years) were administered select SB-IV subtests. Comprehension, Quantitative, and Bead Memory were examined as unique cognitive predictors. Other subtests were excluded due to multicollinearity. Additionally, tumor location and age at the time of diagnosis were examined and did not demonstrate a significant relationship with adaptive functioning.

Results : Linear regression analyses indicated that Comprehension was a significant predictor of all three domains of adaptive functioning. The Quantitative subtest was significant across the Communication and Daily Living Domains. Bead Memory was not a significant predictor of any domain.

Conclusions : These findings demonstrate the ability of select subtests of the SB-IV to predict adaptive functioning in children three to five years post-brain tumor diagnosis. Furthermore, they highlight the important role of the development of receptive and expressive language, and a working knowledge of social mores, in age-appropriate adaptive functioning. Clinical implications of these findings will be discussed.

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

K. ZELMAN, L. CHAPIESKI, P. MASSMAN & M. HISCOCK. Cognitive and Academic Sequelae of Near-Drowning Accidents in a Pediatric Population.

Objective: Although near-drowning accidents in children are relatively common, there have been few studies of neuropsychological sequelae. Neurological consequences can be catastrophic but the literature suggests that most children do not experience ill effects. These conclusions, however, are based on general clinical reports. The goal of this study was to compare specific cognitive and academic abilities of a group of children who had near-drowning accidents with their siblings.

Participants and Methods : Twenty children with a history of near-drowning were compared to 13 sibling controls on measures of intelligence, memory, attention, and academic skills. Testing was completed at least one year after the accident. The average age at the time of the accident was 4.2 years and average age at the time of testing was 9.6 years. Average estimated length of submersion was 4.9 minutes.

Results : The two groups were equivalent in overall IQ. The near-drowning group performed more poorly on a measure of memory for rote verbal material but performance for the two groups was equivalent on measures of memory for meaningful verbal material and for visual-spatial material. There were no group differences on any measures of delayed recall. The near-drowning group made more errors of commission on a continuous performance test but there was no difference between groups in errors of omission. Mothers were more likely to report behaviors consistent with ADHD in the near-drowning group. The near-drowning group performed more poorly on a test of reading comprehension but analyses did not reveal group differences on measures of math or spelling skills. Significantly more children in the near-drowning group either had received or were receiving special education services.

Conclusions : Although the outcome for this sample of children who had near-drowning accidents was generally good, the children experienced subtle cognitive and behavioral problems and were more likely to require special education services.

Correspondence: *Lynn Chapieski, Ph.D., Baylor College of Medicine, 6621 Fannin St.-CC-950, Houston, TX 77008. E-mail: mlchapie@texaschildrenshospital.org*

J. LANDA & A. EVEN. Differential Memory Functioning in Acquired Hypoxic-Ischemic Brain Damage.

Objective: Hypoxic-Ischemic brain damage during childhood, involving bilateral hippocampal pathology, causes significant deficits in memory function, specifically in episodic memory. However, recent retrograde semantic memory depends on the hippocampal system as well, while semantic memory acquired in the long term depends on the neocortex.

The present study aimed to assess the differential memory abilities of children we had suffered hypoxic-ischemic brain damage, and to compare the effect of age of damage on the magnitude of deficit seen in recent retrograde semantic memory.

Participants and Methods : we examined three children who had sustained hypoxic-ischemic brain damage during late childhood and puberty - ages 9, 11 and 15.

Brain structural imaging had shown areas of bilateral abnormality in the hippocampus, basal ganglia, and the thalamus in the three of them. The patients were also given a neuropsychological evaluation consisting of intelligence test, academic attainments and a variety of memory tests.

Results : The neuropsychological profiles of the patients were highly similar. All the three of them presented with relative preservation of semantic memory, compared to a marked impairment in episodic memory. They were highly deficient in remembering the events of everyday life, manipulating material of immediate memory and recollecting semantic knowledge acquired during the last two-three years in academic setting, such as reading, arithmetic or religious practice. The findings also point to a possible effect of age on magnitude of deficit seen in semantic knowledge acquired in close proximity to the injury.

Conclusions : The neuropsychological assessment confirms previous findings pointing to more selective impairment in episodic memory, combined with prominent deficits in recent semantic memory. Also, it seems that injury sustained at younger ages produce a more pronounced loss of acquired semantic knowledge.

Correspondence: *Janna Landa, MD, Pediatric Rehabilitation, The Chaim Sheba Medical Center, 31 Zora Street, Zur Yigal 44562, Israel. E-mail: janna.landa@sheba.health.gov.il*

M. MEADOWS, L. DILLER, S. ROTHENBERG & S. SALLAN. Adult Survivors of Childhood Leukemia: Neuropsychological findings.

Objective: To determine whether or not adult survivors treated for acute lymphoblastic leukemia (ALL) as children have any neuropsychological sequelae.

Participants and Methods : Subjects were recruited from Protocol 81-01 at the Dana Farber Cancer Institute. Individuals were either treated under the standard-risk (SR) protocol [received 1800 cGy cranial irradiation (CRT)] or the high-risk (HR) protocol (received 2800 cGy of CRT) for ALL. Subjects (ages 20-38) were assessed on a variety of neuropsychological measures. Data has been analyzed on a total of 17 subjects (SR: n=5; HR: n=12).

Results : Using treatment group and gender as the independent variables in two-way ANOVAs, females performed less well on Trails A compared to the males in the SR group only ($p < .04$), and had lower scores on the Developmental Test of Visual Motor Integration compared to the males in the HR group ($p < .01$). Given that age of treatment appeared to be a moderating variable, we divided the data using younger (YG: treated < 36 months of age; n=6) and older (OG: treated > 36 months of age; n=11) groups. The YG had lower overall scores on neuropsychological measures compared to the OG. These included the Working Memory Index ($p = .026$) and Block Design subtest ($p = .028$). They also had lower scores on Trails A ($p = .036$), reduced processing speed on the Stroop reading words ($p = .009$) and colors conditions ($p = .005$), reduced semantic fluency ($p = .030$), and difficulties on the Rey-Osterrieth Complex Figure copy task ($p = .003$).

Conclusions : While our N was limited, ALL survivors who were treated at less than 36 months of age had lower scores compared to those who

were treated when they were older. Difficulties were apparent on tests related to working memory, visual organization and processing speed. This was consistent with previous neuropsychological studies in children and adolescents who were treated for ALL. Female subjects exhibited cognitive difficulties on selected tests that were dependent on CRT treatment group compared to the males.

Correspondence: *Mary-Ellen Meadows, Ph.D., Div of Cognitive and Behavioral Neurology, Brigham and Women's Hospital, 221 Longwood Ave, Boston, MA 02115. E-mail: mmeadows@partners.org*

A. HEFFELFINGER, J.I. KOOP, L.L. CONANT, T. BREI, P.S. FASTENAU & K.J. SAWIN. Associations of Neuropsychological Functioning and Adolescent Activities with Adaptation Outcomes in Adolescents with Spina Bifida.

Objective: Spina Bifida (SB) is associated with poor neuropsychological and adaptive outcomes, yet few studies have investigated the variability in these outcomes or the factors that potentially contribute to it. In this pilot study, a model was tested to predict the impact of neurological severity (level of lesion), neuropsychological functioning, adolescent and family variables on functional independence, mental health, and quality of life outcomes in adolescents with SB.

Participants and Methods : Fifty adolescents with SB (age; 15.6 years+/-2.5) completed 1) a neuropsychological battery assessing executive functioning (EF), attention, and processing speed and 2) parental and self-report questionnaires assessing the outcome variables, as well as possible protective variables such as adolescent activities (decision making, household responsibility), adolescent beliefs (hope, attitude) and family functioning.

Results : EF was related to functional independence ($r[47]=.39-.54$, $p=0.001-.006$) but not to mental health or quality of life. Processing speed exhibited the same pattern of relationships as EF, but to a lesser degree ($r[47]=.37-.55$, $p=0.01-.09$). Attention was modestly related to one aspect of functional independence ($r[47]=.37$, $p=0.02$). Adolescent activities but neither adolescent beliefs nor family functioning was correlated to functional independence. The hierarchical regression model (including age, level of lesion, EF, and adolescent activities) accounted for 63% of functional independence variance, but in the final step, only EF and adolescent activities remained significant ($p=0.05/0.001$).

Conclusions : Thus, EF, adolescent decision making and household responsibilities explain significant variance in functional independence above that accounted for by age or disease severity. Targeting interventions toward these variables may assist in optimizing adaptive outcomes in adolescents with SB.

Correspondence: *Amy Heffelfinger, Medical College of Wisconsin, MCW Clinics at Froedtert, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: aheffelf@mcw.edu*

M.L. GOLDMAN, B. BRIERY, M. WARD, I. DELGADO & D. ARMSTRONG. Neurocognitive and Educational Outcomes of Childhood Cancer- A Longitudinal Study.

Objective: Objective is to examine potential changes in neurodevelopment of children who have undergone treatment for brain tumors, leukemias, or lymphomas (hereafter "cancer") between Year 1 and Year 2 in a 5-year study. Goals include examining whether different levels of intervention monitoring, based on specific interventions or accommodations specified in a child's Individual Educational Plan (IEP), result in differential outcomes.

Participants and Methods : Participants include 22 children with cancer recruited through pediatric oncology referrals. Analyses include 18-22 children with some variation due to missing data. A comprehensive battery of neuropsychological tests was administered.

Results : Repeated measures ANOVAs revealed a significant main effect for IEP follow-up, with children followed quarterly performing bet-

ter on academic measures than children followed annually [$F(1,15) = 5.79$, $p < .05$]. Significant interaction effects were found for minority status on understanding directions and oral comprehension across time [$F(1,16) = 4.68$, $p < .05$; $F(1,14) = 4.48$, $p = .05$, respectively]. Significant interaction effect was found for language spoken in the home (English/Spanish) and broad reading abilities over time [$F(1,12) = 5.80$, $p < .05$].

Conclusions : Children whose IEPs were monitored quarterly showed improvement on applied mathematics, and those monitored annually declined. Minority children showed declines in ability to follow increasingly complex directions over time, whereas non-minority children showed improvement. The inverse pattern emerged for oral comprehension, a less complex verbal task. When examining primary language spoken in the home, children from English-speaking households demonstrated an increase in reading abilities over time, whereas those from Spanish-speaking households demonstrated a decline. Future research should further examine the effectiveness of school-based interventions in order to maximize children's academic skills and improve their quality of life.

Correspondence: *Maria L. Goldman, Psy.D., University of Miami, PO BOX 016820, Miami, FL 33101. E-mail: mariagoldman@atlanticbb.net*

A. KUNIN-BATSON, F. ANDERSON, K. BAKER & J. PERKINS. Neuropsychological and Psychosocial Functioning in Survivors of Bone Marrow Transplant.

Objective: The present study aims to characterize the neurocognitive and psychosocial functioning of childhood cancer survivors who underwent bone marrow transplantation (BMT) as part of their treatment regimen. While some previous studies have found normal neurodevelopment and emotional adjustment, others have shown declines in cognitive and academic functioning, and increased risk for emotional/behavioral difficulties post transplant.

Participants and Methods : The neuropsychological and family functioning of 35 childhood leukemia survivors (ages 8-18), who were in disease free remission and between 1 and 10 years post-BMT, were evaluated. A comprehensive battery examining cognitive and academic functioning, visual-motor integration, fine motor skills, academic achievement, verbal and visual learning/memory, executive functioning, and attention was used. Additionally, parents completed measures examining family structure and beliefs, parent and child anxiety, parent post-traumatic stress symptoms, and parent/child quality of life.

Results : Children who were transplanted at a younger age (≤ 5 years) displayed significantly lower scores on measures of visual-construction, inhibition/impulse control, and narrative memory ($p < .05$) when compared to children who were older at time of transplant. Parent ratings reflected greater concerns regarding initiation of behaviors, depressive symptoms, and conduct problems in children who were transplanted at a younger age ($p < .05$). Parents whose children were transplanted at a younger age also reported significantly greater difficulties with their own health and more relationship difficulties with their spouse ($p < .05$).

Conclusions : Longitudinal, multi-site studies which have sufficient power to further examine the interaction between disease variables, child characteristics, and family functioning will be important in developing models to predict neurocognitive outcome after BMT.

Correspondence: *Alicia Kunin-Batson, Ph.D., Pediatrics, University of Minnesota, 420 Delaware St SE, MMC 486, Minneapolis, MN 55455. E-mail: kunin003@umn.edu*

J. MILLER, J. DORFLINGER, Y. HAHN & L.D. STANFORD. Pattern of Neurodevelopment in Very Young Children with Craniosynostosis Compared to Hydrocephalus: Parent Report Versus Standardized Assessment.

Objective: Craniosynostosis is characterized by premature fusion of one or more fibrous joints that separate the bony plates of a newborn's skull.

Although skull malformation and increased intracranial pressure present cause for immediate surgical intervention, residual neuropsychological implications (i.e., developmental delay) for these infants are not as well documented as are the motor delays commonly manifested in both groups.

Participants and Methods : Although recruitment is ongoing, the current sample consists of nine children ranging in age from 4 to 42 months, who were referred to an outpatient clinic for neurodevelopmental evaluation prior to surgical intervention. The participants included six children diagnosed with craniosynostosis and three diagnosed with congenital hydrocephalus.

Results : Preliminary results using independent samples t-tests indicate that both groups demonstrated significant developmental delays on both the mental and motor domains of the Bayley Scales of Infant Development-II (BSID-II) as expected. However, children diagnosed with craniosynostosis demonstrated less well developed motor skills relative to cognitive development, whereas children diagnosed with hydrocephalus were equally impaired in both domains. Parents of both groups identified motor skills as the area of greatest developmental concern as measured by the Vineland Adaptive Behavior Scales (VABS). Parents of children diagnosed with craniosynostosis did not endorse significant concerns in any other domain (i.e., communication, socialization, daily living skills), in contrast to the parents of children diagnosed with hydrocephalus, who endorsed significant concerns across all domains of the VABS.

Conclusions : Different mechanisms of brain constriction produces variable patterns of developmental delay. Early intervention services for children with craniosynostosis should emphasize motor development, whereas children with congenital hydrocephalus would benefit from more comprehensive developmental therapy.

Correspondence: *Lisa D. Stanford, Ph.D., Psychiatry, University of Illinois at Chicago, 912 S. Wood Street M/C 913, Chicago, IL 60612. E-mail: lstanford@psych.uic.edu*

R.F. WHITE, C. PALUMBO, F. DEBES, P. WEIHE, K.J. HEATON, P. GRANDJEAN & D. YURGELUN-TODD. fMRI Findings in Adolescents with High Prenatal Exposures to Methylmercury and PCBs.

Objective: Dose-effect relationships between measures of prenatal exposures to methylmercury (MeHg) and/or polychlorinated biphenyls (PCBs) and neurocognitive and neuromotor functions later in life have been demonstrated among children in the Faroe Islands and elsewhere. In order to explore these findings further, a pilot study was conducted using fMRI methodology to examine patterns of brain activation during cognitive and motor challenge tasks among exposed adolescents from the Faroe Islands.

Participants and Methods : Twelve boys were selected according to the degree of their prenatal exposure to MeHg and PCBs as follows: high MeHg/low PCB, high PCB/low MeHg, high MeHg/high PCB, low MeHg/low PCB. The three boys from the original cohort of 1022 children who best fit the exposure criteria participated in the project. fMRI methods were carried out using photic stimulation, fingertapping, naming and visual organization challenge tasks. Activation patterns in specific brain regions were compared among the 4 exposure groups.

Results : Results across tasks showed greater brain activation in more brain areas among the highly exposed children than those with low exposures. For example, bilateral activation was seen in highly exposed children during one-sided fingertapping in contrast to unilateral activation in children with low exposure.

Conclusions : Results suggest that task performance required more recruitment of cortical resources for children with high prenatal exposures than was required for children with low exposure. Further, they support the findings from neuropsychological studies carried out earlier in the cohort. To our knowledge, this is the first study that has used fMRI methodology to investigate environmental toxicant exposure effects among children.

Correspondence: *Roberta F. White, PhD, Environmental Health, Boston University School of Public Health, 715 Albany Street—T2E, Boston, MA 02118. E-mail: rwhite@bu.edu*

L. DE SONNEVILLE, I. SCHUITEMA, K. LABINAC, I. KOOMEN & M. VAN FURTH. Impairments in Attention and Executive Function Underlying Long-term Academic Limitations after Bacterial Meningitis in Childhood.

Objective: This study investigated neuropsychological impairments underlying long-term academic limitations in 12 - 18 year old children following bacterial meningitis in early childhood, i.e. on average 11 years after treatment.

Participants and Methods : Subjects were selected from a post-meningitic cohort studied five years earlier. Based on their academic profile, they were assigned to groups with and without academic limitations. We compared postmeningitic children with academic limitation (n=17), postmeningitic children without academic limitations (n=25) and siblings (n=14). A computerized assessment battery was used to draw out an extensive profile of attentional and executive function, with particular focus on working memory aspects, inhibition and attentional flexibility.

Results : The postmeningitic group with academic limitations performed significantly worse than both other groups with respect to speed, response speed stability and/or accuracy on a range of tasks. In particular, deficiencies were found in memory for visuospatial-temporal order, aspects of executive function, psychomotor and simple neuromotor function.

Conclusions : These results support the existence of deficiencies in various aspects of executive control, probably reflecting changes in CNS function, that might well underlie the observed academic limitations. Implications for educational interventions are discussed.

Correspondence: *Leo de Sonnevile, PhD, Clinical Child and Adolescent Studies, Leiden University, Wassenaarseweg 52, Leiden 2333 AK, Netherlands. E-mail: ldesonneville@fsw.leidenuniv.nl*

A.I. BUIZER, L.M. DE SONNEVILLE, M.M. VAN DEN HEUVEL - EIBRINK & A.J. VEERMAN. Risk Factors for Attentional Dysfunction after Chemotherapy in Survivors of Childhood ALL and Wilms Tumor.

Objective: We evaluated the effects of chemotherapy on attentional function in survivors of ALL and Wilms tumor, focusing on risk factors that might unfavorably affect these functions. Treatment for childhood acute lymphoblastic leukemia (ALL) includes potentially neurotoxic central nervous system (CNS) directed treatment. CNS-directed chemotherapy is replacing prophylactic cranial irradiation, mainly to reduce long-term neuropsychological sequelae. Chemotherapy for Wilms tumor, in contrast, is not directed at the CNS.

Participants and Methods : We compared attentional function in 36 children at least one year after finishing treatment with chemotherapy only for ALL, with a 39 Wilms tumor patients and with 110 healthy children. A computerized assessment battery was used to draw out an extensive profile of attentional function. Risk factors that might shape this profile were identified using multiple regression analysis.

Results : Attentional deficits were detected in children with ALL, but not in children with a Wilms tumor. Higher treatment intensity was associated with worse performance in children with ALL. Furthermore, young age at diagnosis and female gender were associated with worse performance on several tasks. Treatment intensity as well as gender interacted with age at diagnosis.

Conclusions : Neurotoxicity of CNS-directed is treatment is likely to play a role in the emergence of attentional deficits in children with ALL. Intensified treatment, female gender and a young age at diagnosis were identified as risk factors.

Correspondence: *Annemieke I. Buizer, MD, Pediatrics, VU University Medical Center, De Boelelaan 1117, Amsterdam 1081 HV, Netherlands. E-mail: ai.buizer@vumc.nl*

C. REY-CASSERLY, R. SCOTT, L. GOUMNEROVA, M. PROCTOR, S. POMEROY, K. MARCUS & M. KIERAN. Neuropsychological Outcomes in Children Following Posterior Fossa Syndrome.

Objective: Posterior fossa syndrome (cerebellar mutism) has been described as an infrequent complication of posterior fossa surgery. Children affected develop decreased speech, comprehension deficits, apathy/lack of initiative, and global cerebellar dysfunction. These symptoms improve over time, but studies have demonstrated persistent associated neurological complications or residual neuropsychological deficits involving higher-order language and cognitive skills after posterior fossa syndrome. Children treated for medulloblastoma are demonstrating increasing neurocognitive morbidity following treatment and the additional impact of posterior fossa syndrome needs to be evaluated.

Participants and Methods : We report on the neuropsychological outcomes of 15 children (5 males, 10 females) with medulloblastoma treated with surgery, radiation (craniospinal), and chemotherapy. These children were diagnosed between 1997 and 2002 and treated on the same standard risk medulloblastoma protocol. Six of these children developed posterior fossa syndrome post surgery. Neuropsychological evaluations were completed at a mean of two years post radiation treatment (age range 6 to 14 years of age).

Results : For the posterior fossa group, the full scale IQ's ranged from 73 to 89; for the no posterior fossa syndrome group, the IQ's ranged from 78 to 121 ($p < 0.07$). The children with posterior fossa syndrome also had more difficulties with social adaptation post treatment.

Conclusions : In our cohort, significant medical complications, symptoms that persisted beyond the treatment phase (fatigue, weight loss, motor deficits), and neuropsychological deficits compromised academic and adaptive outcomes and have significant implications for both psychological and medical management. Based on our experience with medulloblastoma, these patients present with more difficulties than expected. The relative impact of posterior fossa syndrome on the neurocognitive outcomes in this population will be discussed.

Correspondence: *Celiane Rey-Casserly, Ph.D., Neuropsychology Program, Children's Hospital, 300 Longwood Avenue, Fegan 8, Boston, MA 02115. E-mail: celiane.rey-casserly@childrens.harvard.edu*

S.R. BONGIOLATTI, E.B. FENNELL & P.R. CARNEY. The Role of Sleep Fragmentation in Disruptive Behaviors in Children with Epilepsy and Co-morbid Sleep Breathing Disorders.

Objective: Sleep disturbances, while relatively common in the pediatric population, occur more frequently in children with epilepsy and have been associated with behavior problems, including disruptive and oppositional behaviors. Although nocturnal hypoxia and sleep fragmentation have been hypothesized as contributing to behavior problems in children with Sleep Disordered Breathing (SDB), the exact mechanism remains unclear and limited research has explored the relationship in children with epilepsy. The present study aims to examine the relationship between sleep fragmentation, hypoxia-related factors, and disruptive behaviors in children with epilepsy and co-morbid SDB.

Participants and Methods : Overnight polysomnography (PSC) and parent report of disruptive behavior (Eyberg Child Behavior Inventory, ECBI) were obtained for twenty children with epilepsy and co-morbid SDB as part of an ongoing larger study. Using ECBI scores, children were assigned to a disruptive behaviors group ($n=10$) or a control group with behavior within normal limits ($n=10$).

Results : T-tests were used to compare arousals, hypoxia variables, and other sleep quality factors in the two groups. Children with disruptive behaviors were found to have a significantly greater number of total arousals than the control group. The two groups did not differ on total sleep time, apnea-hypopnea index (AHI), or other hypoxia variables (e.g., oxygen desaturation nadir).

Conclusions : In children with epilepsy and co-morbid SDB, total nocturnal arousals were significantly greater in children with clinical behavior problems, suggesting that sleep fragmentation—rather than hypoxia—is related to disruptive behavior in these children. These findings suggest that treatment of sleep disturbances in children with epilepsy may help alleviate disruptive daytime behaviors.

Correspondence: *Susan R. Bongiolatti, M.S., Clinical and Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610-0165. E-mail: sbongiol@phhp.ufl.edu*

M.A. MATSON, M. MAHONE, D. BONEKAMP, M. DEGAONKAR, T. HAY, W.R. KATES, S. MORI, P. BARKER & A. HORSKA. Short-Term Follow-Up in Pediatric Brain Tumor Examined Through MRI, MRS, DTI, and Neuropsychological Assessment: A Case Study.

Objective: To examine the relationship between brain structure, treatment factors and outcome in an adolescent with recurrent ependymoma, and the extent to which neurological changes accompany neuropsychological changes across an early-delayed period.

Participants and Methods : The current case study examined neurobehavioral and imaging data in a 15-year old boy with recurrent ependymoma developing in left temporal region, and near-total resection followed by whole brain radiation therapy and left temporal boost, followed by gamma knife radiosurgery for bilateral cerebellar lesions. Data were analyzed post-surgery and at six-month follow-up in the patient and a gender-, age-, race-, and SES-matched healthy control. Metabolic changes were assessed using magnetic resonance spectroscopy (MRS); integrity of white matter structure and function through diffusion tensor imaging (DTI); anatomic changes through volumetric MRI; and, neurobehavioral functioning through neuropsychological examination.

Results : Compared to baseline, the patient showed raw score declines on neuropsychological measures of right-sided motor and select language functions, but stability in all other neuropsychological domains, whereas the control showed stable to improved neuropsychological function. MRS analyses showed a pattern of decline in NAA/Cho ratios. DTI analysis showed declines in fractional anisotropy values across several fiber tracts, potentially indicative of changes in white matter integrity in the patient, but not in the control. The patient showed changes in temporal lobe volume, but otherwise had stable regional brain volumes between baseline and follow-up, as did the control.

Conclusions : The patient had subtle, yet focused declines on neuropsychological assessment that were accompanied by changes on volumetric MRI, MRS and DTI in a manner not observed in a matched control subject.

Correspondence: *Mark Mahone, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

Dementia Subcortical (e.g., Huntington's, Parkinson's, PSP)

A.M. BARRETT, E.K. ZIMMERMAN, R.A. SHAFFER, L. BENNER, G.P. CRUCIAN, L. LENZ & P.J. ESLINGER. Driving Risk and Cognitive Testing in Parkinson Disease (PD).

Objective: PD is associated with driving disability. However, it is unclear if assessed motor dysfunction predicts accident risk. In this study, we compared cognitive and motor testing as means of distinguishing unsafe drivers with PD.

Participants and Methods : Nineteen PD (9 women; mean age 66.1) and 19 control subjects (10 women; mean age 66.6) took the Geriatric Depression Scale (GDS), Mini-mental State Examination (MMSE), Dementia Rating Scale (DRS), Dynavision assessment, Useful Field of View

test (UFOV), and a Navon letter-naming task. PD subjects were clinically evaluated, including the Unified Parkinson Disease Rating Scale (UPDRS), and all had on-road clinical driving evaluations. Before and after each test, subjects self-estimated performance: this was compared with actual performance (anosognosia ratio).

Results : Five PD subjects (26.3%) and no controls failed driving assessment. Discriminant function analysis revealed a combination of measures fully discriminated pass/failure for this subject sample: UFOV, Dynavision, MMSE and GDS scores. PD subjects failing driving testing had (non-significantly) higher UPDRS motor disability. PD subjects demonstrated no cognitive anosognosia relative to controls.

Conclusions : Our results support inadequacy of motor function evaluation as a screen for driving safety in PD (Heikkilä et al., 1998; Wood et al., 2005). Unlike PD subjects in Heikkilä et al.'s study, however, we did not observe cognitive anosognosia in our PD subjects relative to controls when self-evaluating cognitive or driving performance. These results suggest that taking a cognitive and mood history and screening for cognitive and mood disorder may be as important as testing motor function in determining need for driving assessment in PD.

Correspondence: *Erin K. Zimmerman, BA, Neurology/Medicine, Penn State University Milton S Hershey Medical Center, Department of Neurology, H037, P.O. Box 850, 500 University Drive, Hershey, PA 17033. E-mail: bluehey@psu.edu*

A. PURTON, K. CHAPPIE, A. WISNIECKI, M.S. CANNIZZARO, H. COHEN & P.J. SNYDER. Motor Speech and Cognitive Discourse Changes Are Not Correlated in Early Parkinson's Disease.

Objective: Loss of dopaminergic cells in the SNc of patients with Parkinson's Disease (PD) leads to dysregulation of basal ganglia circuitry, and measures of disease progression have mainly focused on motor skills. In this multiple case study, we sought to examine the cognitive, non-motor aspects of speech production. Subtle speech disturbances over time can be objectively quantified by acoustic analysis.

Participants and Methods : We have analyzed the speech samples of two PD patients (H&Y = 2.0) for impairment in discourse production (a measure of fluid cognitive ability) versus motor control. Each subject was asked to talk about the Cookie Theft Card (BDAE; Goodglass & Kaplan, 1983) for 60 seconds. Subjects were given this same task on six different occasions: on- and off-medication (levodopa/carbidopa [Sinemet] at baseline, six and 12 months post-enrollment. To determine cognitive discourse changes, speech sound clips were analyzed with PRAAT to determine percent pause time (PPT), and speech/pause ratio. We also measured successful discourse production, following Nicholas and Brookshire (1993). Words produced per minute (WPM) were extracted as a measure of motor control.

Results : There were negligible effects over time with respect to cognitive change for both subjects. However, there was a decrease in WPM for Subject 1, and an increase in PPT for subject 2.

Conclusions : These results suggest that speech changes can be detected early in the progression of PD, and that the speed of production of connected language (discourse production) is not related to the observed speech motor changes in the early stages of PD.

Correspondence: *Peter J. Snyder, Ph.D., Psychology, University of Connecticut, 406 Babbidge Road, Unit 1020, Storrs, CT 06269-1020. E-mail: peter.snyder@uconn.edu*

E. PIROGOVSKY, J. RICE, F. VALLEJO, A. MEKRUT, A.M. MORRIS, P.E. GILBERT, M. JACOBSON, G. PEAVY, S. WETTER, J. GOLDSTEIN, J. COREY-BLOOM & C. MURPHY. Impairments in Source Memory for Olfactory and Visual Stimuli in Preclinical and Clinical Stages of Huntington's Disease.

Objective: Individuals in both preclinical and clinical stages of Huntington's disease (HD) demonstrate impairments in olfactory functioning and in source memory for verbal stimuli. A task combining both source and odor memory may be particularly sensitive to early changes in HD.

Participants and Methods : Source and item memory for olfactory and visual stimuli were examined in 10 individuals with HD, 10 pre-symptomatic HD gene carriers, 8 non-gene carriers who had a parent with HD, and 20 normal controls. During the study phase, a male and a female experimenter (sources) presented odors and objects to the participant in an alternating sequence. To assess item memory, a stimulus from the study phase and a novel stimulus were presented and the participant was asked to choose the stimulus previously presented. To assess source memory, the experimenter presented a stimulus and asked whether the male or female experimenter had previously presented the stimulus.

Results : Source memory for both visual and olfactory stimuli was impaired in HD patients compared to controls. Source memory for olfactory, but not visual stimuli, was poorer in gene carriers than in non-gene carriers or controls. Gene carriers and HD patients showed similar impairment in source memory for olfactory stimuli. Item memory for visual stimuli was similar in HD patients and controls; however, item memory for olfactory stimuli was impaired in HD patients. Gene carriers, non-gene carriers, and controls did not differ in item memory.

Conclusions : These results suggest that source memory for olfactory stimuli may be particularly sensitive to neuropathological changes in preclinical stages of HD.

Correspondence: *Eva Pirogovsky, MA, Psychology, San Diego State University, 1455 Reed Ave #9, San Diego, CA 92109. E-mail: epirogovsk@projects.sdsu.edu*

M. CAMPBELL, J.C. STOUT & J.K. KRUSCHKE. Mechanisms and Mediating Factors Affecting Set-Shifting in Parkinson's Disease.

Objective: Parkinson's disease (PD) is associated with executive functioning deficits, specifically on tasks requiring set-shifting. However, the mechanisms and mediating factors affecting set-shifting in PD are not well understood. The purpose of this study was to assess two possible mechanisms of set-shifting (learned irrelevance and perseveration), as well as potential mediating roles of physical and psychological factors.

Participants and Methods : Learned irrelevance is difficulty associated with shifting to a previously irrelevant item, while perseveration is characterized by difficulty shifting away from a previously relevant item. To test these mechanisms, 25 PD participants and 24 older healthy controls (HC) completed the Cued Relevance Shift Task, which requires participants to either shift their attention towards a previously irrelevant (distractor) item (learned irrelevance condition), or away from a previously relevant (target) item (perseveration condition). Participants' motor symptoms and symptoms of depression and apathy were also assessed.

Results : Although the PD participants committed significantly more shift trial errors in the learned irrelevance condition than the HC participants ($F(1,47) = 4.80, p = .03$), depression and apathy levels were associated with PD performance in the perseveration condition only ($r = .45, p < .05; r = .42, p < .05$, respectively). The association between severity of motor symptoms and task performance did not differ between conditions.

Conclusions : These results not only support the learned irrelevance hypothesis of set-shifting deficits in PD, but also suggest a possible mediating role of depression and apathy in perseverative responses.

Correspondence: *Meghan Campbell, Ph.D., Psychiatry, Washington University, 327 N. Taylor Ave., apt. 307, St. Louis, MO 63108. E-mail: meghcamp@indiana.edu*

G.P. CRUCIAN, S.J. ARMAGHANI, A. ARMAGHANI, P.S. FOSTER, D.W. BURKS, V. DRAGO, R.D. RHODES, M.S. OKUN, H.H. FERNANDEZ & K.M. HEILMAN. Visual-Spatial Disembedding In Parkinsons Disease.

Objective: Parkinson's Disease (PD) is often associated with deficits on visual-spatial tasks (Cummings & Huber, 1992, Crowdon & Corkin, 1986, Stern & Mayeux, 1986). However, a meta-analysis of this litera-

ture (Waterfall & Crowe, 1995) suggests that visual-spatial deficits in PD are not universal because deficits are typically seen on multifactorial tasks (e.g., Raven's Progressive Matrices) but not more unifactorial measures of visual-spatial ability (e.g., Judgment of Line Orientation, Embedded Figures Test). Waterfall and Crowe identify several issues that potentially confound data interpretation in this research area, including subject characteristics (e.g., age, sex, education), illness duration, current disability level, the presence of emotional depression, the current medication levels, and the presence of dementia. The objective of this study was to assess visual-spatial ability in individuals with PD using a standardized test of visual closure and disembedding.

Participants and Methods : Twenty-seven non-demented individuals with PD (17 men) and 19 healthy adults (8 men) similar in age and education participated in this study as part of a larger research protocol. Visual-spatial disembedding was assessed with the Hidden Patterns Test (Ekstrom et al., 1976).

Results : After statistically accounting for age, education, and sex, PD subjects were significantly less accurate in disembedding than controls, with rigid-akinetic PD subjects exhibiting greater difficulties. Notably, disembedding performance in these PD subjects was not associated with symptom laterality, illness duration, mood status, or medication status. **Conclusions :** These results corroborate previous findings of visual-spatial deficits in PD, reflecting perceptual deficits associated with right hemisphere dysfunction, and potentially involving narrowed focal attention (Barrett et al., 2001).

Correspondence: *Gregory P. Crucian, PhD, Neurology, University of Florida, 100 S. Newell Drive, Rm. L3-100, Gainesville, FL 32610. E-mail: crucial@neurology.ufl.edu*

P.S. FOSTER, V. DRAGO, R. RHODES, G.P. CRUCIAN & K.M. HEILMAN. Relationships between verbal and nonverbal memory and the laterality of Parkinsonian signs.

Objective: Research investigating neuropsychological differences between left versus right asymmetrical symptom presentation in Parkinson's disease has yielded mixed findings. However, many of these investigations have used tests that are not well suited for investigating lateralized neuropsychological functions and have not employed methods using a factorial design. Studies of patients with temporal lobectomy have revealed that left temporal lobectomy impairs verbal and right visuospatial memory. The present investigation sought to investigate material specific memory impairments in Parkinson's patients with predominantly left-sided (LSP) or right-sided (RSP) signs.

Participants and Methods : It was hypothesized that LSP patients (12 subjects) would evidence greater nonverbal memory impairment and that RSP patients (10 subjects) would evidence greater verbal memory impairment. Verbal memory was assessed using percentile scores from the Logical Memory (LM) subtest of the WMS-III and the Hopkins Verbal Learning Test (HVLT). Nonverbal memory was assessed using the Faces subtest of the WMS-III and the Brief Visuo-Spatial Memory Test (BVMST).

Results : The results indicated a significant Group (LSP versus RSP) x Memory (Verbal versus Nonverbal) x Time (Immediate Recall versus Delayed Recall) interaction. Subsequent analyses indicated significant improvement in verbal recall for the LSP group (LM: Immediate Recall M = 32.17, Delayed Recall M = 49.50) and significant improvement in nonverbal recall for the RSP group (Faces: Immediate Recall M = 37.30, Delayed Recall M = 56.10). No other comparisons were statistically significant.

Conclusions : Catecholamines are critical for the limbic (hippocampal)-cortical interactions needed for memory consolidation. These results suggest that an asymmetrical reduction of these neurotransmitters selectively influence material specific memories.

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. AMICK, J. GRACE & K.L. CHOU. Body Side of Motor Symptom Onset in Parkinson's Disease Influences Memory Performance.

Objective: The aim of the study was to investigate the impact of body side of motor symptom onset in Parkinson's disease (PD) upon memory measures associated with hemispheric dominance. PD typically begins with unilateral motor symptoms, which are associated with asymmetrical depletion of dopamine in the basal ganglia. We attempted to link certain types of memory dysfunction with body side of motor symptom onset (i.e. asymmetrical subcortical dysfunction). Specifically, we hypothesized that patients with right body side of motor symptom onset (RPD, inferred left hemisphere dysfunction) would be more impaired on measures of verbal than visual memory. By contrast, we predicted that patients with left motor symptom onset (LPD, right hemisphere dysfunction) would demonstrate greater impairments on measures of visual than verbal memory.

Participants and Methods : Fourteen RPD patients and sixteen LPD patients were administered measures of verbal (Hopkins Verbal Learning Test - revised) and visual memory (Brief Visual Memory Test), which require similar task demands and are associated with left or right hemisphere dominance, respectively.

Results : The RPD group showed poorer verbal than visual memory within group. By contrast, the LPD group demonstrated poorer verbal than visual memory, both within group and in comparison to the RPD group.

Conclusions : Side of motor symptom onset appears to be associated with asymmetrical memory dysfunction. These findings emphasize that body side of motor symptom onset is a critical factor to consider when evaluating PD patients' cognitive performance. Inattention to side of motor symptom onset may lead to an inaccurate description of the cognitive impairments associated with this disease.

Correspondence: *Melissa Amick, Ph.D., Memorial Hospital of Rhode Island, 111 Brewster Street, Pawtucket, RI 02446. E-mail: melissa_amick@mhri.org*

J.A. FIELDS, S. WOODS & A.I. TROSTER. Semantic Priming in Parkinson's Disease Before and After Subthalamic Deep Brain Stimulation (DBS).

Objective: Prior studies have shown semantic verbal fluency decrements to occur after subthalamic deep brain stimulation (STN DBS) for Parkinson's disease (PD). Because this decline appears to be secondary to executive aspects of word retrieval and lexical-semantic processing, this study sought to determine whether STN DBS affects semantic processing in general by evaluating semantic priming before and after STN DBS.

Participants and Methods : 22 persons with PD (14 male, 8 female; 21 right-handed, 1 left-handed; average age 55 years, disease duration 9 years, Unified Parkinson's Disease Rating Scale (UPDRS) Motor score off medication 42) completed semantic priming tasks about 1 month before and 5 months after bilateral STN DBS electrode implantation. The priming test comprised 3 blocks of three tasks: two ratings of how related each of 12 word pairs is (4 categorically related, 4 functionally related, 2 unrelated, 2 fillers), followed by a free association task. For the free association task, participants were presented with the first of each of the 12 word pairs previously rated along with 8 distractors (non-primed items). Alternate forms were used in counterbalanced order before and after DBS. Given non-normal data distributions, non-parametric Wilcoxon tests were used to compare proportions of primed and non-primed words completed with targets and performance before and after DBS.

Results : The proportions of primed and non-primed words completed with targets did not differ prior to DBS, suggesting a failure to prime. Whereas the proportion of primed words completed with targets increased significantly after DBS, the target completion rate for non-primed words did not. After DBS, a significant priming effect was evident.

Conclusions : Subthalamic DBS does not have a uniform effect on semantic processing in PD. Results suggest that semantic priming may be facilitated by DBS, and thus indirectly raise the hypothesis that the basal ganglia's role in automatic and effortful semantic processing may be dissociable.

Correspondence: *Alexander I. Troster, PhD, Dept. of Neurology, University of North Carolina School of Medicine, CB 7025, 3114 Bioinformatics Building, Chapel Hill, NC 27599-7025. E-mail: trostera@neurology.unc.edu*

D.M. SCHIEHSER, S. HAN, V. ZIZAK, D.D. SONG & J. FILOTEO. The Impact of Mood, Cognition, and Motor Symptoms on Quality of Life in Patients with Parkinson's Disease.

Objective: Recent studies have shown that quality of life (QOL) in Parkinson's disease (PD) can be affected by several factors. The objective of this study was to examine the effects of mood, cognition, and motor symptoms on QOL in patients with PD.

Participants and Methods: Thirty patients with mild PD (mean Hoehn & Yahr stage 2.0) were administered the Parkinson's Disease Questionnaire (PDQ-39) as a measure of QOL as well as the Geriatric Depression Scale (GDS), the Mattis Dementia Rating Scale (DRS), and the Unified Parkinson's Disease Rating Scale (UPDRS).

Results: Multiple regression analysis of patients' overall scores on these measures revealed that higher levels of depression ($p < .0001$) and greater motor impairment ($p < .01$) were significant predictors of patients' poorer QOL scores on the PDQ-39. Patients' scores on the DRS were not predictive of QOL. Using empirically derived factor scores from the UPDRS, correlational analyses indicated that greater levels of rigidity were associated with greater impairment on the activities of daily living ($r = .46$, $p = .01$) and the emotional well-being ($r = .37$, $p = .04$) subscales from the PDQ-39, whereas severity of tremor and bradykinesia were not associated with any of the PDQ-39 subscales. Mood correlated significantly with all subscales of the PDQ-39, but did not correlate with any of the motor symptoms measured by the UPDRS.

Conclusions: The findings indicate higher levels of depression and greater rigidity predict poorer QOL in PD patients, while cognition has no significant association with QOL. These results suggest a complex relationship between quality of life, motor symptoms, mood, and cognition in patients with mild PD.

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*

K.F. HOTH, J.S. PAULSEN, D.J. MOSER, D. TRANEL, L. CLARK, A. BECHARA & G. ODEN. Impaired Awareness of Deficits in Huntington's Disease.

Objective: The current study was undertaken to characterize impaired awareness of cognitive, motor and psychiatric deficits among patients with symptomatic Huntington's disease (HD).

Participants and Methods: Sixty-six pairs of patients with HD and patients' close companions completed symptom rating measures regarding the patients' and companions' behavior. Agreement between patient and companion ratings was examined and, using companions' behavior as the target, patients' ability to rate their own versus their companions' behavior accurately was compared. A subset of 20 patients underwent clinical evaluation including structured psychiatric, neurological and cognitive assessment.

Results: Patients significantly underestimated their impairments as compared to companions' ratings of the patients' deficits ($t(65) = 2.63$, $p = .01$). Notably, patients' self-ratings of their deficits were not significantly associated with their objective clinical performance; however, companions' ratings of the patients' behavior were associated with the results of the neurological exam and cognitive testing. There was greater patient-companion agreement regarding companions' behavior and functioning than patients' functioning. Regarding the association between awareness and cognition, impaired awareness was associated with poorer performance on the Wisconsin Card Sorting Test ($r = -0.51$; $p < .05$), the memory subscale of the Dementia Rating Scale (DRS; $r = 0.51$; $p < .05$), and a trend was observed for DRS Total Score ($r = -0.41$; $p = 0.08$).

Conclusions: Findings indicate that patients with HD demonstrate lack of awareness of deficits across symptom domains, and provide preliminary support for associations between impaired self-awareness and dementia severity, aspects of executive functioning, and memory abilities. Correspondence: *Karin F. Hoth, Ph.D., Psychiatry and Human Behavior, Brown University, Centers for Behavioral and Preventive Medicine, Coro West, 3rd Floor, Providence, RI 02903. E-mail: Karin_Hoth@Brown.edu*

S. DAVIDSDOTTIR & A. CRONIN-GOLOMB. Visuoconstructional Impairment in Parkinson's Disease.

Objective: Individuals with Parkinson's disease (PD) commonly present with visuoconstructional impairment. The aim of this study was to investigate to what extent this impairment is associated with other cognitive functions, and whether it predicts daily life functioning.

Participants and Methods: We tested 28 non-demented patients with PD and 18 healthy control adults (HC). Participants completed copy and recall conditions of the Rey-Osterrieth Complex Figure (ROCF), scored according to the Boston Qualitative Scoring System. ROCF scores were correlated with scores on measurements of visual contrast sensitivity and visuospatial ability (Judgment of Line Orientation, Money Road Map Test), and with scores on self-report questionnaires that assess quality of life (PDQ-39) and the ability to perform daily life activities.

Results: PD had more difficulty than HC in accurately placing ROCF details. They showed more perseveration and less planning ability on the ROCF than did HC, indicative of executive dysfunction. Figure retention was similar for both groups. Left hemiparkinsonian patients (more right than left basal-ganglia dysfunction) showed a greater ROCF distortion than did right hemiparkinsonian patients. In PD, ROCF performance was associated with disease duration, contrast sensitivity deficits and visuospatial impairment, and the ROCF organization score on copy trial predicted subsequent retention. ROCF performance was associated with self-reported ability to independently perform activities of daily life and frequency of recent falls.

Conclusions: The results demonstrate that visuoconstructional ability in PD is a multifaceted construct and can be affected by several factors. Visuo-perceptual encoding deficits, executive dysfunction and right hemisphere pathology contributed to impaired ROCF performance in PD, which also was associated with specific difficulties in daily life functioning.

Correspondence: *Sigurros Davidsdottir, MA, Boston University, 648 Beacon Street, 2nd floor, Boston, MA 02215. E-mail: rdavids@bu.edu*

E. KITAHARA, S. NAKAMURA, M. SHINBO, H. MORI & M. NAGAOKA. Impairments in learning of sequential movements in patients with Parkinson's disease : a study with structural equation modeling.

Objective: Previous studies have suggested that the cortico-basal ganglia (GB) system contributes to many functional domains, including executive function and non-supervised learning. To investigate their quantitative interaction, we focused on the PD patients' working memory and reinforcement learning. PD impairs specific region of GB and these two functions were suspected of the major factor of each functional domain.

Participants and Methods: 55 patients with Parkinson's disease and 56 normal control subjects participated in this study. We applied a sequential button press task, "2x5 task" to 55 patients with Parkinson's disease and 56 normal controls. In this paradigm, subjects learned, by trial and error, the correct order of pressing two buttons consecutively for 5 pairs of buttons. We measured several parameters concerned the learning process, e.g., number of specific errors, performance time and so on. Working memory and reinforcement learning as hidden factors were analyzed using structural equation modeling.

Results: The results of the structural equation modeling showed that the working memory and reinforcement learning were the major factors of the sequential button press task. The working memory factor was associated with the number of specific errors and performance time, and the reinforcement learning factor was associated with the number of specific errors and performance time. The working memory factor was also associated with the number of specific errors and performance time, and the reinforcement learning factor was also associated with the number of specific errors and performance time.

Results : In patients with Parkinson's disease, correlation of working memory and reinforcement learning was intentionally low compared with normal control subjects.

Conclusions : It was suggested that cooperation of working memory and reinforcement

learning are poor in addition to each functional failure in patients with Parkinson's disease. It suggests that the nigrostriatal system, which is mainly impaired in PD, modulates the cortico-basal ganglia system. This modulating function is consistent with the neuroanatomical networks of BGs. SEM may be useful for quantitative approach for behavioral analysis.

Correspondence: *Eriko Kitahara, Juntendo University Hospital, 3-1-3 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan. E-mail: rxe03625@nifty.ne.jp*

P. NATH, E. HARRIS, P. MCNAMARA & R. DURSO. Neuropsychologic Correlates of Measures of Personality and Self in Parkinson's Disease.

Objective: We tested the hypothesis that selected personality changes in PD would correlate selectively with prefrontal dysfunction.

Participants and Methods : Thirty-five patients with mid-stage PD and twenty age-matched healthy controls were given executive function, memory, mood, and personality measures including the Cloninger 'temperament and character inventory' (TCI). Levodopa dosage equivalents (LDEs) were calculated for each patient. Side of onset of disease was recorded as well. Group differences on all of our major outcome variables were assessed using the conservative Mann Whitney U test. Bonferroni-corrected Pearson product moment correlations coefficients were calculated among major outcome variables.

Results : While Mini Mental State Exam, Stroop, TCI subscale scores, and the mood scales reliably distinguished patients from controls, only the Stroop interference ($r=0.64$; $p<.001$) and verbal fluency scores (category switching score; $r=0.56$; $p<.03$) were reliably associated with a TCI subscale ('persistence'). We obtained marginally significant correlations between the Stroop interference score and 'novelty seeking' and 'harm avoidance' TCI subscales. The total correct verbal fluency score correlated strongly ($r=0.66$; $p<.001$) with number of names recalled from early childhood and adulthood on the autobiographical fluency task. LDE did not significantly correlate with any TCI personality subscale. Mean TCI subscale scores did not differ significantly in the group of patients with right-sided vs. left-sided onset.

Conclusions : 'Persistence' on the Cloninger TCI and poor autobiographical memory recall may be more strongly related to prefrontal dysfunction than to mood or neuropsychologic dysfunction or to dopaminergic dosing levels in patients with mid-stage PD.

Correspondence: *Erica Harris, Boston University, Boston VAMC, Dept. of Neurology (127), 150 S. Huntington Ave., Boston, MA 02130. E-mail: erh5x@bu.edu*

E. HARRIS, P. MCNAMARA, A. BROWN & R. DURSO. Elevated "Machiavellianism" in Patients with Parkinson's Disease.

Objective: Given our (McNamara et al., 2004) recent findings that some patients with PD exhibit a shift towards socially conformist, opportunistic and suspicious responses on personality tests, we hypothesized that the 'Machiavellian' personality strategy would be elevated in PD patients and correlated with prefrontal dysfunction.

Participants and Methods : Thirty-five patients with mid-stage PD and twenty age-matched healthy controls were given executive function, memory, mood, and personality measures including the MACH IV scale (Christie and Geis, 1970) which yields 4 subscales: positive interpersonal tactics, negative interpersonal tactics, positive view of human nature and cynical view of human nature (Corral and Calvete, 2004). Lev-

odopa dosage equivalents (LDEs) were calculated for each patient. Group differences on all of our major outcome variables were assessed using the conservative Mann Whitney U test. Bonferroni-corrected Pearson product moment correlations coefficients were calculated among major outcome variables.

Results : PD patients consistently scored higher on the 'negative' and lower on the 'positive' subscales of the MACH IV, with the differences being significant for the 'cynical views of human nature' ($p<.001$) and the 'positive interpersonal tactics' ($p<.01$) subscales. While Mini Mental State Exam, Stroop, verbal fluency, and the mood scales reliably distinguished patients from controls, only the Stroop interference ($r=0.58$; $p<.001$) score predicted MACH total score. LDE did not correlate with any MACH personality subscale.

Conclusions : PD patients entertain more cynical views of human nature and are less likely to endorse use of positive interpersonal tactics when interacting with others. This elevated Machiavellianism is related to prefrontal dysfunction.

Correspondence: *Erica Harris, Boston University, Boston VAMC, Dept. of Neurology (127), 150 S. Huntington Ave., Boston, MA 02130. E-mail: erh5x@bu.edu*

A.C. SOLOMON, S.A. JOHNSON, J.C. STOUT, J.S. PAULSEN, L. BEGLINGER, E.H. AYLWARD, V. YALLAPRAGADA & K. FIELD. Dissociable Roles for the Caudate Nucleus and Putamen in Cognitive and Motor Processes: Evidence from Pre-clinical Huntington's Disease.

Objective: Previous research suggests functional segregation at the level of dorsal striatum, implicating the caudate nucleus in cognitive tasks, and the putamen in motor functions. With regard to memory, explicit memory tasks are considered more cognitive in nature, whereas some implicit memory tasks rely more heavily on motor learning. Huntington's disease (HD), characterized by neurodegeneration in dorsal striatum, is associated with impairments in both explicit and implicit memory.

Participants and Methods : To test the relationships between striatal volumes and memory, a pre-clinical sample ($n = 261$ for HVLTR, $n = 288$ for SRT) of individuals with the genetic mutation for HD completed the revised Hopkins Verbal Learning Test (HVLTR; Brandt & Benedict, 2001) and the Serial Reaction Time task (SRT; Knopman & Nissen, 1991). Volumetric MRI measures of caudate and putamen were derived via a standardized hand-tracing method.

Results : Multivariate regression analyses indicated that better performance on the HVLTR, a measure of explicit learning and memory, was associated with larger caudate volumes (full model R square $>.18$, $p <.001$); putamen volumes were unrelated to HVLTR performance. The opposite pattern of results was found for the SRT task, which assesses motor learning; faster response times were associated with larger putamen volumes (full model R square $>.23$, $p <.001$) but were unrelated to caudate volumes.

Conclusions : Our findings are consistent with the notion of functional segregation in the striatum, and suggest that the caudate plays a role in explicit memory, whereas the putamen is involved in executing motor responses.

Correspondence: *Andrea C. Solomon, Psychology, Indiana University, 1101 E. 10th Street, Bloomington, IN 47405. E-mail: ansolomo@indiana.edu*

A.C. SOLOMON, S.A. JOHNSON, J.C. STOUT, J.S. PAULSEN, K. DUFF & D.R. LANGBEHN. Movement Initiation, Execution, and Planning in Pre-clinical Huntington's Disease.

Objective: Huntington's disease (HD) has been associated with difficulties in movement initiation in the absence of a cue, as well as inefficient use of advance information for movement planning (Bradshaw et al., 1992).

Participants and Methods : To characterize movement initiation, execution, and planning in pre-clinical HD, 443 Predict-HD participants completed a sequential button pressing task. We manipulated the amount of advance information available for movement planning across three blocks; Block 1 provided no advance information, Block 2 provided a one-button advance cue, and Block 3 provided a two-button advance cue. To differentiate movement initiation from execution of the motor response, we calculated mean response times (RT) and variability in RT separately for movement initiation and execution.

Results : For blocks where no or little advance information was provided (Blocks 1 and 2), both accuracy and reaction time data were related to DNA-based estimates of future disease onset, such that higher error rates, slower initiation and execution of movements, and greater variability in initiation and execution RTs were associated with closer proximity to disease onset. When more advance information was provided (Block 3), slower execution of movements and greater variability in motor initiation and execution RTs were associated with closer estimated proximity to disease onset.

Conclusions : Findings suggest that motor initiation and execution are affected in pre-clinical HD, and these processes become slower and more variable as individuals approach disease onset. Therefore, motor initiation and execution could prove to be valuable markers of disease progression in HD, and be useful surrogate markers in clinical trials.

Correspondence: *Andrea C. Solomon, Psychology, Indiana University, 1101 E. 10th Street, Bloomington, IN 47405. E-mail: ansolomo@indiana.edu*

L. KIRSCH-DARROW, M. MARSISKE, A. MIKOS, H. FERNANDEZ, M. OKUN & D. BOWERS. Apathy: An Important “Factor” in Parkinson’s Disease.

Objective: Emotional changes frequently accompany Parkinson’s disease (PD). Recent attention has focused on the occurrence of a “syndrome of apathy,” reflecting a primary loss of motivation. Studies suggest apathy is distinct from depression and PD patients experience apathy in the absence of depression. However, no study has examined whether separate apathy and depression factors can be identified. The present study examines whether items will cluster into discrete apathy and depression factors.

Participants and Methods : One-hundred fifteen PD patients (68.3±9.5 years of age, 2.5±.67 Hoehn Yahr severity scale) completed the Beck Depression Inventory (BDI-I) and Apathy Evaluation Scale (AES). Confirmatory factor analysis (CFA, Lisrel 8.71) examined the fit of the data to 4 a priori hypothesized factors: 1) apathy/loss of motivation, 2) depressed mood, 3) loss of interest, 4) somatic symptoms.

Results : There was good support for the overall model, $\chi^2(128, N=115)=210.22$, $p < .01$ (NFI=.925, CFI=.969, IFI=.969, RFI=.911, GFI=.835). RMSEA=.07, $p=.03$, RMR=.08, critical N=92.18. Results suggested that apathy, depressed mood, and loss of interest were strong factors, high loadings, mostly .7-.8. The somatic factor was less strong, moderate loading, mostly .49-.59, suggesting that physical symptoms may be intertwined in mood symptoms.

Conclusions : CFA results support the notion that apathy and depression are discrete factors and add to the growing support of the ‘separability’ of these two psychiatric states in PD.

Correspondence: *Lindsey Kirsch-Darrow, M.S., University of Florida, 2238 NW 1st Ave, Gainesville, FL 32603. E-mail: lkirsch@phhp.ufl.edu*

S. FERNANDEZ GUINEA, J. RUIZ SANCHEZ DE LEON, J. MUNIZ CASADO & J. GONZALEZ MARQUES. Priming and procedural learning of cognitive skills in Parkinson’s Disease.

Objective: Implicit memory refers to several cognitive processes through which subjects retain information about past experiences with neither awareness nor intention and in such a way that it is difficult to express

their knowledge. Developmentally, implicit memory arises previously to explicit memory and it is supported by mechanisms relatively resistant to aging disorders. Those lasting changes that take place in behavior are expressed by some phenomena: procedural learning, priming, classical learning and habituation / sensitization.

Participants and Methods : Our aim is to confirm priming and procedural learning preservation in an elderly people without neurological or psychiatric disorders sample and to analyze if both phenomena are impaired in a Parkinson’s Disease sample. Two implicit memory tasks were created in which subjects were never told explicitly to have to learn or to have to improve in the task while performing it. We expected a reaction time (RT) decrease during the study phase, without subjects intention/awareness, either due to practice (procedural learning) or to prior processing of stimuli (priming) during the test phase.

Results : Our data show significant differences in RT between groups (young adults, old adults and Parkinson’s Disease patients). Longer RT in the elderly are probably a result of the slowing down of processing of information. Although priming effects are preserved in every sample, some procedural learning of perceptual skills are impaired in Parkinson’s Disease.

Conclusions : Although the slowing down of processing of information, some implicit learning phenomena are not impaired in Parkinson’s Disease. Therefore, neuropsychological training programs must pay more attention to these usually preserved abilities in the elderly. Cognitive science demands more detailed theoretical models about coding, recording and retrieval of implicit information.

Correspondence: *Jose Maria Ruiz, Universidad Complutense de Madrid, Facultad de Psicología - Campus de Somosaguas, Pozuelo de Alarcón, Madrid 28924, Spain. E-mail: jm.ruiz.sdl@gmail.com*

I. KELLISON, C.M. SAPIENZA, U. SPRINGER, M.S. OKUN & D. BOWERS. Improvement in Facial Expressivity in a Patient with Parkinson’s Disease Following Expiratory Muscle Strength Training.

Objective: Expiratory muscle-strength training (EMST) is being evaluated as a therapy for improving respiratory muscle strength in patients with Parkinson’s disease (PD; Sapienza, 2004). The effect of training on flexibility of the facial muscles has not been examined. We observed dramatic improvements in facial muscle movement in a patient with reduced facial expressivity secondary to idiopathic PD following one month of therapy.

Participants and Methods : Computer-imaging techniques were used to quantify dynamic facial movement in a 58-year old female patient with a ten-year history of idiopathic PD. The patient underwent four weeks of therapy (five respiratory sets per day, five days a week). Quantification of facial movement was performed pre-treatment and post-treatment. Expressions were videotaped, digitized, and analyzed for movement changes using software developed by Gokcay (2000). This software computed overall movement change (entropy) during the course of each expression. Depression and anxiety were assessed using the Beck Depression Inventory and the State Trait Anxiety Inventory.

Results : The patient was at Hoehn-Yahr Stage 3 (on medication) during the evaluation. Her motor Unified Parkinson’s Disease Rating Scale (UPDRS) score was 28. She was not anxious or depressed. Objective analysis of the change in facial movement revealed a 250% increase in entropy post-therapy “on” medication, which was also reflected by observers and UPDRS facial score.

Conclusions : We found that EMST may result in improvements in facial expressivity in patients with PD. The basis for this improvement is unknown, but could be due to improved muscle strength. We plan on investigating this effect in a randomized, controlled study.

Correspondence: *Ida Kellison, B.A., University of Florida, 745 NE 10th Ave., Gainesville, FL 32601. E-mail: IKellison@phhp.ufl.edu*

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

K. WILD & T. HAYES. Cognitive Performance and In-Home Activity Levels of MCI and Healthy Elders.

Objective: As early detection of cognitive impairment becomes more important with the increasing availability of potential treatment strategies, the search for reliable measures has intensified. Changes in mobility and levels of activity in the elderly have been described as possible predictors of cognitive decline. This study examined the ability of standard cognitive assessments and unobtrusive in-home measures of mobility and activity to differentiate between healthy older adults and those with mild cognitive impairment.

Participants and Methods: Seven healthy controls and seven MCI subjects participated in this pilot study. All subjects were administered a neuropsychological test battery as part of their participation in an ongoing longitudinal study, and had in-home motion sensors installed for six months. Activity level was determined by the number of sensor firings during times when the subject was at home, while median walking speed was calculated over 26 seven-day intervals.

Results: As would be expected, significant differences between groups were found on a measure of verbal memory, but not in other cognitive domains. Basic functional abilities were similar, although MCI subjects needed more help with instrumental activities of living. While median walking speed varied greatly among all participants, the MCI group showed a trend toward slower walking speed. Further, walking time increased over the time of the study for the MCI group, while it remained unchanged for the healthy elders. Finally, there was a trend toward greater variance in mean daily activity for the MCI group.

Conclusions: This study offers evidence that continuous in-home monitoring may identify early changes that might not be detected during routine clinic assessments.

Correspondence: *Katherine Wild, Ph.D., Neurology, Oregon Health & Science University, 3151 SW Sam Jackson Park Rd., CR-131, Portland, OR 97239. E-mail: wildk@ohsu.edu*

Y. TANAKA, Y. KATO, M.L. ALBERT, M. MIYAZAKI, S. YAMAMOTO & K. NAKATANI. GABA-Minergic Therapy for Manipulospacial Dysfunction in Vascular Dementia.

Objective: There is a suggestion in the literature that the GABA-Minergic system may be linked to manipulospacial behavior. The "clock drawing test", which evaluates aspects of manipulospacial behavior, is commonly used in the diagnosis of dementia. To evaluate the possibility that GABA may be beneficial in treatment of manipulospacial behavior in vascular dementia, we compared pre- and post-treatment performance on the clock drawing test, using the GABA - transaminase inhibitor, sodium valproate.

Participants and Methods: Twelve subjects who showed abnormalities on the clock drawing test were recruited (seven male, five female; 64-87 years old, mean age 76.1). Each participant carried one of the following diagnoses: lacunar state, multiple cerebral infarctions, or mild vascular dementia.

In a preliminary, open label study we administered sodium valproate 200 to 300 mg/day for one to two months and compared pre- and post-treatment performances on the clock drawing test. Subjects were given the drawing of a circle containing the numbers of a clock, but no hands, and were asked to draw in the hands at ten minutes past ten.

Results: Prior to treatment, seven patients drew the hands in the wrong locations and five drew horizontal lines between the 2 and the 10. After treatment, nine of the twelve patients showed dramatic improvement of clock drawing.

Conclusions: Good performance on the clock drawing test demands a good sense of relative positioning. In this open label study we demonstrated considerable improvement on the clock drawing test after treatment with a GABA-Minergic agent, thus supporting the notion that GABA-Minergic neurons may play an important role in the capacity for relative positioning and manipulospacial behavior.

Correspondence: *Yutaka Tanaka, Tanaka Clinic, 124 Shimogaito, Heguri-Cho., Ikoma-Gun, Nara 636-0933, Japan. E-mail: EZZ05540@nifty.ne.jp*

A.L. JEFFERSON, S. WONG, E. BOLEN, A. OZONOFF, S. LEVENSON, R.C. GREEN & R.A. STERN. Cognitive predictors of Hooper Visual Organization Test (HVOT) performance differ between patients with mild cognitive impairment (MCI) and geriatric normal controls (NC).

Objective: The HVOT is multifactorial in nature, as multiple cognitive processes (e.g., naming, executive functioning) are necessary for task completion. The present study compared HVOT performances among geriatric participants of several cognitive categories and identified the naming and executive functioning correlates of HVOT performance for MCI and NC participants.

Participants and Methods: This study utilized data from the BU-ADC registry. Participants (n=388, ages 55-95) were diagnosed as NC (n=222) or MCI (n=166) by multidisciplinary consensus based on a neurodiagnostic evaluation. Neuropsychological assessment included the HVOT, two tests of executive functioning (Trail Making Test Part B [TMT-B], Controlled Oral Word Association [COWA]), and two tests of naming (Boston Naming Test 30-item even version [BNT], Animal Naming).

Results: Two separate regression analyses were conducted to identify the naming and executive functioning correlates of HVOT performance for MCI and NC. Among NC participants, COWA, age, and BNT were significant predictors accounting for 12%, 6%, and 4% of variance for HVOT performance, respectively. Among MCI participants, the BNT accounted for 43% of variance for HVOT performance. Neither TMT-B nor Animal Naming were significant predictors for either group.

Conclusions: Rapid word generation (COWA), a measure of executive functioning, is the most salient predictor of HVOT performance among NC participants. In contrast, lexical retrieval (BNT) is the most salient language or executive functioning predictor of HVOT performance. These findings suggest that reduced HVOT performance in MCI patients (and possibly Alzheimer's disease) may be secondary to lexical retrieval difficulties rather than visuospacial deficits alone.

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*

J. REILLY, V. TROIANI & M. GROSSMAN. Serial Recall and Word Learning in Semantic Dementia: A Model of Cognitive-Linguistic Loss.

Objective: To model the cognitive-linguistic loss associated with semantic dementia (SD) and assess capacity for word learning at different stages of this disease.

Participants and Methods: We report cross-sectional data of five patients with mild (n=3) or severe (n=2) SD, based on semantic and naming impairments (below). Participants repeated lists of nouns presented auditorily, varied by frequency and concreteness. Accuracy was scored by proportion of words correctly recalled in serial order.

	Mild	Severe	Norm
Pyramids/Palm Trees	86.5%	48.1%	>98%
Boston Naming	19.3%	4.2%	>96%

Results: Severely impaired patients demonstrated reduced word span with recall limited to recent items; a pattern consistent with impaired semantic memory. These patients showed similar recall of concrete and

abstract nouns, high and low frequency nouns, and negligible learning effects through repetition priming. Patients with mild semantic impairment recalled more words, particularly initial items (i.e., primacy effects), indicating residual semantic support for STM. Patients with mild impairment showed better recall of concrete nouns and modest learning effects through repetition priming.

P(recall) by serial position in word list

_____1st_____2nd_____3rd

MILD____.62____.30____.45

SEVERE___.03____.03____.64

Behavioral results correlated with gross patterns of atrophy in clinical SPECT and MRI.

Conclusions: These findings are interpreted as support for a temporal model reflecting continuous reduction of lexical-semantic support for verbal STM that coincides with the progressive course of SD. We propose that this degradation of support occurs in a predictable order, as follows: semantic→lexical→phonological. Behavioral and physiological markers distinguish these overlapping stages. Under this model, as support from long-term memory degrades, patients will increasingly rely on phonology to process language. Correspondence: *Vanessa Troiani, Bachelor of Science, Neurology, University of Pennsylvania, 3 West Gates, 3400 Spruce St., Philadelphia, PA 19104. E-mail: troiani@mail.med.upenn.edu*

M.A. ZELLER, P.H. LU, B. CELAYA & J. CUMMINGS. Anosognosia, Executive Functioning and Depression Among Patients With Amnesic Mild Cognitive Impairment.

Objective: To examine cognitive performance and mood in patients with amnesic mild cognitive impairment (MCI) with and without anosognosia (reduced insight regarding one's deficits).

Participants and Methods: Participants were consecutively referred individuals from the UCLA Memory Disorders Clinic diagnosed with amnesic MCI after clinical interview and neuropsychological evaluation. Data regarding anosognosia were extracted from chart review. The final sample consisted of 84 patients classified as aware and 19 participants who were unaware. Anosognosia was hypothesized to be related to executive deficits; therefore, performance on three measures of executive functions (Trails B, Stroop Interference, Verbal Fluency) was examined. Mood was assessed using the Geriatric Depression Scale (GDS).

Results: The two groups did not differ significantly in age or MMSE score; however, mean years of education was significantly higher for the aware group compared to the unaware group. Independent t-tests revealed that the aware group scored significantly higher on the GDS than the unaware group ($p=.008$). Cognitively, the two groups did not differ significantly on any of the executive tests; however, secondary analysis revealed that the unaware group committed significantly more near-miss errors on the Stroop Interference task ($p<.0001$). These results did not change meaningfully after statistically adjusting for education. Functionally, significantly more unaware patients stopped driving and were accompanied by caregivers to the evaluation compared to aware patients.

Conclusions: In a sample of amnesic MCI patients, approximately 23% exhibited impaired insight and awareness of their cognitive impairment. Reduced inhibitory response may contribute to anosognosia and awareness of cognitive deficits is associated with significantly more depressive symptoms.

Correspondence: *michelle A. zeller, Psy.D., Psychiatry, UCLA, 760 Westwood Plaza, Los Angeles, CA 90095. E-mail: mazeller@juno.com*

V. STAMENOVA, E. ROY & S. BLACK. Progression of Apraxia in Corticobasal Degeneration-A Case Study.

Objective: Corticobasal degeneration (CBD) is a progressive neurodegenerative disorder characterized by asymmetrical akinetic rigidity, cortical sensory loss, myoclonic jerks, alien limb syndrome and apraxia. Even though, apraxia is one of the cardinal signs of CBD, few studies have examined its progression over time.

Participants and Methods: We report on a 62 year old right handed male patient who was examined yearly three consecutive times on an apraxia battery examining conceptual knowledge of tools and gestures and gesture production performance (pantomime and imitation of both transitive and intransitive gestures). The patient's scores were standardized in relation to the scores of an age-matched control group. If the scores fell between 1 to 2 SD's below the mean of the control group, the patient's performance was considered borderline apraxic and if below 2 SD's-apraxic.

Results: Gesture performance was initially impaired only with his left hand on all tasks. On the two subsequent examinations the left hand could no longer be tested due to rigidity, while performance with the right hand moved first to the borderline range and then by the third assessment was apraxic. Conceptually, the patient was not impaired on any of the tasks on his first assessment. His ability to identify tools and gestures remained unimpaired on subsequent assessments. His performance on tool and action naming tasks deteriorated likely due to dysarthria.

Conclusions: The study suggests a dissociation between conceptual and production system in this case of CBD, with deterioration of the production system over time and preservation of the conceptual knowledge of tools and gestures. A group study is under way to determine generalizability of the results.

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

P.N. MOORE & M. GROSSMAN. Confrontation naming in Semantic Dementia (SD), Progressive Non-Fluent Aphasia (PNFA), and Progressive Mixed Aphasia (PMA) Patients.

Objective: Naming difficulty is common in patients with progressive aphasia, including SD, PNFA, and PMA. However, the cause of impaired naming may differ across these groups: SD patients' naming deficit may be related to impaired semantic memory, PNFA tend to have difficulty with phonologic formulation, and PMA patients may have both semantic and output naming difficulties.

Participants and Methods: We investigated naming errors in 34 progressive aphasias, including 14 SD, 13 PNFA and 7 PMA patients matched for age and MMSE using a brief version of the Boston Naming task. We evaluated overall naming using z-scores based on 25 age- and education-matched controls, and examined error patterns.

Results: Relative to controls, 9 of 14 (64%) SD, 4 of 13 (31%) PNFA, and 3 of 7 (43%) PMA patients had significant naming deficits. ANOVA for overall naming showed a significantly different mean naming performance across these groups [$F(2,31)=3.28$; $p=0.05$]. SD were significantly more impaired compared to PNFA [$t(25)=2.67$; $p<0.05$]. Error analysis showed significantly more circumlocutory than semantic, phonemic, visual, and unrelated errors in SD (all $p<0.05$). PNFA produced the most phonemic errors, significantly more so than PMA ($p<0.05$). PMA patients produced circumlocutory, semantic, and visual errors.

Conclusions: Many SD, PNFA, and PMA patients have naming difficulty, but error analyses suggest different underlying difficulties in each group.

Correspondence: *Peachie N. Moore, BA, Cognitive Neurology, University of Pennsylvania School of Medicine, 3 W. Gates Bldg., 3400 Spruce St., Philadelphia, PA 19104-4283. E-mail: peachie@mail.med.upenn.edu*

V. DRAGO, J. CHEONG, G.R. FINNEY, G.P. CRUCIAN, P.S. FOSTER, F. PISANI & K.M. HEILMAN. Lewy Body Dementia and Creativity: Case Report.

Objective: We studied a patient with Lewy Body Dementia (LBD), who was an artist, to learn whether the visuospatial dysfunction associated with this disease influenced his paintings during the course of the disease.

Participants and Methods : The first study evaluated two painting of the same subject matter, one that the patient painted before his illness and the other after the onset of the disease. The second evaluated a collection of his paintings from the onset of the disease in 1994 until 2002. Ten judges evaluated: aesthetic-beauty, closure, evocative impact, novelty, technique and representational quality on a 1-10 scale to learn if there were any changes in these factors with the progression of the disease.

Results : For the first study, the ratings of the quality of the representation for the two paintings were subjected to a paired samples t-test. This analysis revealed that the portrayal of the subject matter in the second painting was significantly poorer in quality than that of the first painting, $t(9) = 5.11$, $p = 0.001$. For study 2, we correlated the criterion variables with the year of the painting. With the exception of novelty, all measures were significantly negatively correlated with the year the painting was created, reflecting a decline in criterion scores over time. In addition, we conducted a forward stepwise regression analysis using quality measures as predictor of year. This analysis revealed that only representational quality significantly predicted painting year, $R^2 = 0.539$, $F(1, 6) = 7.005$, $p = 0.038$.

Conclusions : Our results suggest that as LBD progresses, there is a gradual degradation of the ability to visually express artistic subject matter. It remains unclear if the degradation impairs the brain's iconic representations or the knowledge needed to portray these representations. Correspondence: Valeria Drago, Medicine, Neurology, University of Florida, 100 S Newell Dr, Gainesville, FL 32610. E-mail: valeria.drago@neurology.ufl.edu

N.C. MCLAUGHLIN & H.J. WESTERVELT. Olfactory Dysfunction in Frontotemporal Dementia.

Objective: To analyze the differences between participants with frontotemporal dementia, Alzheimer's disease, and control participants on an odor identification task.

Participants and Methods : 13 participants with frontotemporal dementia were administered the Brief Smell Identification Test along with a mental status examination. Three participants with semantic dementia were excluded to rule-out confounds due to a loss of semantic knowledge. The ten remaining participants (5 with the behavioral subtype, 5 with nonfluent aphasia) were matched based on age and education to individuals with Alzheimer's disease and a healthy older control group.

Results : Significant differences were found between the frontotemporal dementia group and the control group on the odor identification task. There were no significant differences between the frontotemporal dementia group and the Alzheimer's dementia group. Non-significant trends also indicate that as frontotemporal dementia increases in severity (as measured by decreased mental status scores), olfactory identification abilities worsen.

Conclusions : These findings show that olfactory identification abilities worsen in frontotemporal dementia, which parallels past research into relationships between other dementias (e.g. Alzheimer's, vascular, Lewy body) and olfactory deficits. This research lends additional support to the importance of olfactory identification tasks in neuropsychological evaluations to aid in distinguishing patients with dementia from those who do not have dementia.

Correspondence: Nicole C. McLaughlin, M.A., Brown University, 18 Cornell Rd., Narragansett, RI 02882. E-mail: nicole_mclaughlin@brown.edu

S. BANKS, B. BARAN, B. HERGUNSEL, N. JOHNSON & S. WEINTRAUB. Clinical Dementia Rating (CDR) for Behavioral Variant Frontotemporal Dementia (bvFTD) and Primary Progressive Aphasia (PPA).

Objective: The CDR was developed to categorize dementia severity in Alzheimer's disease (AD). The measure generates a series of box scores in various domains: memory, orientation, community affairs, household

and hobbies, judgment and personality, and personal care. These scores are used to generate a global score, heavily weighted towards the memory box score, since memory loss is the key sign of AD. In recent years, there has been a surge of interest in non-AD dementias, especially those caused by frontotemporal lobar degeneration. BvFTD and PPA are two such syndromes in which memory can remain intact until quite late in the disease. Use of the global CDR score in these populations may result in imprecise assessment of dementia severity due to its reliance on the memory box score. This study investigated using products of the CDR other than the global score to characterize dementia severity in non-AD dementias.

Participants and Methods : We assessed correlations of the global CDR score, individual box scores and sum of box (SB) scores with functional (activities of daily living) and cognitive (naming, memory, mental status) test scores in three diagnostic groups; PPA, bvFTD and AD.

Results : Whereas the use of global scores correlated with few measures in bvFTD and PPA, SB scores correlated well with a variety of measures across diagnoses.

Conclusions : The results of this study suggest that the CDR can be a valid staging instrument in bvFTD and PPA, if SB scores are used in the place of global scores.

Correspondence: Sarah Banks, Cognitive Neurology and Alzheimer's Disease Center, Northwestern University, 320 E Superior, Searle 11-569, Chicago, IL 60613. E-mail: s-banks2@northwestern.edu

N. LEVY, N. NADKARNI & S. BLACK. Executive Dysfunction and Cerebral Perfusion in Alzheimer's disease and Frontotemporal dementia.

Objective: Executive function (EF) impairment is common to Alzheimer's dementia (AD) and Frontotemporal dementia (FTD), but its neural correlates have been less studied. We investigated the relationship between performance on EF tasks and regional perfusion in AD and FTD.

Participants and Methods : We compared age- and education-matched AD (n=24), behavioral variant-FTD (bv-FTD n=15) and language variant-FTD (lv-FTD n=20) on standardized EF tasks and Single Photon Emission Computerized Tomography (SPECT). Perfusion ratios for 7 bilateral regions of interest (ROI) were assessed: ventrolateral (VLPFC) and dorsolateral prefrontal (DLPFC) cortices, superior temporal and inferior temporal gyri, temporal (TP) and frontal poles (FP) and the superior parietal (SP) lobe. MANOVA and stepwise multiple regressions (p set at 0.01) were used for statistical analysis.

Results : All subjects showed EF impairment. MMSE (mean=24.1) and duration of disease (mean=3.2 yrs) were similar between groups. FTD groups showed decreased perfusion relative to AD patients in VLPFC and DLPFC, and TP and FP. No significant perfusion differences were seen between the two FTD groups. In the AD group, performance on a fluency task correlated with perfusion in the left SP ($R^2=0.31$, $p<0.01$). Decreased right DLPFC perfusion was associated with increased perseverations on the WCST ($R^2=0.43$, $p<0.01$). Performance on Raven's Matrices positively correlated with right SP perfusion ($R^2=0.31$, $p<0.01$). Trails B correlated with right SP lobe perfusion ($R^2=0.64$, $p<0.01$) in bv-FTD and with left TP and VLPFC perfusion ($R^2=0.58$, $p<0.01$) in lv-FTD. Left TP perfusion also correlated with backward digit span ($R^2=0.36$, $p<0.01$) in lv-FTD.

Conclusions : In this study of AD and FTD decline in verbally loaded EF tasks were related to left-sided hypoperfusion, while nonverbal EF deficits were related to right sided hypoperfusion. The results highlight that the neural substrates involved in EF are complex and may differ depending on type of EF task, pathology and hemispheric specialization. Correspondence: Naama Levy, PhD Candidate, Institute of Medical Science, University of Toronto, 310-245 Davisville Ave, Toronto, ON M4S3H4, Canada. E-mail: Naama.Levy@sw.ca

J. MEDINA & S. WEINTRAUB. Characterizing Depressed and Non-Depressed Patients Diagnosed with Primary Progressive Aphasia.

Objective: Primary Progressive Aphasia (PPA) is a clinical syndrome in which language functions decline over time while other cognitive and behavioral domains remain relatively preserved for at least the first two years. While a significant body of literature has been devoted to defining the diagnostic criteria of PPA, very little attention has been spent on other features of the illness such as emotional distress and depression. Because patients with PPA suffer progressive interference with communication despite preserved memory and reasoning, there is reason to believe they may experience depression.

Participants and Methods : Sixty-one patients with PPA were administered the Geriatric Depression Scale (GDS).

Results : According to the GDS published norms, this sample of patients was not significantly clinically depressed [mean = 8.38 (5.6)]. However, 34% of this sample scored in the depressed range. When comparing depressed PPA patients (n=21) with non-depressed PPA patients (n=40) no significant demographic differences between groups were found. When neuropsychological profiles of depressed and non-depressed PPA patients were compared, the only significant difference was in Boston Naming Test score ($p = .03$) with depressed patients having lower scores. Interestingly, a significantly larger proportion of depressed patients (43%) than non-depressed patients (15%) reported having experienced depression before the onset of their diagnosis ($p = .02$).

Conclusions : Possible explanations for these findings will be discussed along with implications for treatment and psychoeducation in PPA.

Correspondence: *Jennifer Medina, B.S., Clinical Psychology, Northwestern University, 2552 N. Seminary Ave #2, Chicago, IL 60614. E-mail: jmedina@northwestern.edu*

S.A. WYLIE, K. ECKERLE & C. MANNING. Response Conflict In Mild Cognitive Impairment (MCI): Delta Plots Reveal Inhibition Deficits.

Objective: We investigated the role of response inhibition in MCI patients when they encounter stimuli in the visual field that correspond to conflicting responses. Using a flanker task (Eriksen & Eriksen, 1974) and delta plots for analyzing reaction time (RT) and accuracy distributions, we were able to distinguish between deficits arising from activation or inhibition of conflicting responses.

Participants and Methods : Twelve MCI patients (diagnosis based on neurological and neuropsychological evaluation) and 11 healthy controls (HC) performed a computerized flanker task requiring participants to make left or right button presses based on the direction of a target arrow flanked along the horizontal axis by distractor arrows (flankers) that pointed in the same (congruent) or opposite (incongruent) direction.

Results : Under conditions of response conflict (incongruent flankers), both groups showed a RT cost (HC = 64 ms; MCI = 98 ms), but this effect was larger in MCI ($p=.05$). RT delta plot analysis showed that the interference effect was similar in magnitude and slope at early segments of the RT distribution in both groups ($p>.05$), but greater among MCI patients at the slowest segments ($p<.05$), a finding consistent with poor recruitment of inhibition. Accuracy delta plots did not differ between groups ($p>.05$), suggesting similar flanker response activation.

Conclusions : MCI patients show larger interference effects than HC in situations of response conflict. Delta plot analyses, which can determine the source of interference effects, suggest that poor response inhibition accounts for the enhanced RT interference effect in MCI.

Correspondence: *Scott A. Wylie, Ph.D., Neurology, University of Virginia, 500 Ray C. Hunt Drive, Charlottesville, VA 22908. E-mail: saw6n@virginia.edu*

D.A. CAHN-WEINER, L.J. JULIAN, J.H. KRAMER, B.R. REED, D. MUNGAS, H.C. CHUI & M. WETZEL. Executive Function Predicts Future Change in Instrumental Activities of Daily Living.

Objective: There is a growing literature demonstrating that executive dysfunction is associated with deficits in instrumental activities of daily living (IADLs) in dementia. Most studies showing this relationship have been cross-sectional, and have not determined the degree to which executive function impairment predicts future IADL decline.

Participants and Methods : The present study examined the cognitive predictors of future functional decline in 169 subjects enrolled in a multicenter longitudinal study of aging and cerebrovascular disease (mean age 75.2 ± 7.9 years, 52% male) who were evaluated at three consecutive time points (time 1 to time 2: 565.5 ± 286.3 days; time 1 to time 3: 1089.2 ± 424.5 days) with the Mattis Dementia Rating Scale (DRS) and a caregiver report of IADLs. IADL change was determined by subtracting the IADL score at time 2 from the IADL score at time 3.

Results : Bivariate correlations between the DRS subscale scores at time 1 and the IADL change score revealed significant correlations with the Initiation/Perseveration (I/P), Memory, and Attention subtests ($p's < .001$). In a hierarchical multiple regression, controlling for baseline IADL score, only the I/P subscale contributed significantly to the prediction of IADL change, accounting for 14% of the variance ($p<.01$).

Conclusions : These findings indicate that early detection of executive dysfunction serves as a better predictor of future functional decline than other measures of cognitive function, including memory and attention. Further studies are needed to determine how well other patient characteristics including demographic and medical variables as well as structural brain changes predict decline in IADLs.

Correspondence: *Deborah A. Cahn-Weiner, Ph.D., Neurology, UCSF, 400 Parnassus Avenue, San Francisco, CA 94143-0138. E-mail: dcahn@itsa.ucsf.edu*

A.H. WICKLUND, N. JOHNSON, A. RADEMAKER, B. FUNG & S. WEINTRAUB. Word List versus Story Memory in Alzheimer's Disease and Frontotemporal Dementia.

Objective: To compare performance on story versus word list recall in patients with Alzheimer's disease (AD), the behavioral variant of frontotemporal dementia (FTD), and cognitively intact elderly control subjects. AD patients were hypothesized to show a pattern of rapid forgetting, while FTD patients would show decreased encoding on both tasks, but better delayed recall than AD. FTD subjects were also predicted to benefit from the structure of the story to aid in encoding while AD subjects would not benefit.

Participants and Methods : 33 AD patients and 20 behavioral variant FTD patients with mild to moderate dementia severity (MMSE>17), and 62 cognitively normal elderly control subjects participated. Participants were administered the CERAD word list learning task and the Logical Memory subtest of the WMS-R. The percent of information recalled immediately, after a delay, and the percent retention between these conditions were calculated for both tests.

Results : Repeated measures ANOVA covarying for age and MMSE score, with pairwise comparisons for significant main effects was used to analyze the data. Results showed that FTD patients encoded and recalled more information from the story than AD. No difference was found between FTD and AD for encoding of the word list. However, FTD patients recalled more words after a delay than AD. Percent retention on both tasks was greater for the FTD group.

Conclusions : Results suggest that patterns of performance on different tests of memory can be useful in differentiating AD from FTD. AD patients demonstrated a pattern of rapid forgetting on both tasks, while FTD patients were able to retain more information over time. FTD patients also benefited from the organization of the story to enhance encoding. The results suggest that qualitative patterns of performance on different memory tests may be more informative in differentiating between AD and FTD than absolute test scores on a single measure.

Correspondence: *Alissa H. Wicklund, PhD, Cognitive Neurology and Alzheimer, Northwestern University, 37 Drexel Ave, La Grange, IL 60525. E-mail: ahwicklund@yahoo.com*

M.L. DREXLER & E.S. SUTHERLAND. A Preliminary Cross-Validation of Education Corrections for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Total Scale Indices in a Clinical Geriatric Sample.

Objective: The RBANS is commonly used, and indices are age-corrected. The influence of education on neuropsychological tests is also notable, and the current study explores this influence on RBANS Total Scale Indices (TSIs) in a clinical geriatric sample referred for dementia workup, extending Gontkovsky, Mold, & Beatty, (2002).

Participants and Methods : Of 85 cases examined, 36 were excluded due to incomplete RBANS data. Following criteria of Gontkovsky, et al., (2002), we dropped those under 65 and those completing graduate school, yielding 36 subjects (23 Caucasians and 13 African-Americans; average age 78.33 years, SD = 6.46). We compared TSI's and Education-Corrected Indices (ECI's).

Results : Education ranged from 4-16 years (M = 12.11, SD = 2.65), and was not related to TSI's ($r = .27, p = .11$). When comparing TSI's with ECI's using 76 as a cutoff for impairment (Gontkovsky, et al., 2002), the proportion of subject's scoring below 76 remained the same. However, 11% of subjects were reclassified. Of the 4 subjects who changed, 2 were well-educated Caucasians (changing to below 76), and 2 were African-Americans with limited education (changing to above 76). Notably, the difference between Caucasians and African-Americans on education was not significant ($t = .98, p = .34$).

Conclusions : While education was not statistically related to TSI's, when ECI's were used 11% of subjects were reclassified, revealing potential clinical significance for education-corrections (perhaps in diverse populations). We encourage clinicians using the RBANS to be aware of education and the availability of score corrections. Limitations in sample size and suggestions for future research are discussed.

Correspondence: *Elizabeth S. Sutherland, MA, Nursing Home Care Unit, San Francisco VA Medical Center, 17 Oak Road, Larkspur, CA 94939-1920. E-mail: essutherland@aol.com*

L. QUITANIA, D. CAHN-WEINER, J.H. KRAMER, K.P. RANKIN, N. BELFOR, J.K. JOHNSON & B.L. MILLER. Apathy and Cognitive Contributions to Activities of Daily Living.

Objective: Patients with Alzheimer's disease (AD) and Frontotemporal dementia (FTD) have dissociations in cognitive functions, with AD patients showing relatively greater impairment in memory and FTD patients showing relatively greater impairment in executive functioning. Both memory and executive functioning have been implicated in the prediction of functional decline in these two patient groups. Additionally, measures of apathy have been shown to contribute significantly to the prediction of impairment in instrumental activities of daily living (IADLs) in dementia. The purpose of this study was to examine the relative contributions of memory, executive function, and apathy to the prediction of IADL impairment in AD and FTD.

Participants and Methods : Patients included 86 AD (MMSE mean=20 \pm SD=3.5 and age mean=73 \pm SD=10) and 37 FTD (MMSE mean =24 \pm SD=3.1 and age mean=60 \pm SD=7). Diagnoses were based on multidisciplinary evaluations comprised of history, neurological examinations, cognitive evaluations, and neuroimaging. All patients were recruited from the UCSF Memory and Aging Center. Memory was assessed with the CVLT-MS and executive functioning was assessed by verbal fluency. Apathy was assessed via the Neuropsychiatric Inventory. The Functional Activities Questionnaire served as the instrument for functional impairment. Separate multiple regressions were utilized for each diagnosis using the FAQ as the criterion. Memory, executive function, and apathy were our predictor variables.

Results : The model for AD was significant (adjusted $R^2 = .113, p < .01$), with apathy and memory respectively contributing 4% and 5% of the variance to FAQ. The model for FTD was also significant (adjusted $R^2 = .260, p < .01$), only apathy was significant, accounting for 23% of the variance in FAQ.

Conclusions : These findings highlight the importance of considering both cognitive and behavioral factors in predicting functional declines in AD. In contrast, functional decline in FTD can be mostly attributed to behavioral disturbance.

Correspondence: *Lovingly Quitania, BA, Neurology, UCSF Memory and Aging Center, 350 Parnassus Ave, Suite 706, San Francisco, CA 94143-1207. E-mail: lquitania@memory.ucsf.edu*

B. FREILICH, N. HUSSAIN, Z. NIZAM, S. SHAH & L. HYER. The Inventory of Vascular and Alzheimer's Characteristics (IVAC): An Empirically-Based Checklist for the Differential Diagnosis of Alzheimer's Disease, Vascular Dementia, and Mixed Dementia.

Objective: The present study describes the development of an empirically-based checklist, the Inventory of Vascular and Alzheimer's Characteristics (IVAC), and reports its effectiveness in classifying cases of Alzheimer's disease (AD), vascular dementia (VaD), and mixed dementia (MD) in a dementia diagnostic clinic.

Participants and Methods : 37 subjects (14 males, 23 females) were included in the study. All subjects had MMSE scores greater than 15 and received diagnoses of probable AD (n=16), VaD (n=9), or MD (n=12) by a board certified geropsychiatrist. We reviewed the literature and selected 12 variables (6 neuropsychological and 6 historical) that have gained empirical support as being able to discriminate between AD and VaD.

Results : The sensitivities, specificities, positive predictive values, and negative predictive values were calculated for each of the 12 items. One item (confrontation naming) was dropped from further analyses due to its failure to differentiate between groups. Of the other 11 items, variables supportive of AD were scored positive and variables supportive of VaD were scored negative. Items with the best predictive values were weighted +2 or -2, while all other items, if proven to successfully differentiate between groups were scored +1 or -1. Intermediate variables or items related to MD were scored 0. Total IVAC scores were calculated by summing up the individual items. Scores greater than +3 were designated AD, scores less than -3 were designated VaD, and scores in between were designated MD. Using these cut-off values, the IVAC was able to correctly classify 95% of cases (100% AD, 89% VaD, 92% MD).

Conclusions : The IVAC is an empirically-based, user-friendly checklist that can be completed by clinicians after a brief clinical interview and 45-minute neuropsychological evaluation. Using 11 neuropsychological and historical variables that have gained empirical support as being able to discriminate between AD and VaD, the IVAC was able to correctly classify 95% of AD, VaD, and MD cases.

Correspondence: *Bryan Freilich, Psy.D., University of Medicine and Dentistry of New Jersey, 10-21 162nd Street, Apt 6C, Whitestone, NY 10357. E-mail: bfreil@nyc.rr.com*

J. CHUNG, K. RYU, A. CHO, D. LEE, J. KIM & Y. KANG. Relationship Between Depression and Cognitive Functions in the Dementia of the Alzheimer's Type and the Vascular Dementia.

Objective: Depression has been regarded as a cause of cognitive functions, especially memory problem and frontal/executive dysfunction. However, recent studies (Berger et al., 2002) reported that depression does not appear to worsen cognitive impairments in AD. Although patients with vascular dementia (VaD) often have depressive disorders (Sultzer et al., 1993), our understanding of the relationship between depression and cognitive symptoms in VaD is very limited. This study examined the relationship between depression and cognitive functions in VaD and AD.

Participants and Methods : The subjects were 22 VaD and 29 AD. There was no group difference in age, educational level, and dementia severity. All the patients were in the “very mild (CDR=0.5)” or “mild (CDR=1.0)” level of dementia. They were given the Geriatric Depression Scale (GDS) that consisted of 4 factors (Ryu et al., 2000), “helplessness,” “worry & agitation,” “unhappiness,” and “cognitive decline & social withdrawal.” Comprehensive cognitive functions were evaluated with the Seoul Neuropsychological Screening Battery (SNSB).

Results : The results showed that there was no difference between VaD and AD in the severities of depression measured by the total and the factor scores of GDS. However, it was found that the severity of depression was negatively correlated to attention, verbal memory, and frontal/executive functions in VaD, while there was no correlation between depression and cognitive functions in AD. All 4 factors of the GDS were *negatively* correlated to the frontal/executive functions in VaD, while two factors, “helplessness” and “unhappiness,” were *positively* correlated to verbal memory in AD.

Conclusions : These results suggest that the relationship between depression and cognitive functions in VaD is different from that in AD. Correspondence: *Yeonwook Kang, Ph.D., Psychology, Hallym University, Okchon-dong, Chuncheon 200702, South Korea. E-mail: ykang@hallym.ac.kr*

M. SUH, E. KIM, B.H. LEE & D.L. NA. Ideogram Alexia in Patients with Semantic Dementia.

Objective: Japanese patients with left posterior cerebral artery (PCA) territory infarction showed dissociation in reading of their syllabogram (Kana) and ideogram consisting of Chinese characters (Kanji). The same dissociation between Korean phonogram (Hangul) and Chinese characters (ideogram, Hanja) has also been reported in Korean patients with PCA infarction. It is reported that the posterior fusiform gyrus (BA 37) is responsible for the dissociation. Previously, a case of semantic dementia (SD) showing Kanji alexia explained as surface dyslexia was reported. Though Hanja and Kanji take similar forms, they have different patterns of use. The purpose of this paper was to see if the Korean SD patients would show discrepancy in Hanja and Hangul reading. SPM analysis was done on the patients’ PET images to see if there were any dysfunctions in the posterior fusiform gyrus.

Participants and Methods : Five patients diagnosed as SD preformed the Korean version of Western Aphasia Battery, Hangul word/non-word reading task, and Hanja single character reading task.

Results : All patients had aphasia(anomic or Wernicke type). Their Hangul word/non-word reading task performances were normal except for one patient, whereas, Hanja alexia was observed in all. SPM group analysis showed deactivated areas in the uncus (BA36), superior (BA 38) and middle (BA 21) temporal gyri, anterior and middle parts of the fusiform gyrus (BA20), and anterior cingulate gyrus (BA 25).

Conclusions : SD patients showed Hanja alexia, although they did not show any deactivation in the posterior fusiform gyrus as in the stroke patients. The lesions in anterior or middle parts of fusiform gyrus(BA20) may be responsible the temporal lobe connections preventing the function of the posterior fusiform gyrus.

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Correspondence: *Mee Kyung Suh, Masters, Neurology, Samsung medical center, samsung medical center department of neurology, 50 bunji, il-won dong kang nam ku, seoul 135-710, South Korea. E-mail: rosasuh2000@hotmail.com*

A.E. MIKOS, M. LOPEZ, C.C. PRICE & D. BOWERS. Memory for Emotional Words in Mild Cognitive Impairment.

Objective: Many studies have suggested that memory is enhanced for emotionally arousing compared to neutral material. Emotional memory has not been evaluated in mild cognitive impairment (MCI),

a disorder involving reduced memory in the context of intact general cognitive abilities and activities of daily living. We used a rate of forgetting paradigm, sensitive to mesial temporal lobe dysfunction in humans, to evaluate the rate of information loss for emotional versus neutral stimuli in individuals with MCI compared to normal controls.

Participants and Methods : We evaluated 9 adults with amnesic MCI and 9 age and education-matched controls. Participants viewed 90 words (30 pleasant, 30 negative, 30 neutral) and completed two recognition test phases (10 minutes and 1 hour later). For each valence category, rate of forgetting was calculated by dividing the amount of information lost over time by the original amount of correctly discriminated information.

Results : A mixed ANOVA with Bonferroni-adjusted post hoc tests revealed that for the MCI group, rate of forgetting was significantly lower for negative compared to neutral and positive words. For controls, there was no difference in rate of forgetting for the three valence types.

Conclusions : MCI subjects lost less negative than positive or neutral information over time. Thus, despite having impaired general memory, individuals with MCI may benefit from emotional content. Given the well-documented emotional enhancement effect for memory in normal individuals it is surprising that controls did not benefit from emotional content. It will therefore be important to test these individuals at intervals beyond one hour.

Correspondence: *Ania E. Mikos, B.A., 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*

W. SANTOS-MODESITT, B.L. MILLER, J.H. KRAMER, D. PAVLIC, V. BECKMAN & K.P. RANKIN. Spontaneous Social Behaviors that Discriminate FTLD from Vascular and other Dementias.

Objective: Non-specialists such as primary care physicians must recognize the need for specialized dementia referral based on brief, routine clinical visits. Because some atypical dementias do not initially present with cognitive deficits but with disruptions in interpersonal functioning, simple behavioral observations might help clinicians recognize the need for specialty referral. We hypothesized that patients with different neurodegenerative diseases would spontaneously display specific social deficits during routine clinical interactions.

Participants and Methods : The Interpersonal Measure of Psychopathy (IM-P), an 18-item checklist of observed inappropriate behaviors, was completed on 288 patients after a medical visit by clinicians blind to diagnostic status. Patients were later diagnosed by a team of dementia experts. Subject groups included: Alzheimer’s (AD), Frontotemporal Dementia (FTD), Semantic Dementia (SD), Primary Progressive Aphasia, Vascular (VD), mixed AD/VD, Corticobasal Degeneration, Lewy-Body Disease, Progressive Supranuclear Palsy, and psychiatric cognitive disorders. Their IM-P scores were compared to age-matched normal controls (NC) using a general linear model and post-hoc Dunnett’s tests.

Results : FTD and SD patients showed unique abnormal patterns of scores (mean FTD=22.1±4.8; SD=24.7±6.21; NC=18.8±1.5), while no other group’s behavior differed significantly from controls. VD and AD/VD patients showed the next highest scores (mean VD=20.1±4.1; AD/VD=20.0±4.1, n.s. compared to NCs). Item analysis (e.g., “interrupts interview”, “ignores professional boundaries”, “discusses personal uniqueness,”) correctly discriminated 100% of VD or mixed AD/VDs against 75% of FTDs and 76% of SDs.

Conclusions : This study identifies specific spontaneous behaviors that can alert primary care clinicians to the presence of an atypical dementia requiring specialized referral and treatment.

Correspondence: *Wendy Santos-Modesitt, UCSF, 454 las Gallinas Ave., 144, san rafael, CA 94903. E-mail: wsantosmodesitt@memory.ucsf.edu*

E.E. LASHER, R.H. OUAOU, A.N. CERNICH, M.H. KABAT, K.A. LONSER & R.L. KANE. Cognitive Predictors of Functional Status in Dementia Clinic Outpatients.

Objective: This study attempted to determine predictors of independent functional status from a neuropsychological screening battery in consecutive outpatients referred to a dementia assessment clinic. This was an extension of previous findings by Ouaou and colleagues (2001) utilizing a smaller sample size ($n=63$) and focusing primarily on executive functioning.

Participants and Methods : Of 157 available patients referred to the clinic, complete neurocognitive screening data were available for 109. Stepwise logistic regression analyses with forced entry were performed for four domains of independent functional status as determined by Instrumental Activities of Daily Living (IADLs): general independence, medication management, driving, and financial management. Four cognitive domains were represented as predictors in the model: executive functioning (Reciprocal Motor Movements, COWA), working memory (Letter-Number Sequencing), immediate memory (Digit Span-Forward), and memory (CERAD Delayed Recall).

Results : Tests of the full models with all predictors against a constant-only model yielded the following results: general independence χ^2 ($df = 5$, $p < .01$) = 15.442, medication management χ^2 ($df = 5$, $p < .01$) = 19.540, driving χ^2 ($df = 5$, $p < .05$) = 11.97, and financial management χ^2 ($df = 5$, $p < .01$) = 15.94. After all predictors were entered, total prediction success was 74.3, 71.6, 64.2, and 66.1%, respectively.

Conclusions : Four neurocognitive domains reliably differentiated individuals who were independent and dependent in IADLs both generally and for specific critical areas of functioning. These results extended previous findings and provide additional evidence for the relationship between neurocognitive test performance and successes with pertinent life tasks.

Correspondence: *Erin E. Lasher, M.A., VA Maryland Health Care System, Baltimore Campus, 10 North Greene Street, BT/116/MH, Baltimore, MD 21201. E-mail: lasher1103@yahoo.com*

K.P. RANKIN, S. GLENN, C.M. STANLEY, S. ALLISON, J.H. KRAMER & B.L. MILLER. Specific Right Frontal Structures Mediate Social Self-Monitoring In Dementia.

Objective: The capacity to monitor one's self-presentation in social contexts declines precipitously in some variants of frontotemporal lobar degeneration, while it can remain intact until late in other dementias such as Alzheimer's disease (AD). Functional imaging of healthy adults suggests dorsomedial frontal regions may contribute to self-awareness; however, this brain-behavior relationship has not been directly quantified in patients with neurodegenerative disease.

Participants and Methods : First-degree relatives rated 69 dementia patients (18 frontotemporal dementia [FTD], 9 semantic dementia, 7 primary progressive aphasia, 24 AD, 11 progressive supranuclear palsy or corticobasal degeneration) using the Revised Self-Monitoring Scale (RSMS) questionnaire, which measures the ability to modulate self-presentation based on others' social expressions. Structural T1-weighted MRIs were obtained on all subjects. Voxel-based morphometry was performed using SPM-2 software to determine which brain areas correlated significantly with RSMS score. Correction for multiple comparisons was performed using a mask that included bilateral parietal, temporal, and frontal volumes.

Results : Areas significantly predicted by RSMS, controlling for age and sex, included part of the right superior frontal gyrus (25, 52, 16) ($p < 0.013$ corrected), the right middle frontal gyrus (26, 45, 28) ($p < 0.065$ corrected), and the right superior medial gyrus (12, 46, 35) ($p < 0.081$ corrected) (all areas $p < 0.0001$ uncorrected).

Conclusions : This study provides direct evidence that damage to specific right dorsomedial frontal structures diminishes the capacity to observe and modulate one's own behavior in response to social cues. It also helps explain why frontal variant FTD patients are more likely to display early loss of self-awareness than are patients with neurodegenerative conditions sparing these regions.

Correspondence: *Katherine P. Rankin, Ph.D., Neurology; UCSF, 350 Parnassus Avenue, Suite 706, San Francisco, CA 94143-1207. E-mail: kraink@memory.ucsf.edu*

S. GLENN, B. MILLER, J.H. KRAMER, C.M. STANLEY & K.P. RANKIN. Evidence Against Ventral Orbitofrontal Involvement in Visual Perspective Taking.

Objective: Visual Perspective Taking (VPT) is the ability to identify what another person knows based on what they can see, and is one element of Theory of Mind (ToM). Evidence suggests frontal structures may mediate VPT, but the literature is inconsistent about whether orbitofrontal (OFC) or dorsomedial structures are responsible. Frontotemporal dementia (FTD) patients have impaired first- and second-order VPT, while VPT is normal in Alzheimer's Disease (AD). However, no study has examined VPT in Semantic Dementia (SD) patients, who have temporal lobe and OFC damage but no other frontal damage.

Participants and Methods : A variant of the Gregory VPT test, involving a series of photographs of 2 people hiding an object, was administered to 54 subjects (14 FTD, 8 SD, 11 AD, 21 older healthy controls [NC]). Subjects then answered questions about where the object was located (control question), where the man thought the object was (1st order question), and where the woman thought the man thought the object was (2nd order question). GLMs with post-hoc Dunnett's tests were performed controlling for sex, age, and education.

Results : ADs were impaired on the control condition (AD:7.4 +/- 2.6; NC:11.5 +/- 0.6, $p < 0.05$), suggesting non-ToM cognitive impairments interfered with their VPT performance. FTDs performed normally on the control condition, but were impaired on both 1st order (FTD:8.4 +/- 2.7; NC:11.1 +/- 1.2, $p < 0.5$) and 2nd order (FTD:7.1 +/- 3.2; NC:10.7 +/- 1.8, $p < 0.05$). SDs performed normally on all conditions.

Conclusions : Thus, despite significant OFC damage, SDs perform normally on 1st and 2nd order VPT tasks, supporting the hypothesis that the OFC is not critical for this aspect of ToM.

Correspondence: *Shenly Glenn, B.A., UCSF, 350 Parnassus Ave. Ste 706, San Francisco, CA 94134. E-mail: sglenn@memory.ucsf.edu*

B.L. ROPER, K. ATKINS, C.H. BASSIN, J.B. WOOD & R.P. JOHNSON. Unusually Rapid Onset of Primary Progressive Aphasia: Case Report.

Objective: We report a case of primary progressive aphasia that demonstrated an unusually rapid onset.

Participants and Methods : A 54-year-old man was functioning normally until developing forgetfulness followed eleven days later by abrupt onset of language impairments, including nonfluent, empty speech, impaired comprehension, and echolalia. Five weeks later, MRI revealed focal atrophy of the left anterior temporal lobe and several small focal hyperintensities of cerebral white matter bilaterally. Language progressively deteriorated over the ensuing months, while he continued to perform ADLs independently, drive normally, and complete complex mechanical repairs and welding projects. EEG and labs were normal. Arteriogram showed normal arteries of the head and neck, with normal flow.

Results : Neuropsychological evaluation was conducted five months after the original presentation of symptoms. The patient demonstrated global aphasia, with nonfluent speech, phonemic and semantic paraphasias, and impaired comprehension, repetition, and naming. Written language impairments were present as well. In contrast, visuospatial abilities were generally well preserved.

Conclusions : The patient presented with an unusually rapid onset of aphasia that did not abate. Rather, his aphasia worsened over ensuing months in the absence of confirmed evidence of infarction that would explain the rapid onset. Differential diagnostic issues are discussed.

Correspondence: *Brad L. Roper, Ph.D., Psychology Section (116A4), VAMC, 1030 Jefferson Ave., Memphis, TN 38104. E-mail: Brad.Roper@va.gov*

D. PAVLIC, B. MILLER, J. KRAMER, S. GLENN, C. STANLEY & K. RANKIN. Deficits in Realistic Non-Verbal Comprehension in Frontotemporal Lobar Degeneration.

Objective: Studies suggest some frontotemporal lobar degeneration (FTLD) and Alzheimer's (AD) patients show emotion recognition deficits. However, their comprehension of nonverbal cues in more realistic settings has not been well-quantified. In sarcastic utterances, nonverbal cues communicate the speaker's true meaning, while spoken content is misleading. We hypothesized that frontotemporal dementia (FTD) patients would fail to attend to nonverbal cues in sarcasm, while semantic dementia (SD) patients and ADs would correctly focus on nonverbal cues because of diminished verbal comprehension.

Participants and Methods : Sixty - eight subjects (20 FTD, 11 SD, 16 AD, 21 healthy older controls [NC]) underwent The Awareness of Social Inference Test (TASIT) Part 2, in which actors communicate sincerely, using simple (exaggerated) sarcasm, or using paradoxical (subtle) sarcasm. Subjects' comprehension of each vignette was probed by standardized questions.

Results : Controlling for age, sex, and education, all patient groups showed normal comprehension of sincere communication, and SDs actually performed better than controls (SDs: 17.5 +/- 1.3; NCs: 15.2 +/- 3.9; $p=n.s.$). However, SDs patients were severely impaired comprehending both subtle (SDs: 7.4 +/- 3.8; NCs: 16.0 +/- 4.7) ($p < 0.005$), and exaggerated sarcasm (SDs: 10.0 +/- 3.0; NC: 17.4 +/- 4.7) ($p < 0.0001$). FTDs were impaired reading subtle sarcasm (12.5 +/- 5.6), but not exaggerated sarcasm. ADs performed normally on all tasks.

Conclusions : Thus, despite known language deficits, SDs accurately followed the semantic content of each communication yet failed to attend to nonverbal cues. This suggests their realistic emotion comprehension may be even worse than FTDs, who can recognize exaggerated nonverbal cues. Conversely, ADs, who show emotion recognition deficits with static facial pictures, interpret more realistic nonverbal communications accurately.

Correspondence: *Danijela Pavlic, BA, Memory and Aging Center, UCSF, 350 Parnassus suite 706, San Francisco, CA 94117. E-mail: dpavlic@memory.ucsf.edu*

B.J. RAUDABAUGH, B.L. MILLER, J.H. KRAMER, D.L. DEAN, C. HALABI & K.P. RANKIN. Right Temporal Lobe Volume Predicts Empathy in Dementia.

Objective: Recent studies have illustrated that patients with frontotemporal dementia (FTD) or semantic dementia (SD) have lower levels of empathy than normal controls and Alzheimer's disease (AD) patients. This suggests that empathy is mediated by the brain regions most affected by these diseases, specifically temporal and frontal structures. We hypothesized that reduced empathy would correlate with decreased lobar volume in these regions.

Participants and Methods : First-degree relatives rated subjects' empathy using the Interpersonal Reactivity Index (IRI) questionnaire. Fifty-eight subjects were included (17 FTD, 15 AD, 14 SD, 8 corticobasal degeneration [CBD] or progressive supranuclear palsy [PSP], and 4 primary progressive aphasia [PPA] patients). The Empathic Concern, Perspective Taking, and Fantasy subscales of the IRI were averaged together to yield a composite empathy score for each subject. Patients underwent T1-weighted structural MRI imaging. Total lobar volumes were calculated using the BRAINS2 software package and an automated Talairach-based method of regional classification, then were normalized for total intracranial volume. To account for high intercorrelations among lobar volumes, a backwards regression procedure was performed including right and left frontal, temporal, and parietal volumes and controlling for age, sex, and education.

Results : A significant model ($p < 0.001$) including right temporal ($p < 0.001$) and right parietal ($p < 0.05$) lobar volumes and sex ($p < 0.10$) predicted 26% of the variance in empathy score. No other brain volumes or confounds remained significant predictors of empathy.

Conclusions : These data suggest that empathy may be primarily mediated by right temporal and, to a lesser degree, right parietal structures, while the contribution of the frontal lobes may be less central.

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*

R. WELDON, B.L. MILLER, J.H. KRAMER, S. GLENN, C.M. STANLEY, S. ALLISON & K.P. RANKIN. Structures in Right and Left Frontal Lobes Mediate Social Dominance.

Objective: The capacity to exert social dominance is a complex interpersonal behavior that requires individuals to negotiate their desires in an assertive manner without alienating others. Self- and other-awareness and executive skills are likely involved. Research indicates that while patients with Semantic Dementia (SD) and Alzheimer's Disease (AD) show mild dominance loss, Frontotemporal Dementia (FTD) causes drastic decreases in dominance. While this suggests that this personality trait may be mediated by frontal lobe structures, the neuroanatomic origins of dominance have not yet been explored.

Participants and Methods : First-degree relatives rated 64 patients (20 FTD, 9 SD, 7 progressive aphasia, 25 AD, 8 progressive supranuclear palsy, 4 corticobasal degeneration) using the Social Power (SP) questionnaire, a psychometrically validated measure of the tendency to exert interpersonal dominance. Structural T1-weighted MRIs were obtained on all subjects. Voxel-based morphometry was performed using SPM-2 software to determine which brain areas correlated significantly with SP score. Correction for multiple comparisons was performed using a mask that included bilateral parietal, temporal, and frontal volumes.

Results : Areas significantly predicted by SP score, controlling for age and sex, included the left middle frontal gyrus (-22, 41, 29) ($p < 0.05$ corrected), the right dorsolateral frontal areas corresponding to BA 44/45 (49, 17, 4) ($p < 0.10$ corrected, $p < 0.0001$ uncorrected), the right middle frontal gyrus (35, 59, 10) ($p < 0.0001$ uncorrected), and the right superior frontal gyrus (25, 47, 22) ($p < 0.0001$ uncorrected).

Conclusions : These data suggest that specific dorsomedial and lateral frontal regions mediate the tendency to exert dominance in interpersonal settings, and that social dominance may involve self-awareness, perspective taking, and executive skills.

Correspondence: *Rebecca Weldon, BA, neurology, Memory and Aging Center, UCSF, 350 Parnassus, Suite 706, Box 1207, San Francisco, CA 94117. E-mail: bweldon@memory.ucsf.edu*

L.J. JULIAN, D. CAHN-WEINER, J.H. KRAMER, B.R. REED, D. MUNGAS & H.C. CHUI. Hypertension is Associated with MRI Markers of Cerebrovascular Disease and Course of Cognitive Functioning and Depression.

Objective: Risk factors for cerebrovascular disease (CVD) are associated with the onset of dementia. In this investigation, we evaluated hypertension (HTN) status as a predictor of baseline MRI markers and the course of cognitive functioning and depression in a cohort of older adults evaluated at 5 consecutive time points.

Participants and Methods : Participants included 49 non-demented individuals enrolled in a longitudinal multi-center study of aging and CVD (mean age 73.9 ± 6.9 , 57% male). Cognitive measures included Dementia Rating Scale (DRS), phonemic fluency, semantic fluency,

Boston Naming Test (BNT), and Memory Assessment Scales (MAS). Depressive symptoms were evaluated by interview and classified by factor analysis into Motivational/ Somatic and Cognitive symptom factors. MRI measures included volume of white matter signal hyperintensities (WMSH).

Results : Fifty-nine percent ($n=29$) met criteria for HTN at baseline (systolic ≥ 140). Repeated measures ANOVAs revealed significant between-subjects effects across HTN status on longitudinal outcomes over 5 time points (mean interval = 15.5 ± 3.77 months) in phonemic ($p < .01, \eta^2 = .16$) and semantic fluency ($p < .01, \eta^2 = .18$), DRS Total ($p < .01, \eta^2 = .15$), DRS Initiation/ Perseveration ($p < .05, \eta^2 = .12$), DRS Conceptualization ($p < .05, \eta^2 = .09$), BNT ($p < .01, \eta^2 = .15$), and motivational/ somatic depressive symptoms ($p < .05, \eta^2 = .15$). Finally, at baseline, ANOVAs revealed significant differences on volume of WMSH ($p < .01$).

Conclusions : HTN at baseline predicted cognitive functioning and some depressive symptoms over time. Furthermore, HTN was associated with baseline MRI markers of CVD. These findings warrant further study of CVD risk factors and prevention among older adults.

Correspondence: *Laura J. Julian, Ph.D., Medicine, University of California San Francisco, 4150 Clement Street, (116S - Building 9R), San Francisco, CA 94121. E-mail: ljulian@itsa.ucsf.edu*

L. DELANO-WOOD, A. BOZOKI & N. ABELES. Evidence for Heterogeneity in Mild Cognitive Impairment (MCI): Differences in Neuropsychological Profile and Associated White Matter Lesion Pathology.

Objective: Since Alzheimer's disease (AD) and vascular dementia (VaD) are associated with considerable morbidity and mortality, elucidating early, pre-clinical manifestations of these dementia syndromes is essential. This study investigated Mild Cognitive Impairment (MCI), a clinical construct comprising at-risk individuals for dementia, to examine whether distinct neuropsychological profiles can be delineated as well as to investigate the contribution of white matter lesions (WML) to associated cognitive impairment.

Participants and Methods : A clinical sample of 80 older adults diagnosed with MCI were assessed using neuropsychological test scores as well as structural MRI. WML was measured using a semi-automated volumetric approach (Pixel Thresholding) with T2-weighted FLAIR images. Cluster, discriminant, and ANOVA analyses were conducted to assess whether distinct groups existed with the sample based on cognitive scores. Regression analyses were performed to determine the effect of lesion type (deep white matter (DWML) vs. periventricular (PVL)) on neuropsychological performance.

Results : Three distinct groups exhibiting different neuropsychological profiles (amnestic, subcortical, and mixed) were formed based on neu-

ropsychological scores. Results showed that each group differed with respect to white matter lesion load, with the subcortical group demonstrating the highest level of WML pathology. While both types of lesions were associated with greater cognitive impairment, the strongest effect was found for DWML ($p < 0.01$).

Conclusions : Findings suggest that distinct neuropsychological profiles exist within MCI and that these profiles differ over levels of WML. While both types of lesions were associated with greater cognitive impairment, the strongest effect was found for DWML, likely due to frontal-subcortical circuitry disruption.

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*

Other (Please Specify):

C.L. BURTON, D. BUNCE, D.F. HULTSCH, E. STRAUSS & M.A. HUNTER. Instrumental Activities of Daily Living and Everyday Problem Solving in Older Adults with Mild Cognitive Impairment.

Objective: Although the concept of mild cognitive impairment (MCI) has received much attention, there has been little consensus with respect to the terms and criteria used to define this state. However, a general set of criteria for diagnosing MCI were recently proposed by a multidisciplinary group of experts who met at an international symposium on MCI (Winblad et al., 2004), with one of the proposed criteria requiring preserved basic activities of daily living (ADLs) and minimal impairment in complex instrumental activities of daily living (IADLs). The purpose of this study was to investigate whether older adults with MCI classified according to the 3 subtypes identified by the Working Group (i.e., amnesic, single nonmemory domain, multiple domain with or without a memory component,) differed from cognitively intact older adults on a variety of measures indexing functional abilities obtained 2 years later.

Participants and Methods : Two hundred and fifty-five community dwelling older adults, ranging in age from 64 to 90, completed self-report and everyday problem solving measures indexing IADLs. Ratings of participants' IADL functioning were also obtained from informants (e.g., spouse, adult child, friend).

Results : In general, older adults with deficits in multiple cognitive domains demonstrated poorer IADL functioning than cognitively intact older adults and older adults with deficits in only one cognitive domain.

Conclusions : These results suggest that individuals with multidomain MCI are most likely to experience changes in complex everyday life activities.

Correspondence: *Catherine L. Burton, M.A., Psychology, University of Victoria, PO Box 3050 STN CSC, Victoria, BC V8W 3P5, Canada. E-mail: clburton@uvic.ca*

Paper Session 3

9:00–10:30 a.m.

Disorders of Childhood

L. EWING-COBBS, M.R. PRASAD, P.R. SWANK, M. BARNES & X. ZHANG. Long-Term Intellectual and Academic Outcomes Following Inflicted and Noninflicted Traumatic Brain Injury Sustained During Early Childhood.

Objective: To characterize the outcomes of children who sustained moderate to severe inflicted and noninflicted traumatic brain injury (TBI) prior to six years of age in terms of performance in intelligence and academic domains evaluated five years after injury.

Participants and Methods : Children sustaining inflicted and noninflicted TBI (n=23) between the ages of 4 and 71 months were enrolled in a prospective, longitudinal study. Mean age at injury was 21 months; mean age at assessment was 89 months. The Stanford-Binet Intelligence Scale: IV, Woodcock-Johnson III Tests of Achievement, and Gray Oral Reading Tests-4 were administered. Age-based standard scores from the TBI groups and a community comparison group (n=21) were compared using ANOVA; a priori contrasts examined performance of the two TBI groups and the combined TBI group relative to comparison children.

Results : The IQ and achievement scores of children in the inflicted and noninflicted TBI groups were comparable. Children with TBI scored significantly lower than the comparison group in all domains: 1) IQ: composite score, pattern analysis, and memory for sentences subtests, all p values <.0393; 2) Reading: word identification, comprehension, accuracy, and fluency, all p<.0401; 3) Math: calculation, applied problems, and fluency, all p<.0160; and 4) Language: oral comprehension, spelling, and writing fluency, all p<.0071. Outcome scores were significantly correlated with the lowest post-resuscitation Glasgow Coma Scale score. Forty-eight percent of the children with TBI had IQ scores below 80 and 30 percent had failed a grade.

Conclusions : Both inflicted and noninflicted TBI sustained early in life have significant and persistent consequences for the development of intellectual and academic functions and deleterious effects on academic performance. Supported by R01-NS029462.

Correspondence: *Linda Ewing-Cobbs, PhD, Pediatrics, University of Texas Health Science Center at Houston, 7000 Fannin, Suite 2401, Houston, TX 77030. E-mail: linda.ewing-cobbs@uth.tmc.edu*

J.R. WOZNIAK, P. CHANG, B. MUELLER, R. MUETZEL, G. MAUREN & K. LIM. Diffusion Tensor Imaging (DTI) in Sub-Threshold Fetal Alcohol Syndrome: Evidence for Microstructural Brain Abnormalities and Associated Neurocognitive and Behavioral Deficits.

Objective: Heavy prenatal alcohol exposure is known to be associated with gross structural brain abnormalities as well as severe neurocognitive deficits and behavioral disturbances. We examined the effects in milder cases of sub-threshold Fetal Alcohol Syndrome (FAS).

Participants and Methods : We studied 13 control subjects and 14 patients with Alcohol Related Neurodevelopmental Disorder (ARND). Subjects, who were ages 10 to 14, underwent neurocognitive evaluations and MRI scans including Diffusion Tensor Imaging (DTI). Group differences in brain macrostructure and microstructure were examined and tested for associations with neurocognitive and behavioral variables.

Results : ARND subjects performed below controls on most cognitive measures. There was a strong trend toward smaller brain volume in the ARND group (p=.06, effect size=.7) and brain volume was correlated significantly with full-scale IQ across subjects (r=.57, p=.002). DTI showed that the ARND subjects had significantly greater mean diffu-

sivity (MD) in the isthmus of the corpus callosum than controls (p=.02, effect size=.87), suggesting microstructural abnormalities in this region. There were no group differences in other regions of corpus callosum. MD in the isthmus was correlated with both a neurocognitive measure and parent-report measure of impulse control: Test of Variables of Attention (TOVA) commissions (r=-.45, p=.03) and Behavior Rating Inventory of Executive Functioning (BRIEF) inhibition (r=.46, p=.02).

Conclusions : Results indicate that sub-threshold Fetal Alcohol Syndrome is associated with microstructural abnormalities in the corpus callosum and that these abnormalities are correlated with neurocognitive and behavioral status in children. The results will be discussed in the context of a large clinical fetal alcohol dataset (n=315).

Correspondence: *Jeffrey R. Wozniak, Ph.D., Psychiatry, Univ. of Minnesota, F256/2B West, 2450 Riverside Ave., Minneapolis, MN 55454. E-mail: jwozniak@umn.edu*

K. MILLAR, J. ASBURY, A. BOWMAN, M. HOSEY, T. MUSIELLO & R.R. WELBURY. Impairment of Children's Cognitive Function after Anesthesia.

Objective: Children who undergo general anesthesia (GA) show behavioral and affective disturbances that last several weeks. However, the effect of GA upon post-operative cognitive function is unknown. The omission contrasts with research showing adult cognition to be impaired for hours, and even days, after GA. The matter is of practical significance because of the increasing use of day-case anesthesia where patients are discharged home only hours after recovering from an anesthetic. The study reports the use of objective tests of cognition to assess children during recovery from GA, and when discharged home.

Participants and Methods : The prospective study recruited 53 children aged 5 to 10 years having dental extractions under GA (isoflurane/N₂O), and 55 control children. Assessment was by validated tests of choice reaction time (CRT), attention, perceptual-motor co-ordination, memory and behavioral disturbance. Cognition and psychological morbidity were assessed prior to GA, post-operatively before discharge, and at 48 hours at home.

Results : CRT, perceptual-motor co-ordination and attention were significantly impaired post-operatively, but recovered to pre-operative levels at 48 hours. Explicit memory for stimuli presented prior to anesthesia was very poor, indicating a strong retrograde amnesic effect. Implicit memory scores were significantly better, and similar to those of control children. There was no significant psychological morbidity.

Conclusions : It is concluded that the profile of pediatric cognitive recovery is similar to that of adults. However, whilst average impairment resolved within 48 hours, a proportion of children continued to suffer residual effects. There may be implications for safety and well being in the aftermath of day-case GA for children.

Correspondence: *Keith Millar, PhD, Psychological Medicine, University of Glasgow, Gartnavel Royal Hospital, 1055 Great Western Road, Glasgow G12 0XH, United Kingdom. E-mail: k.millar@clinmed.gla.ac.uk*

D.J. SCHRETLEN, L.R. KINGERY, S.M. MEYER, H.A. JINNAH, Y. MUSHTAQ, C.H. KUZU & J.C. HARRIS. Quantitative Structural Brain Abnormalities in Lesch-Nyhan Disease and Its Variants.

Objective: Lesch-Nyhan disease (LND) is a rare neurogenetic disorder that involves the near absence of an enzyme (hypoxanthine phosphoribosyltransferase, or HPRT) required for purine metabolism. Patients with LND demonstrate compulsive self-injury, neurological abnormalities, and intellectual disability. An early autopsy study revealed striatal dopamine depletion, and subsequent neuroimaging studies have focused on the basal ganglia. However, the clinical phenotype of LND cannot be fully explained by striatal abnormalities alone. In this study, we examined neuroanatomic abnormalities in patients with LND and partial HPRT-deficient variants (LNV) using voxel-based morphometry.

Participants and Methods : Nine patients with LND, 9 patients with LND, and 7 healthy controls underwent brain magnetic resonance imaging at 1.5T. We acquired 124 contiguous T1-weighted SPGR images. These were spatially normalized to a standard template, re-sliced into 1.5mm isotropic voxels, partitioned into gray and white matter segments, and smoothed using a 12mm FWHM kernel. We then used analyses of covariance to compare gray, white, total cerebral, and total intracranial volumes across groups.

Results : Patients with LND showed reduced volume of all tissue segments and their total intracranial volumes compared to healthy controls (all p s < .01), while those with LNV showed volumes that were intermediate between the other two groups. Voxel-based morphometry confirmed previous reports of reduced striatal volume, but also revealed more widespread gray and white matter changes.

Conclusions : These findings confirm previous reports of striatal abnormality in LND, but also reveal dramatic and unexpected white matter changes that could fundamentally alter the pathophysiological investigation of LND.

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*

Poster Session 7 /9:00–10:30 a.m.

Aneurysms

B.J. DIAMOND & J. DELUCA. Spatial Discrimination, Memory and Executive Function in Anterior Communicating Artery Aneurysm.

Objective: The goal of this study was to determine the relationships between spatial context memory, executive function, and visual-verbal memory in Anterior Communicating Artery Aneurysm (ACoA).

Participants and Methods : Twenty patients ($M = 56.5$ years of age, $SD = 8.4$) were given a Spatial Memory Test (SMT) that measured word-list learning and recognition; and recall for words and objects and their locations within a 49-square grid.

Results : Greater executive impairment (i.e., lower word fluency and a higher number of perseverations on the WCST) predicted less accurate spatial discrimination (i.e., spatial proximity measure) ($Z = -2.039$, $p = .04$). While level of executive functioning did not predict recognition or recall on Trial 1 of a multiple word-list learning condition, patients with greater executive impairment recalled fewer words on the last recall trial. On the Short-Delay Free Recall condition of the CVLT, individuals with better spatial discrimination recalled a greater number of words ($Z = -2.39$, $p = .017$).

Conclusions : Taken together, levels of executive functioning did not predict recognition or recall on Trial 1 of a word-list learning task. However, better executive function was associated with better spatial context discrimination, word-list learning and short-delay free recall. Basal forebrain (BF) damage, often implicated in ACoA aneurysm may underlie these impairments. Future work should examine contrasts and similarities between BF and non-BF, frontally-mediated impairments in spatial memory and verbal learning/memory, in order to determine if BF amnesia is associated with a distinct impairment profile.

Correspondence: *Bruce J. Diamond, Ph.D., Psychology, William Paterson University, Box 43592, Upper Montclair, NJ 07043. E-mail: diamondb@wpunj.edu*

A.J. HRICIK, C.M. BENDER & P.R. SHERWOOD. Trajectories of Cognitive Function over the First Year Following Subarachnoid Hemorrhage.

Objective: The purpose of this study was to examine changes in cognitive function at 3 and 12 months following aneurysmal SAH.

Participants and Methods : A total of 14 patients admitted to a neurovascular ICU following aneurysmal SAH (Hunt and Hess ≥ 3 and/or Fisher ≥ 2) underwent a comprehensive neuropsychological assessment at 3 and 12 months following discharge. Wilcoxon Signed Ranks tests were performed to evaluate change over time.

Results : Learning and memory domains of cognitive function were measured using the Rey Complex Figure Test (RCFT; Immediate and Delayed recall) and the Wechsler Logical Memory Test. Immediate ($p < .01$) and delayed recall ($p < .01$) scores on the RCFT improved over time. Delayed Logical Memory scores were significantly better over time for story B ($p = .02$) and near significant improvement was found for story A ($p = .06$). The second immediate score for story B also improved over time ($p = .02$). Executive function was measured with the Stroop Color Word Test. Color t-scores improved at the 12 month time point ($p = .04$). There were no significant changes over time in measures of attention, language, psychomotor speed, and visuospatial abilities.

Conclusions : The findings of this pilot study suggests that visual and verbal memory as well as executive function improve during 12 months post-aneurysmal SAH. Knowing the specific cognitive domains that improve overtime can play an influential role in the development of rehabilitative interventions.

Correspondence: *Allison J. Hricik, MS, School of Nursing, University of Pittsburgh, 3500 Victoria St., 336 Victoria Bldg., Pittsburgh, PA 15261. E-mail: ahdog33@hotmail.com*

M. VAN ZANDVOORT, C. BUIJTENHUIS, G. NYS & G. RINKEL. Cognitive sequelae of subarachnoid haemorrhage in the long term.

Objective: Patients with a ruptured intracranial aneurysm (SAH) often suffer from cognitive deficits despite good neurological outcome. In this study the neuropsychological profile in SAH in the long term is assessed and related to subjective complaints and medical measures in the early stage in order to find possible associates for long term cognitive outcome.

Participants and Methods : Twenty-six patients (aged: 50.8 (sd:10.8)) with a SAH 4-5 years ago with good neurological outcome and living independently at home, were compared to age, sex and education matched healthy controls ($n=44$) on a comprehensive neuropsychological test battery (language, visuospatial and verbal memory, attention, executive functioning, language). In addition, cognitive and emotional complaints, as well as medical measures (e.g. SAH severity, temporal horn enlargement) were registered.

Results : Fifty percent of the patients experienced a decrease in overall cognitive functioning, 30% in perception, 35% in memory, and 48% in emotional well-being. Patients had an overall decrease in cognitive functioning ($p < 0.05$), in which only verbal and visual memory were significantly impaired ($p < 0.05$). More surprisingly, there was a clear dichotomy with respect to cognitive outcome, that is, 2 out of 3 SAH patients had good cognitive outcome (0-1 impaired task performance), whereas 1 in every 3 patients was severely impaired with verbal learning and visuospatial memory as the most affected domains.

Conclusions : This is the first study that describes this dichotomy with respect to cognitive outcome SAH patients with good neurological outcome. This dichotomy might underlie the difference with respect to reported neuropsychological sequels of SAH in literature. These findings will be discussed with underlying hippocampal dysfunction as result of temporal horn enlargement due to hydrocephalus in the early stage as hypothesis and as possible associate for cognitive outcome.

Correspondence: *Martine J. Van Zandvoort, Ph.D., Helmholtz Instituut, Utrecht University, Van Unnikgebouw, Heidelberglaan 2, Utrecht NL-3584 SC, Netherlands. E-mail: m.vanzandvoort@fss.uu.nl*

Electrophysiology/EEG/ERP

J. MOYLE, A. FOX, M. BYNEVELT, M. ARTHUR & J. BURNETT. Event-Related Potentials in Adults with Phenylketonuria.

Objective: Phenylketonuria (PKU) is an autosomal recessive disorder of phenylalanine metabolism that if untreated leads to severe cognitive difficulties and structural brain damage. Early dietary therapy prevents the global cognitive impairments, however, diet-treated patients still experience cognitive and neurophysiological abnormalities. Specifically, deficits in sustained attention and response inhibition are observed in adults with PKU. The event-related potential (ERP) permits the detection of changes in cortical activity related to sensory and cognitive processes, which is not possible through examining behavioural outcomes. This study used ERPs to examine attentional and inhibitory differences between early-treated PKU adults and matched controls.

Participants and Methods : Electroencephalogram scalp recordings, used to derive ERPs, were recorded from eighteen participants (PKU n=9; control n=9) while they completed a visual Go-Nogo task. Frontocentral and parieto-occipital sites were examined.

Results : No behavioural differences were found between the two groups. Despite the absence of behavioural differences, repeated measures ANOVA revealed the PKU group had significantly decreased P1 and N1 peak amplitudes at occipital and parieto-occipital sites in both Go and Nogo conditions and reduced fronto-central Nogo-N2 amplitude compared to the control group (all $p < 0.05$).

Conclusions : These findings provide neurophysiological evidence for a specific reduction in both early visual processing and attentional abilities in the PKU group. Furthermore, the reduced Nogo-N2 suggests impairment of an inhibitory process in the PKU group. Our results underscore the merit of using ERPs when examining cognitive processes in small samples; being a sensitive measure of the underlying neural functioning that may not be observed in the gross overt behavioural measures.

Correspondence: *Jonson Moyle, Psychology, University of Western Australia, 35 Stirling Hwy, Crawley, Perth, WA 6008, Australia. E-mail: jmoyle@student.uwa.edu.au*

Imaging: Functional

B.J. NAGEL, A.D. SCHWEINSBURG, K. CUMMINS, L.T. EYLER & S.F. TAPERT. The Unique Influences of Age and Task Performance on fMRI Response to Visual Working Memory Across Early Adolescent Development.

Objective: Across adolescence, there are differences in neural activation during working memory tasks. However, the interpretation of age-related brain response patterns is often confounded by improvements in working memory performance, making it difficult to disentangle developmental influences on working memory brain response. The current study examined brain response to a functional magnetic resonance imaging (fMRI) task of visual working memory (VWM) among adolescents and its relationships to the independent influences of age and task performance.

Participants and Methods : Participants were 28 right-handed 12- to 14-year-old typically developing adolescents. Each teen underwent fMRI during a VWM task with two working memory load conditions. Using residuals, regression analyses examined the unique influences of age and task performance on VWM fMRI response.

Results : Performance on the high-load condition of the VWM task improved, while lower working memory load performance remained stable across this age range. After parceling out its relationship with performance, adolescent age was uniquely associated with less brain response

to the high-load condition in left precentral gyrus (BA 6). After removing shared variance with age, better performance on the high-load condition was independently associated with greater brain response in right dorsolateral prefrontal cortex (DLPFC) and anterior cingulate and in bilateral cingulate gyrus.

Conclusions : These results demonstrate that both task performance and age exert independent influences on VWM brain response across early adolescence. Similar to adults, these findings provide support for the role of the DLPFC in high-load working memory performance and point to the importance of examining task performance in developmental imaging studies.

Correspondence: *Bonnie J. Nagel, Ph.D., Psychiatry, University of California San Diego, 3350 La Jolla Village Drive, 151-B, San Diego, CA 92161. E-mail: bnagel@ucsd.edu*

S. RIMRODT, A. CLEMENTS, J.R. ABEL & L.E. CUTTING. fMRI of Word Frequency and Words in Sentential Context in Children with Reading Disability.

Objective: Children with reading disability (RD) have been shown to exhibit different functional magnetic resonance imaging (fMRI) activation patterns than controls during single-word and nonword reading. Less is known about activation patterns associated with differences in word frequency or about reading words in sentential context in children with RD.

Participants and Methods : Preliminary fMRI data from eleven 10-13 year old children reading nonwords, high-frequency and low-frequency words was analyzed in two fixed-effects models (RD n=6; control n=5). Additionally, data from nineteen 9-14 year old children reading blocks of single-words and blocks of words that form sentences was analyzed in a two-step random-effects analysis contrasting reading sentences to reading words in RD (n=10) versus controls (n=9).

Results : The first analysis suggests that, compared to controls, activation in children with RD is similar to controls for high-frequency words but different for low-frequency words, including greater bilateral frontal and parietal lobe activations. It also suggests fewer activation differences between nonwords and low-frequency words in RD than controls. This could reflect less familiarity with low-frequency words in RD so that processing is similar to nonwords. The second analysis showed greater activation among children with RD than controls, including right anterior cingulate and left middle frontal gyrus activations.

Conclusions : In summary, we present additional evidence suggesting that children with RD activate the brain differently than controls when reading single-words, but also when reading sentences even after accounting for activation due to single-words; this suggests that children with RD may have deficits beyond those identified at the word-level.

Correspondence: *Sheryl Rimrodt, M.D., Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205. E-mail: rimrodt@kennedykrieger.org*

J.L. STRICKER, S.P. DRUMMOND, L.A. WETHERELL & G.G. BROWN. Compensation in Action: Networks of Activation Differ in Sleep Deprived and Well-Rested Participants.

Objective: Examine differences in activation networks during verbal encoding in sleep deprived and well-rested individuals by applying structural equation modeling (SEM) to fMRI data.

Participants and Methods : Participants (23 normal controls (10F), age 24.0 ± 4.8 yrs) memorized words either easy or difficult to recall during fMRI scanning after 12 (well-rested) and 36 hours (sleep deprived) awake. Based upon our previous work, regions of interest (ROIs) were defined prior to data analyses: left and right prefrontal cortex, (LPFC & RPFC) left inferior parietal lobule (LIPL) and left superior parietal lobule (LSPL). SEM was applied to covariance matrices produced by extracting peak activation values for each individual from each ROI.

Results : Models were evaluated which linked the specified ROIs. Excellent model fits were obtained in well-rested individuals for both word types and in sleep deprived individuals for difficult words ($\chi^2 < 1.0$, $p > 0.3$; AIC < -1.0 , RMSEA < 0.001), but a poor model fit was obtained for easy words while sleep deprived ($\chi^2 = 6.99$, $p < 0.01$; AIC = 4.99; RMSEA = 0.56). The importance of specific connections was tested for the good-fit models. For well-rested participants, removing the RPF - LPFC connection produced a poor overall model fit while removing the RPF - LSPL connection did not affect the models. After sleep deprivation, the opposite pattern was observed.

Conclusions : These results demonstrate the importance of interactions between the left and right PFC during verbal encoding and illustrate a process of compensation while sleep deprived where the dominant RPF interaction changes from LPFC to LSPL.

Correspondence: *John L. Stricker, Ph.D., San Diego Veterans Health-care System, 3350 La Jolla Village Drive, Building 13 Mailcode 151c, San Diego, CA 92161. E-mail: jstricker@ucsd.edu*

J. MATTHES, L. BAXTER, F. GONZALEZ & T. SCHULER. Cognitive Outcome Following Brain Tumor Surgery: The Role of Pathology and fMRI Activation.

Objective: Functional Magnetic Resonance Imaging (fMRI) is a tool used by neurosurgeons to determine potential functional outcome and to help determine possible surgical approaches. The purpose of this study is to 1) evaluate whether tumor type (low-grade versus high-grade) influences pattern of activation on fMRI due to differences in tumor vascularization, and 2) to examine whether the proximity of activation (with-in or adjacent to the tumor) influences functional outcome.

Participants and Methods : fMRI data, tumor pathology, and functional outcome were available on 9 patients. Five of the patients had low-grade tumors (2 males, 3 females, age range = 28-37). Four patients had high-grade tumors (2 males, 2 females, age range = 32-69). Participants underwent language and/or motor function tasks. Functional outcome was coded from follow-up neurosurgical evaluations

Results : Of the low-grade patients 3 showed activation adjacent to the tumor bed, 2 showed activation within the tumor bed. Of the high-grade tumor patients, 1 had activation adjacent to the tumor bed, 2 showed activation within the tumor. One high-grade patient showed no activation. Following tumor resection, 2 patients with activation adjacent to the tumor showed no functional change, 2 had functional decline. Three high-grade patients with activation within the tumor bed showed no functional change, one had functional decline.

Conclusions : Preliminary results of this study suggest tumor type did not impact whether activation occurred within the tumor bed, and that the location of activation (adjacent to or within the tumor) did not appear to affect functional outcome following surgery. Further investigation, with additional subjects, is underway.

Correspondence: *Jessica Matthes, Ph.D., Barrow Neurological Institute, 222 W. Thomas Rd., Phoenix, AZ 85013. E-mail: jessica.matthes@chuw.edu*

M. O'CONNOR, M.N. PAVULURI, S. ARYAL, E. HARRAL & J. SWEENEY. An fMRI Study of the Interface Between Affective and Cognitive Circuitry in Pediatric Bipolar Disorder.

Objective: Pediatric bipolar disorder (PBD) is associated with affective dysregulation and cognitive dysfunction. The current study investigated the impact of emotion on cognitive function using cognitive and emotional tasks during an fMRI paradigm. We hypothesized that in PBD subjects emotional stimulation would lead to over activation of affective circuitry, reduced activation of cognitive systems, and would negatively impact performance on a cognitive task.

Participants and Methods : fMRI data was collected during an affective Stroop task with negative, positive and neutral word conditions.

Participants were ten unmedicated euthymic PBD Type I subjects and ten healthy controls matched on age and IQ. fMRI data was collected in a 3T scanner and data was processed using FIASCO and AFNI softwares. Average group Tmaps, average percent signal change maps, and group difference maps were calculated.

Results : Analysis revealed that PBD subjects displayed significantly increased activation in the amygdala, ventral anterior cingulate gyrus, and insula during the negative word condition compared to controls. In contrast, controls displayed increased activation in the posterior cingulate gyrus and DLPFC. In the positive word condition, PBD patients displayed activation in the nucleus accumbens while controls displayed activation in the DLPFC, posterior cingulate gyrus, and putamen. PBD subjects performed significantly worse across all word conditions compared to control subjects (negative $p=.045$; positive $p=.032$; neutral $p=.024$), and demonstrated longer response latencies, although this was not statistically significant ($p > .05$).

Conclusions : Our findings suggest that affectively laden words results in over activation of affective circuitry and compromises cognitive systems in PBD subjects. These findings have direct clinical implications, suggesting that emotional disturbances may contribute to cognitive deficits in PBD.

Correspondence: *Megan O'Connor, Ph.D., Psychiatry, University of Illinois at Chicago, Neuropsychiatric Institute, 912 S. Wood St., Suite 227, Chicago, IL 60612. E-mail: mmconnor@psych.uic.edu*

W.S. HOUSTON, M.W. BONDI, D. HAN, A.J. JAK, L.T. EYLER & G.G. BROWN. Correlation Maps of APOE Gene Dose by Brain Response During Learning.

Objective: Utilization of gene dose by brain response correlational maps may yield spatially coherent BOLD activation patterns and identify possible genetic sources of variation in BOLD response among at-risk groups. We combined fMRI datasets from two different encoding tasks of nondemented older adults to explore possible genetic influences involved in learning.

Participants and Methods : Two fMRI datasets of encoding were combined to obtain a sample of 46 nondemented older adults. Twenty-two individuals (10 $\epsilon 3/\epsilon 3$; 8 $\epsilon 3/\epsilon 4$; 4 $\epsilon 4/\epsilon 4$) completed a picture-encoding paradigm, and 24 individuals (14 $\epsilon 3/\epsilon 3$; 10 $\epsilon 3/\epsilon 4$) completed a verbal paired-associate encoding task. Demographic and cognitive variables did not differ across APOE allelic types, nor did recognition and cued-recall, respectively, of the items presented during learning. Anatomical MR images and whole brain EPI sequences were collected and analyzed with AFNI. The contrast common to both datasets was novel items vs. a baseline condition.

Results : Whole brain maps between APOE $\epsilon 4$ gene dose (coded as 0, 1, or 2) and BOLD response during encoding showed several regions of high correlation including the medial frontal gyrus, medial temporal lobes, and right posterior cingulate/precuneus. In each region, greater BOLD response during learning was associated with a larger APOE $\epsilon 4$ gene dose.

Conclusions : The results implicate genetic sources of variation in brain response during learning. The spatial coherence of the results also shows that maps displaying correlations of genetic information with brain activity can underscore possible interactions between brain regions and stimulate hypotheses about functional connectivity.

Correspondence: *Wes S. Houston, Ph.D., Department of Neurology, University of Iowa, 200 Hawkins Drive, 2007 RCP, Iowa City, IA 52242-1053. E-mail: wes-houston@uiowa.edu*

M.M. MACHULDA, M.L. SENJEM, B.J. BOROWSKI, G.E. SMITH, R.J. IVNIK, B.F. BOEVE, D.S. KNOPMAN, R.C. PETERSEN & C.R. JACK, JR. An fMRI Study of Endogenous Spatial Orienting in Normal Aging and Amnesic Mild Cognitive Impairment.

Objective: The ability to shift attention slows with aging, and difficulties with cognitive flexibility are even more apparent in the early

stages of cortical neurodegenerative conditions. Several functional imaging studies demonstrate that a frontal-parietal network is activated while young subjects perform cued attention tasks. Less is known about the effects of aging and early neurodegenerative conditions on fMRI response to cued attention. The aim of this study was to examine fMRI activation during endogenously cued covert shifts of attention in normal elderly and individuals with amnesic mild cognitive impairment (MCI).

Participants and Methods : We studied 14 normal elderly (9M/5F; mean 71, range 59-86) and 14 patients with amnesic MCI (6M/8F; mean 74, range 63-88) using a block-design paradigm on a 3.0T scanner. For the cued condition, a unidirectional arrow correctly indicated the location of the target in 75% of the trials. A nondirectional cue was used for the control condition.

Results : Comparison of endogenous cuing to the control condition revealed bilateral activation in the precuneus, right premotor cortex, right inferior frontal gyrus, and right superior temporal gyrus in normal elderly. In the MCI group, the precuneus (bilaterally, right > left) and right middle occipital lobe were activated. Visual inspection of group maps showed larger volumes of activation in the precuneus and right premotor cortex in the normal elderly relative to the MCI group. A two-sample t-test revealed greater activation in the right inferior frontal lobe and right superior temporal gyrus in normal elderly relative to MCI, but these clusters were not statistically significant (uncorrected $p < .005$).

Conclusions : Normal elderly activated a frontal-parietal network during an endogenously cued attention task that is comparable to the pattern reported in young adults while activation in the MCI group was primarily in posterior brain regions. Results suggest dysfunction beyond the medial temporal lobe in amnesic MCI.

Correspondence: *Mary M. Machulda, Ph.D., Psychiatry and Psychology, Mayo Clinic, 200 1st Street SW, Rochester, MN MN. E-mail: machulda.mary@mayo.edu*

J. GALLO, S.M. PLATEK, D.L. CHUTE, T. GIOVANNETTI, D.J. LIBON, M. GIBNEY, F. MOHAMED & S. COSENTINO. Detecting Action Errors: Reflections on the Mirror-Neuron System.

Objective: The mirror-neuron system (MNS) is hypothesized to account for an observation-execution matching system that facilitates understanding the actions of others; however, little is known about mirror-neuron involvement when errors of action are encountered. We tested whether the MNS becomes activated during the detection of action-related and object-related errors embedded within descriptions of goal-directed activities.

Participants and Methods : In an fMRI experiment, 9 participants (M age=24.2, SD=3.9; M yrs education=17, SD=1.5) read descriptions of goal-directed activities, including a header, to prime them to the goal at hand, followed by four steps necessary to accomplish the goal. BOLD activation while reading correct descriptions was used as the control condition; descriptions with action- and object-related errors were used as experimental conditions. Group-level random-effects analyses were employed using one-sample t tests with a cluster detection corrected, $p < 0.005$, and spatial extent > 8 voxels.

Results : Compared to correct descriptions, those containing action-related errors primarily activated bilateral occipital, superior temporal, inferior frontal, and premotor regions, whereas those containing object-related errors primarily activated superior parietal, mesial temporal, occipito-temporal, and prefrontal regions.

Conclusions : Results indicate that when actions, but not objects, involved in a task are flawed the MNS is activated. This might suggest that when presented with goal-directed tasks, humans generate a representation of the actions required to accomplish the goal using a mental matching strategy, and when the match is incongruent the MNS is activated.

Correspondence: *Jennifer Gallo, MS, Drexel University, 1802 South Sartin Street, Philadelphia, PA 19148. E-mail: jlg37@drexel.edu*

A.B. SOLLINGER, K.A. SHAIKH & M.W. PARSONS. Localization of Sensory-Independent Language Comprehension Cortex: A Functional Magnetic Resonance Imaging Protocol.

Objective: The value of functional MRI based mapping of cognitive functions prior to neurosurgery has been established for several motor, sensory, and cognitive abilities (e.g., productive language, sensory, motor). Identification of brain structures specifically involved in language comprehension has proved more difficult due to the fact that paradigms used to map receptive language also produce sensory activation. We sought to design a protocol, simple and brief enough for easy use with patients, but able to reliably discriminate language comprehension from sensory perception.

Participants and Methods : Eleven right-handed, healthy young adults completed two language comprehension tasks during fMRI: participants alternated between blocks of visually presented or auditorily presented yes/no questions (e.g., "Will a good pair of rubber boots keep water out?"). Subjects responded via a button press.

Results : A conjunction analysis identified common areas of activation across the visual and auditory tasks. At the group level, a large area of activation in the region of the left superior and middle temporal gyri was identified and was used as a region of interest (ROI) to query individual subject fMRI data. At the individual subject level, nine of eleven subjects demonstrated detectable activation in this ROI. Preliminary use of this task in patients with neurosurgical lesions has shown mixed results: some subjects have failed to show activation, whereas others have shown activation which was confirmed as language related by intraoperative mapping.

Conclusions : Results suggest that this protocol offers promise as a means of reliable identification of language comprehension areas in individual subjects. The clinical application of fMRI is discussed.

Correspondence: *Ann B. Sollinger, PhD, Department of Behavioral Medicine, West Virginia University, 930 Chestnut Ridge Road, Morgantown, WV 26505. E-mail: asollinger@hsc.wvu.edu*

Y. KESSEL, L.S. MILLER, N.E. YANASAK & P.J. MAHER. Practice Dependent Decrease in Brain Activation in a Spatial Working Memory Task.

Objective: Practice is known to affect neural activity and behavior. Brain imaging studies have demonstrated both a decrease and an increase in neural activity following practice. These changes in neural activity are conceptualized as increased efficiency in task performance, with decreased activation in strategy non-specific brain regions and increased activation in efficient strategy-specific neural networks. We hypothesized a decrease in both the intensity and the dispersion of neural activity in subjects who received a practice session several days prior to scanning, compared with subjects in the control group. We predicted that the decreased neural activity in the Practice group would correlate with shorter response time and greater accuracy on behavioral measures.

Participants and Methods : This functional magnetic resonance imaging (fMRI), between-group experiment investigated practice effects in a spatial working memory task (n-back) in twenty-one right handed young male participants.

Results : In line with our hypothesis, statistical parametric maps demonstrated greater overall activity in the Control group compared with the Practice group, mainly in parietal and frontal regions ($p < 0.001$). However, the groups did not significantly differ on intensity or dispersion measures of neural activity. Behaviorally, practice failed to demonstrate group differences, suggesting that the manipulation of practice was not powerful enough to demonstrate significant between-group behavioral practice effects in a small sample.

Conclusions : These results demonstrate the ability of fMRI to capture changes in neural activity that are behaviorally undetectable. They also demonstrate the importance of understanding and controlling practice effects for improving replicability in fMRI studies.

Correspondence: *Yfat Kessel, M.S., Psychology, University of Georgia, Psychology Building, University of Georgia, Athens, GA 30602. E-mail: y_kessel@yahoo.com*

J.G. CRAGGS, D.D. PRICE, W.M. PERLSTEIN, N. VERNE & M.E. ROBINSON. Using fMRI to Examine Cortical Connectivity and Communication of the “Pain-Matrix” in Individuals with Irritable Bowel Syndrome.

Objective: Functional neuroimaging studies have found that placebo alters neural activity in pain-related areas of the brain. Using fMRI, brain activity of irritable bowel syndrome patients (IBS) was measured in response to rectal distension during natural history (NH) and placebo (P) conditions. Placebo-related decreases in activation should reflect diminished afferent processing of pain. The present study examined systemic patterns of activity to better understand regional synergy in the “pain-matrix.”

Participants and Methods : Nine Caucasian pre-menopausal women with IBS participated in the study. During each scan, each participant experienced rectal distension via a balloon barostat and reported level of pain. Subjects were exposed to the NH and P conditions on different days.

Results : Repeated measures ANOVA for pain rating was significant for condition ($F(2,16) = 23.5, p < .001, \eta^2 = .75$) indicating that placebo-suggestion reduced pain level. Comparable reductions of activity were found in regions of interest (ROI) during placebo (statistical maps thresholded at $p < .05$; t-contracts between conditions significant at $p < .02$). All ROIs were significantly and positively correlated during NH, but not during P. During P some ROIs did not covary or were negatively correlated. ROI synergy was estimated using structural equation modeling, resulting in a well fitting model (GFI=0.98, AGFI=0.99, IFI=0.99, RFI=0.97).

Conclusions : These findings suggest that, while ROIs are associated with processing “painful” stimuli, they may serve disparate functions supporting the hypothesis that active afferent inhibition is, in part, responsible for placebo analgesia.

Correspondence: *Jason G. Craggs, Ph.D., Clinical and Health Psychology, University of Florida, Box 100165, Gainesville, FL 32610. E-mail: jrcraggs@mbi.ufl.edu*

B.E. CARLSON EMERTON, C.L. LEVERONI, B.R. BUCHBINDER, J.A. HIRSCH, R.L. MARTUZA, D.J. COSTELLO, A.J. COLE & L.R. MOO. Discordant IAP and fMRI language lateralization: A case report and cautionary tale.

Objective: Accurate determination of language dominance is a crucial component in the pre-operative assessment of patients with structural lesions near traditional cortical language areas. The Intracarotid Amytal Procedure (IAP) is a widely used and repeatedly validated test for determining language and memory lateralization. The clinical application of fMRI to identify functional cortex near resectable lesions is increasingly common as fMRI offers a non-invasive assessment that avoids potential behavioral confounds of sedation and agitation sometimes associated with the IAP.

While the IAP remains the standard of care for determining language and memory dominance, recent research offers mounting evidence of reliable concordance between the IAP and fMRI language localization procedures. Still, isolated cases of divergent IAP and fMRI language localization results have been reported. We present such a case.

Participants and Methods : The patient is a 36-year-old right-handed man who, following two generalized tonic-clonic seizures,

was found to have a large left frontal lobe tumor. Prior to surgical resection, fMRI was performed using standard tasks designed to elicit language localization. Subsequently, a unilateral IAP was conducted to assess expressive and receptive language functions of the right hemisphere.

Results : fMRI results indicated exclusive right hemispheric language representation. In contrast, IAP testing revealed no receptive or expressive language functions, suggesting complete left hemispheric dominance for language.

Conclusions : In this case, sole reliance on fMRI would have led to assumed right hemisphere language dominance and may have resulted in significant post-operative language impairment.

Factors that may result in failed activation of functional cortex and implications for pre-operative functional assessments are discussed.

Correspondence: *Britt E. Carlsson Emerton, BS, Neurology, Massachusetts General Hospital, 175 Cambridge Street, Boston, MA 02114. E-mail: bemerton@partners.org*

C. ORYNICH, T. PEREZ, A. WABNITZ, B. CROSSON, A. BACON MOORE, K. MCGREGOR, K. GOPINATH, C. WIERENGA, M.E. GAIEFSKY, K.K. PECK, R.W. BRIGGS, T.W. CONWAY, L. GONZALEZ ROTH & K.D. WHITE. Time Courses of fMRI Activations Spanning The Stimulus-Response Interval During Word Generation By Nonfluent Aphasics.

Objective: fMRI separation of sequential cognitive processes during word generation tasks is challenging in normal controls. Nonfluent aphasics respond slowly, however, so that many brain images elapse between a stimulus and the spoken response. We analyzed images from three ischemic stroke patients with modest anomia, using deconvolution analyses time-locked to: (1) stimulus delivery, (2) the post-stimulus image, (3) the pre-response image, and (4) spoken response. Hypotheses: “Perception” time-locks to (1) or (2), “production” time-locks to (3) or (4), and activity spanning the (1) to (4) interval will also exist.

Participants and Methods : At trial onset, patients heard a single category cue (e.g., “birds”) and attempted to say aloud a single exemplar (e.g., “eagle”). Each fMRI run at 3T consisted of 9 trials separated by variable randomized inter-trial intervals with five runs per session (event-related; GE LX, TR=1660, TE=18, FA=70, 64x64 matrix).

Results : Active voxels ($R^2 > .16$) were found in bilateral posterior superior temporal cortices, Broca’s area perilesionally, right Broca’s homologue, and medial frontal cortices. Voxels in these areas whose average hemodynamic responses (HDRs) spanned the stimulus-response interval showed onsets slightly delayed relative to the onsets of “perception”-locked HDRs, and offsets nearly coincident with the offsets of “production”-locked HDRs.

Conclusions : Stimulus delivery evoked the expected activation in perception cortices but also in Broca’s homologue. Response production evoked the expected activation in production cortices but also in perception cortices. HDR time courses spanning the stimulus-response interval might reveal activity keeping perceptual information “on-line” until response execution. Brain images in these slow responders (non-fluent aphasics) tease apart normally overlapping processes.

Correspondence: *Keith M. McGregor, University of Florida, 4012 sw 21st ln, gainesville, FL 32607. E-mail: kmcgrego@ufl.edu*

J. JANUSZ, T. ROSSER, C. STITZLEIN, J. FOSS-FIEG, L. KAPLAN & C. VAIDYA. Neural Basis of Response Inhibition in Children with and without NF1 and ADHD: A Functional MRI study.

Objective: Approximately 30-50% of children with Neurofibromatosis Type 1 (NF1) have symptoms of Attention-Deficit/ Hyperactivity Disorder (ADHD) that are relieved by stimulant medications such as

methylphenidate (MPH). The inability to inhibit responses is a characteristic symptom of ADHD. We examined whether the neural basis of response inhibition in NF1 children with comorbid ADHD differed from age-matched typically developing children, and whether administration of MPH reduced those differences.

Participants and Methods : Six children with NF1 and ADHD (mean age = 9.5 years) and six control children (mean age = 9.6 years) performed a Go-No Go task with increasing demands for response inhibition during functional magnetic resonance imaging (fMRI). Children with NF1 were imaged while on (regular dose) and off MPH (36 hour wash-out).

Results : Subjects in both groups made more errors with increasing response inhibition. However, MPH did not appear to improve performance in children with NF1. Control children exhibited activation of the dorsal cingulate gyrus in the low demand condition with additional recruitment of the putamen and insular regions in the high demand condition. Children with NF1 exhibited more extensive activation in the same regions as control children. Administration of MPH increased activation in areas involved in motor control (dorsal cingulate, supplementary motor area, caudate) and insular regions, bilaterally.

Conclusions : More extensive activation in children with NF1 suggests an atypical neural basis of response inhibition. Further, atypical activation patterns were not normalized by MPH in children with NF1. Thus, the neural substrate of response inhibition, and its response to stimulant medication, may be different in children with NF1 than without NF1.

Correspondence: Jennifer Janusz, Psy.D., Pediatric Neuropsychology, Children's National Medical Center, 111 Michigan Ave., NW, Suite 1200, Washington, DC 20010. E-mail: jjanusz@cnmc.org

J. PENDERGRASS, R.M. ROTH, N.S. KOVEN, L.A. FLASHMAN, H.S. PIXLEY & A.J. SAYKIN. Relationship Between Neural Correlates of Response Inhibition and Reaction Time Variability.

Objective: Lesion studies suggest that consistency of reaction time (RT) during cognitive tasks is modulated by frontal lobe systems. A recent neuroimaging study reported that reaction time variability during response inhibition was associated with neural activity in regions commonly identified to subservise response inhibition and attentional processes. In the present study, we evaluated the relationship between reaction time variability and neural correlates of response inhibition.

Participants and Methods : Ten healthy adults (mean age = 37, SD = 12.4; 5 women) completed an event-related fMRI visual go/nogo task. fMRI images were obtained on a 1.5T GE scanner. Data was analyzed using regression models in SPM ($p < .01$, $k > 3$) with the nogo > go contrast. Intra-individual reaction time variability during correct go trials was calculated using the coefficient of variation (ICV = SD/RT), which controls for differences in mean reaction times.

Results : Simple regression models revealed significant negative correlations between ICV and the right inferior/middle frontal gyrus and putamen activity during successful response inhibition. By contrast, mean RT was negatively correlated with right inferior frontal activity.

Conclusions : The present study revealed significant relationships between ICV and RT with frontostriatal circuitry elicited by successful response inhibition; however, the regions of neural activity associated with ICV and RT were only partly overlapping. These findings indicate that more consistent and rapid responding is associated with greater neural activity in regions subserving successful inhibition. Further investigations on the impact of ICV on executive control processes in normal and clinical populations are needed.

Correspondence: Jo Cara Pendergrass, Ph. D., Psychiatry, Dartmouth Medical School, 912 S. Wood Street, M/C 913, NPI - 4th floor, Rm 440, Chicago, IL 60612. E-mail: jo.c.pendergrass@dartmouth.edu

M.S. ALOIA, L.H. SWEET, M.E. ZIMMERMAN, J. ARNETT, S. HARRIS & J. SKREKAS. The Effects of Treatment for Sleep Apnea on Brain Activity during a Working Memory Task.

Objective: Obstructive Sleep Apnea (OSA) has been associated with both medical and psychological consequences and has even been reported as a predictor of stroke. Cognitive correlates of OSA have been reported in most cognitive domains but a clear picture of cognitive dysfunction has not yet been determined. Treatment for OSA has been shown to result in improvements in certain cognitive functions. Our objective was to determine the degree to which treatment affected MR signal in OSA during the completion of a working memory task.

Participants and Methods : We recruited 10 individuals with OSA. Participants completed the 2-back during fMRI sessions after effective treatment and after withholding treatment for two consecutive nights. Adherence to treatment was monitored objectively. Conditions were delivered in a counterbalanced manner and participants were practiced on the cognitive activation task before each session.

Results : Multiple regression was used to identify regions where activation was associated with task condition after controlling for head movement. Nine regions of interest were identified as activated in either of the two experimental conditions (on or off treatment). These nine regions were then examined using paired t-tests comparing treatment condition. Three regions showed greater intensity of activation with treatment: 1.) right posterior parietal cortex (PPC), 2.) bilateral cingulate, and 3.) right DLPFC. In contrast, the left DLPFC showed greater intensity of activation without treatment. Moreover, the left PPC showed greater voxel recruitment without treatment and a trend toward greater activation within those voxels. There were no other volumetric changes associated with treatment condition.

Conclusions : This study has implications for better understanding the neurofunctional underpinnings of OSA and the effects of treatment on brain function.

Correspondence: Mark S. Aloia, PhD, Psychiatry and Human Behavior, Brown University, Duncan Building, Butler Hospital, 700 Butler Drive, Providence, RI 02906. E-mail: aloia@brown.edu

A. RAMATI, S. ARYAL, B. BARCH, D. BHAUMIK, R.D. GIBBONS & J.A. SWEENEY. Reliability Estimation of a New Approach to Modeling Event-Related Functional MRI Data.

Objective: fMRI studies of brain function are being used in presurgical planning and treatment effect evaluation. In this context, it is crucial that valid and reliable approaches for evaluating BOLD signals during fMRI studies are established. Recently, we developed a new statistical approach for analyzing event-related fMRI data (Gibbons et al., 2004). This approach combines random-effect polynomial regression models, and empirical Bayes estimation, to identify voxels with a significant hemodynamic response. In this study, we evaluated the ability of this approach to reliably detect activation in a simple sensorimotor task.

Participants and Methods : Twelve healthy subjects performed a 7 minute event-related visually guided saccade task twice, consecutively. All imaging was performed on a 3T whole body scanner. Statistical analyses were conducted using fMRIview software (Gibbons et al., 2004).

Results : Two approaches for assessing reliability were used. We observed significant relationships ($r > .70$) between the number of active voxels in pre-specified ROIs across subjects for the two runs of the saccade paradigm. Secondly, percent agreement between the two runs in identifying the same voxels as active or inactive in individual subjects in the robustly activated frontal eye fields revealed consistent voxel classification rates ranging from 88% to 99% across subjects.

Conclusions : The findings indicate that event related brain activity can be reliably detected, which is important for utilizing fMRI for tracking brain function longitudinally in developmental or treatment studies.

Correspondence: *Alona Ramati, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Rd., North Chicago, IL 60064. E-mail: ramati_a@yahoo.com*

A.J. SAYKIN, B.C. MCDONALD, T.A. AHLES, L.A. CHESNUT, P.J. WANG, C.T. FURSTENBERG, S.A. HARRIGAN & A.C. MAMOURIAN. Altered Brain Activation Following Systemic Chemotherapy for Breast Cancer: Interim Analysis from a Prospective fMRI Study.

Objective: Neuropsychological impairment has been reported after systemic cancer chemotherapy. To date, however, no study has examined the neural substrate of these cognitive changes using functional neuroimaging.

Participants and Methods : We used fMRI to examine brain activation patterns during working memory (WM) processing in breast cancer patients treated with chemotherapy, those treated with local therapy only (surgery, radiation, and/or hormone therapy), and healthy control subjects. Participants completed an auditory verbal n-back fMRI task at baseline (BL; prior to adjunctive chemotherapy and/or radiation) and one month (1M) following completion of chemotherapy (or yoked interval for the local therapy and control groups). Groups were matched for age, gender (all women), and education.

Results : All three groups showed the expected WM activation pattern at the most challenging load (3-back), with regions of bifrontal, biparietal, and bilateral cerebellar activation apparent at both BL and 1M assessments. However, whereas local therapy patients and controls showed stable to mildly decreased activation in typical WM circuitry at the 1M assessment relative to BL, chemotherapy-treated patients showed increased activation in bilateral parietal and medial frontal regions. Chemotherapy-treated patients also showed greater increase in overall extent of activation from BL to 1M relative to the other two groups. There were no differences in task performance between groups.

Conclusions : These findings are the first to our knowledge to prospectively demonstrate alterations in brain activation following chemotherapy for breast cancer. In view of the preserved WM task performance, these changes may be compensatory in nature. This would be consistent with similar findings in other clinical populations and begins to elucidate the neural substrate of chemotherapy-induced cognitive changes. Correspondence: *Andrew J. Saykin, PsyD, Brain Imaging Laboratory, DHMC, Dartmouth Medical School, DHMC, Lebanon, NH 03756. E-mail: saykin@dartmouth.edu*

M.A. COLE, J. TOWNSEND, J.M. CORY & S.Y. BOOKHEIMER. Clinical Preoperative Functional Magnetic Resonance Imaging of Language.

Objective: Clinically applied functional magnetic resonance imaging (fMRI) is emerging as an important preoperative tool in neurosurgical excisions of intracranial tumors, vascular malformations, and seizure foci. This study evaluated the efficacy of fMRI in mapping brain functions in precise spatial relation to affected tissue to help achieve the delicate balance between maximal excision of deleterious tissue and minimal loss of function in tumor resections.

Participants and Methods : Six neurosurgical patients with intracranial tumors located near eloquent tissue were analyzed. fMRI was conducted on five patients with a 3-T GE unit with a gradient echo, echo-planar acquisition sequence. High-resolution spin-echo scans were acquired in the same plane as the functional scans and were used to normalize spatial relations and pinpoint neural activation in within-subject analyses. Eloquent tissue activation paradigms included verbal and visual object naming, sentence comprehension, and tongue movement tasks. Outcome was measured by 1) reviewing medical records to determine whether fMRI results influenced surgical decisions, 2) comparing fMRI results to intraoperative corticography in 3/6 cases, and 3) examination of language functioning before and after surgery.

Results : Findings indicated that preoperative fMRI influenced surgical planning in 5/5 cases. Linguistic functioning was preserved in 5/5 cases utilizing preoperative fMRI. Intraoperative corticography confirmed fMRI findings in 3/3 cases. Additionally, fMRI activation patterns indicated that the left BA 47 was selectively involved in processing semantic relationships between words or phrases and the speech supplementary motor area was capable of functional reorganization.

Conclusions : Clinical fMRI provided substantive contributions to successful neurosurgical excisions of tumors and provided insight into linguistic systems.

Correspondence: *Michael A. Cole, Doctorate, Neuropsychology, University of California, Los Angeles, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, #CS-746, Los Angeles, CA 90095. E-mail: micole@mednet.ucla.edu*

D. MECHANIC-HAMILTON, M. KORCZYKOWSKI, D.Y. KIMBERG, J.I. TRACEY, K.A. LAWLER, M.R. SPERLING, J.A. FRENCH & J.A. DETRE. Neural Changes in fMRI Activation After Surgical Intervention for Temporal Lobe Epilepsy.

Objective: Although temporal lobectomy has proven efficacy in the management of medically refractory temporal lobe epilepsy (TLE), it is often complicated by symptomatic memory dysfunction. Little is known about mechanisms of functional reorganization in the brain following temporal lobectomy. fMRI during memory encoding demonstrates activation changes in mesial temporal lobe (mTL) regions subserving memory function that correlate with seizure lateralization and memory outcome. This study compared memory activation before and after temporal lobectomy to assess changes in activation patterns.

Participants and Methods : Ten patients with TLE (5 left-sided, 5 right-sided) participated in the study and were scanned before and 9-13 months following surgery. fMRI was carried out at 3 Tesla during an 8.5 minute blocked scene encoding paradigm. Group activation was assessed in whole brain and the mTL regions of interest (ROI) by visual inspection and using an asymmetry ratio (AR) of activated voxels.

Results : Both before and after surgery, subjects showed asymmetric activation, greater on the side contralateral to the seizure focus. The ipsilesional hemisphere showed a decrease in activation post-surgically. The asymmetry of mTL regions outside the resection (parahippocampus and fusiform gyrus) increased significantly from the pre to the post-surgical scan [$t(8)=-4.02, p=0.004$].

Conclusions : The increase in asymmetry suggests an important role of the contralateral mTL in supporting memory function following temporal lobectomy, either due to compensatory increases in activity or due to disconnection in the ipsilateral mTL, and expands upon previous results suggesting that memory outcome is predicted by mTL activation ipsilateral to the seizure focus. fMRI provides a useful biomarker for examining neuroplastic responses.

Correspondence: *Dawn Mechanic-Hamilton, Psychology, Drexel University, 245 N. 15th Street, Mail Stop 626, Philadelphia, PA 19102. E-mail: dawn_mechanic@yahoo.com*

H.A. WISHART, A.J. SAYKIN, L.A. RABIN, J.D. WEST, T.W. MCALLISTER, H. RHODES, B. MCDONALD, R. ROTH, L. FLASHMAN, T. AHLES & G. TSONGALIS. BDNF Genotype Predicts Brain Activity Associated with Episodic Memory in Healthy Adults.

Objective: The valine (val) to methionine (met) substitution in the 5' region of the brain-derived neurotrophic factor (BDNF) gene has been associated with altered synaptic plasticity, reduced episodic memory performance, and altered hippocampal activation. We examined its association with brain activity during episodic memory processing.

Participants and Methods : Participants were 16 healthy, right-handed adults with the val/met genotype and 16 val homozygotes individually matched on age, sex and education. Participants completed genotyping,

neuropsychological assessment, and structural and functional MRI. An auditory-verbal fMRI task was used to probe episodic encoding and retrieval. SPM ANCOVA was used to assess BDNF-related differences in brain activation; APOE genotype and age were used as covariates given their association with the dependent variable.

Results : There were no group differences in estimated baseline IQ, cognition, or accuracy on the in-scanner task. Across the entire sample, encoding and retrieval were associated predominantly with frontotemporal activation (L>R). A right medial temporal region showed significantly greater activity during both encoding and retrieval compared to rest in met carriers. A homologous region in the left hemisphere showed increased activation in met carriers during encoding. The first eigenvariate of signal intensity in these regions was related to in- and out-of-scanner memory performance.

Conclusions : The presence of a single met allele is associated with altered patterns of brain activation during episodic memory in healthy cognitively intact adults, and these alterations have implications for individual differences in memory performance. The effect of BDNF genotype on brain activation patterns in neurological and neuropsychiatric populations deserves further investigation.

Correspondence: *Heather A. Wishart, PhD, Psychiatry, Dartmouth Medical School, One Medical Center Dr., Lebanon, NH 03756-0001. E-mail: wishart@dartmouth.edu*

K. DOUVILLE, K. NIELSON, M. SEIDENBERG, J. WOODARD, M. FRANCAZAK, P. ANTUONO & S. RAO. Famous Faces and Landmarks: An fMRI Investigation.

Objective: Previous neuroimaging studies using person-specific stimuli (e.g., famous faces and famous names) have demonstrated the activation of a common neural network distinct from general semantic processing networks. These results have been interpreted to support the notion that person-specific stimuli are represented uniquely in the brain. However, few studies have directly tested this hypothesis using an appropriate control task. The goal of the current investigation was to examine whether famous faces activate unique brain regions compared to famous landmarks, a control task matched on its level of semantic uniqueness.

Participants and Methods : Participants were 26 young adults (mean age = 20.27) who underwent an fMRI and were asked to perform a recognition task in the scanner using a two-button key press to respond to pictures of famous and not famous faces and landmarks.

Results : Results of t-tests between conditions showed famous landmarks uniquely activated extensive areas in the visual cortex, bilateral parahippocampal gyri and bilateral frontal lobes, whereas famous faces uniquely activated the medial frontal cortex, cingulate cortex, and the right lateral temporal lobe. Repeated measures ANOVAs on the estimates of the hemodynamic response functions revealed significantly greater activation for famous landmarks compared to famous faces in the left medial and inferior frontal areas and in the right precuneus. Famous faces had significantly greater activation in the right medial temporal lobe compared to famous landmarks.

Conclusions : The results of this study provide support for the presence of unique neural regions that underlie the processing of person-specific stimuli.

Correspondence: *Kelli Douville, M.S., Brown University, SC Squire Lane, Riverside, RI 02915. E-mail: Kelli_Douville@brown.edu*

Y. CHANG, T. CONWAY, D. KENDALL, K. MCGREGOR, K. GOPINATH, K.K. PECK, M. BENJAMIN, M. KURTZMAN, A. WABNITZ, T. PEREZ, L.J. GONZALEZ ROTH, K. WHITE & B. CROSSON. fMRI Reveals Neural Reorganization of Overt Pseudoword Repetition Following Phonological-Motor Treatment of Phonological Alexia in Nonfluent Aphasia.

Objective: Successful phonological-motor treatment of phonological alexia in nonfluent aphasia generalizes to improved pseudoword repetition.

However, the neural reorganization that supports this generalization is not defined. We analyzed overt pseudoword repetition to identify neural substrates of improved pseudoword repetition following treatment. Hypothesis: perilesional cortex will show increased activity following treatment, but right-hemisphere homologues of damaged cortex will also be recruited.

Participants and Methods : A 48-year-old, right-handed, male with an ischemic stroke 81-months prior exhibited infarction in left-hemisphere operculum and frontoparietal involvement with extension up to the anterior communicating artery territory. He demonstrated residual phonological alexia, anomia, and nonfluent aphasia. He participated in a multiple-baseline treatment program for 92 hours. Pre- and post-treatment 3T fMRI were obtained during an event-related pseudoword repetition task. Deconvolution analyses (AFNI) identified neural reorganization in three regions of interest.

Results : The patient demonstrated improved real word reading, generalization to pseudoword repetition, and accuracy on the fMRI task more than doubled. fMRI data included increased activity in left superior temporal gyrus (STG), left supramarginal gyrus (SMG), and bilateral supplementary motor area (SMA). Decreased activity was evident in right-hemisphere STG, SMG, middle temporal gyrus, precentral gyrus, and inferior frontal gyrus.

Conclusions : Generalization of a phonological-motor treatment to pseudoword repetition involved increased activity in some perilesional cortex and the right-hemisphere SMA. However, more regions of decreased activity in the right- and left-hemisphere were evident post-treatment. Increased activity in two perilesional regions, decreased activity in several regions, and improved behavioral performance indicates neural reorganization towards increased cortical efficiency following successful phonological-motor treatment.

Correspondence: *YU -LING CHANG, Clinical and Health Psychology, University of Florida, 101 South Newell Drive, Room 3151, Gainesville, FL 32611. E-mail: ychang@phpf.ufl.edu*

W.Q. JOE, G.A. STEFANATOS, G.K. AGUIRRE, J.A. DETRE & G. WETMORE. A Rapid Event-Related fMRI Study of Auditory Attention.

Objective: Functional neuroimaging studies of human auditory cortex have documented a specialized role of the left hemisphere (LH) in speech perception, which may reflect a left-lateralized bias in decoding rapidly changing temporal cues. Although there are crossed and uncrossed fibers in the ascending pathways of the human auditory system, previous functional magnetic resonance imaging (fMRI) studies of monaural stimuli (speech and non-speech tokens) have shown activation dominance of the contralateral pathway. If the functional specialization of LH extends to the level of phonemic processing, one might expect that monaurally presented left ear (LE) speech tokens would show more ipsilateral activation and less rightward asymmetry. The aim of the current study was to show whether a rapid event-related fMRI paradigm could demonstrate a LH bias in speech processing at the phonemic level.

Participants and Methods : Ten healthy right-handed adults were assessed using BOLD fMRI in a 3T scanner. Participants were asked to identify a consonant-vowel (CV) syllable target presented aurally amongst two other CV distractors. Target and non-target stimuli were presented to either ear (monaurally) randomly in one series and to both ears simultaneously (binaurally) in another series.

Results : Using functionally defined ROIs delineating auditory cortex bilaterally, RE stimuli elicited a strong leftward bias in number of active suprathreshold voxels, concentrated in primary auditory cortex. By contrast LE stimuli elicited a more symmetric response with a slight rightward bias concentrated in secondary auditory cortex.

Conclusions : Our results suggest that a random event-related fMRI paradigm, contrary to previous studies utilizing blocked designs, may be used to show LH specialization of monaurally presented speech.

Correspondence: *Wilson Q. Joe, Ph.D., Moss Rehabilitation Research Institute, 1200 West Tabor Road, Philadelphia, PA 19141. E-mail: jow@einstein.edu*

Multiple Sclerosis/ALS/Demyelinating Diseases

J. BRUCE & P.A. ARNETT. Visual Acuity Disturbances Are Associated with Performance on Tests of Complex Visual Attention in MS.

Objective: Over 50% of MS patients demonstrate deficits on tests of complex attention. Many of these tests require patients to rapidly encode visual information. MS patients frequently report visual acuity disturbances caused by optic neuralgia, diplopia, and nystagmus. Typically, neuropsychologists screen patients for severe visual acuity disturbances and tailor test batteries that minimize the need for intact vision. Less is known about how mild to moderate visual acuity disturbances may influence neuropsychological test performance. This study examined the extent to which mild/moderate visual acuity disturbances influence performance on two common visually-based tests of complex attention.

Participants and Methods : Ninety-one relapsing-remitting and secondary progressive MS patients were recruited from Central Pennsylvania. All patients reported adequate vision and stated they were able to read standard newsprint. At the outset of the study, participants' vision was tested with a reduced Snellen eye chart. Patients were instructed to use both eyes and, if necessary, corrective lenses. A neuropsychological battery was administered that included the oral version of the Symbol Digit Modalities Test (SDMT) and the Visual Elevator (VE) subtest from the Test of Everyday Attention.

Results : Partial correlations controlling for estimated intellectual abilities revealed that better visual acuity was associated with better performance on the SDMT ($r = .38, p < .01$) and VE ($r = -.34, p < .01$).

Conclusions : Overall, nearly 15% of the variance on these visually based tests of complex attention was predicted by visual acuity disturbances. These results suggest that, in addition to measuring higher order cognitive processes, visual tests of attention are sensitive to primary visual disturbances in MS.

Correspondence: *Jared Bruce, Ph.D., Brown University, 82 Ninth Street, Providence, RI 02906. E-mail: jaredmbruce@yahoo.com*

Y. GOVEROVER, E. GAUDINO-GOERING, N.B. MOORE & J. DELUCA. What is the Relationship between Performance of Activities of Daily Living and Self-awareness of Functional Status in Individuals with MS?

Objective: To investigate the relationship between self-awareness of functional status and performance of Instrumental Activities of Daily Living (IADL) in persons with Multiple Sclerosis (MS), and to compare their performance to healthy controls.

Participants and Methods : 74 individuals with clinically definite MS and 35 community dwelling, healthy controls participated in the study. A between-groups design was used to examine differences in self-awareness of functional status. Correlations were used to examine the relationship between self-awareness and performance of functional activities.

Main Outcome Measures: Functional Behavior Profile (FBP): both participants and their informant rated the subject's ability to perform tasks of everyday living. Participants' scores were subtracted from their informants and the absolute value was used as self-awareness measure; Executive Function Performance Test (EFPT), an objective measure of IADL performance. Functional Assessment of Multiple Sclerosis (FAMS).

Results : MS participants had worse self-awareness of functional tasks, relative to healthy controls. Significant positive correlations were observed between actual performance of IADL and self-awareness of func-

tional status. However, correlations between self-report of quality of life (FAMS) and self-awareness of functional status were non-significant. After controlling for depressive symptomatology, awareness scores were significantly associated with EFPT performance, but not FAMS scores.

Conclusions : The association between awareness of task performance and IADL performance provides support for the role of awareness in rehabilitation in evaluating task difficulty in relationship to individual strengths and weaknesses, to plan ahead, and to choose appropriate strategies. Results are discussed in terms of the different dimensions these tools are measuring and their respective strengths and limitations. Correspondence: *Yael Goverover, PhD, Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: ygoverover@kmrrec.org*

A. SOBEL, W.S. MACALLISTER, C. CHRISTODOULOU, W.F. SCHERL, M. MILAZZO & L. KRUPP. Objective Evidence of Cognitive Fatigue on the PASAT in a Pediatric MS Sample.

Objective: Fatigue is common in pediatric Multiple Sclerosis (MS). We were curious as to the differences in cognitive performance of fatigued and not-fatigued pediatric MS patients on a prolonged attention test. Although the physical effects of fatigue are well known, the effects on cognition are poorly understood.

Participants and Methods : Our 32 patients, of which 75% were female, ranged from 10 to 17 years of age and had clinically definite MS. Each patient performed a children's version of the Paced Auditory Serial Addition Test (PASAT) as part of a larger battery of neuropsychological tests. We recorded the percentage of dyads (two consecutively correct responses) for both halves of each trial. A performance decrement was assessed by comparing the differential performances on the first half versus the last half of the sum of all trials and comparisons were made between patients reporting significant fatigue ($n = 15$) and those reporting no fatigue ($n = 17$). Because there were no baseline differences between the subgroups ($p = .442$), an independent-samples t -test was used to compare the differences in performance decrements between the subgroups.

Results : The fatigued subgroup demonstrated a significantly greater performance decrement than the non-fatigued group ($p = .002$).

Conclusions : Pediatric MS patients reporting fatigue demonstrate objective performance declines on cognitive tasks. Comprehensive treatment planning should consider the debilitating nature of the disease as well as the fatigue often experienced.

Correspondence: *Andrew Sobel, Neurology, Pediatric MS Center at Stony Brook University Hospital, HSC - T12, Stony Brook, NY 11794. E-mail: ads17@duke.edu*

E.A. GAUDINO-GOERING, J. DELUCA, G. VOELBEL, Y. GOVEROVER, N.B. MOORE & J. HALPER. Using the MSFC to predict Performance of Complex Activities of Daily Living in MS.

Objective: The Multiple Sclerosis Functional Composite (MSFC) is the outcome measure of choice for estimating the level of functional status in persons with Multiple Sclerosis. The MSFC is comprised of the Nine Hole Peg Test, the Timed 25 Foot Walk, and the PASAT 3-second trial. We examined the accuracy of the MSFC in predicting functional status as indicated by observed performance of easy vs cognitively complex tasks of daily living. We also examined the potential increase in sensitivity of the MSFC by adding a verbal learning test.

Participants and Methods : Participants with MS ($n=76$) and healthy controls ($n=38$) matched for age and education received the MSFC tests

and the open-trial Selective Reminding Test. To assess functional status in activities of daily living, the Executive Function Performance Test (EFPT) was administered. The EFPT is an objective, structured assessment of ability to perform six tasks. The tasks were categorized as cognitively easy or complex based on performance of the entire study group.

Results : Stepwise regression showed that the MSFC significantly predicted performance of both easy ($R^2=.13$, $p<.001$) and complex tasks ($R^2=.14$, $p<.001$). However, the prediction of performance on cognitively complex tasks was significantly improved with the addition of the SRT ($R^2=.21$, $R^2\Delta=.04$, $p<.05$).

Conclusions : This investigation lends support to the use of the MSFC as an outcome measure in that it does significantly predict performance of tasks of everyday living. However adding a test of verbal learning improves the power of the MSFC for predicting performance on cognitively complex tasks.

Correspondence: *Elizabeth A. Gaudino-Goering, Ph.D., Neuropsychology & Neuroscience Laboratory, Kessler Medical Rehabilitation Research and Education Corporation (KMRREC), 300 Executive Drive, Suite 10, West Orange, NJ 07052. E-mail: egaudinogoering@yahoo.com*

M.A. BUTLER, J.R. CORBOY & C.M. FILLEY. The Relationship between Psychiatry and Neurology from the 1800s to the Present and its Impact on Patient Care in Multiple Sclerosis.

Objective: To understand why the conceptualization of MS changed from one that acknowledged cognitive deficits, in the late 1800s, to one that, for decades thereafter, excluded them from the description of MS, and to examine the forces that led to their eventual proper recognition in the late 1900s. We hypothesized that the U.S. conflict between psychiatrists and neurologists over control of the treatment of the mentally ill fueled a misunderstanding of the nature of MS which led to a compromise in patient care, and as the fields began to merge in the late 1900s, a more informed conceptualization emerged and patient care was improved.

Participants and Methods : We reviewed documents from the 1800s to the present pertaining to the relationship between psychiatry and neurology and the acknowledgment of cognitive deficits in MS, and assessed the relationship between them. Key sources were works of Spitzka, Mitchell, Grissom, Gray, Hammond, Wechsler, Halstead, Reitan, Torrey, Hobson, Murray, Damasio, Kushner, Sacks, Beatty, and Rao, et al. **Results :** As the conflict between disciplines peaked in the late 1800s, the awareness of cognitive deficits by neurologists diminished, and as the conflict decreased, awareness increased. A century later, neuropsychology raised the awareness of cognitive deficits in MS, helping to shape a more accurate conceptualization of the disease, and neuroscience exploited advanced techniques to confirm and expand the findings of the 1800s. These developments contributed to a growing reconciliation of psychiatry and neurology.

Conclusions : Sociocultural factors have the power to unravel good work that has already been done affecting how clinicians and researchers conceptualize, diagnose, and treat disease. An awareness of these influences is important for advancing patient care.

Correspondence: *Michelle A. Butler, PhD, Behavioral Sciences and Leadership, US Air Force Academy, HQ USAFA/DFBL, 2354 Fairchild Dr., Ste. 6L101B, USAF Academy, CO 80840-6221. E-mail: michelle.butler@usafa.af.mil*

A. KUZNETSOVA, J.D. FISK, V. BHAN, S. DARVESH & M. SCHMIDT. Relations between Information Processing Efficiency and 1H-MRS Measures of Neural Integrity in Patients with Relapsing-Remitting Multiple Sclerosis.

Objective: This pilot study examined the relation between metabolic changes in specific brain regions and performance on a cognitive test of

information processing efficiency, the Computerized Test of Information Processing (CTIP). The CTIP employs simple and choice reaction-time tasks with increasing information processing demands. Measures of information processing efficiency were expected to be related to NAA levels in thalamic nuclei and frontal white matter regions.

Participants and Methods : Participants were 8 female patients with relapsing-remitting MS and 8 healthy control subjects matched for sex, age and education. MRI and MRS scans were conducted on a GE 1.5 Telsa scanner. ^1H -MRS scans consisted of four voxels (320 averages, PRESS sequence, TE/TR = 30/2000 msec), two within the thalamic nuclei and two within frontal white matter including thalamo-cortical projections. Regions of interest were prescribed on an axial T1-weighted SPGR (TE/TR=5/25msec, Flip angle = 40 degrees, acquisition matrix = 256 x 192, thickness/gap = 1.8/0 mm, slices = 192). MRI images were processed using AFNI software. ^1H -MRS data was processed Using LC Model v.6.0 software.

Results : Standardized regression slopes of CTIP reaction times were calculated for individual subjects to reflect the increase in reaction time as information processing demands increased across subtests. Regression slopes were greater for MS patients than for controls ($p<0.05$) and a similar trend was evident for errors ($p<0.10$). For the combined group, NAA levels were negatively correlated with CTIP regression slopes ($r=-0.50$, $p<0.05$) but only in the right thalamic voxel.

Conclusions : The findings demonstrate a limited association between a measure of information processing efficiency and NAA concentration in right thalamic nuclei in a small group of MS patients and matched healthy controls subjects. Further studies are needed to determine if neuro-metabolic measures and cognitive test performance both change with disease progression in MS.

Correspondence: *John D. Fisk, Ph.D., Psychology, Capital Health, 4066 A.J. Lane Building, 5909 Veteran's Memorial Lane, Halifax, NS B3H 2E2, Canada. E-mail: john.fisk@cdha.nshealth.ca*

M.E. WITGERT, P. MASSMAN, M. BRADSHAW, D. MOSNIK & P. SCHULZ. Behavioral Change in Amyotrophic Lateral Sclerosis (ALS).

Objective: Numerous studies suggest frontal system-mediated cognitive changes in ALS patients. However, little is known about behavioral changes in the disorder.

Participants and Methods : Here, 225 ALS patients were administered cognitive tests and a family member completed the Frontal Systems Behavior Scale (FrSBe; Grace & Malloy, 2001).

Results : Behavioral change ratings (comparing before- and after-illness onset) showed significant increases on the FrSBe Total Score ($n=39$; paired t-tests; $p < .001$) and all subscales (Apathy, Disinhibition, Executive Dysfunction). Using after-illness onset FrSBe ratings, we compared behavioral (high and low FrSBe scorers) to cognitive test performances. For those in the top quartile on the FrSBe Total Score, Verbal Series Attention Test (VSAT) time and errors were significantly worse ($n=225$; t-tests; $p = 0.007$ & 0.026) as was Executive Dysfunction ($p = 0.035$ & 0.036). In the opposite direction, we examined the association between cognitive impairment and behavioral scores. Cluster analysis using neuropsychological data yielded three subgroups ($n=141$): (1) cognitively intact, (2) mild executive impairment, and (3) globally impaired ALS patients. Using ANOVA with planned pair-wise comparisons, we found that patients in the global impairment subgroup had significantly higher scores on the FrSBe Apathy scale than patients in the cognitively intact subgroup. Patients in the top quartile on the Apathy subscale also had significantly higher Beck Depression Inventory scores ($p = 0.004$).

Conclusions : This study suggests the presence of frontally-mediated behavioral changes in ALS patients, in addition to frontally-mediated cognitive changes. We plan to examine the hypothesis that there may be additional behavioral changes not captured by this study.

Correspondence: *Mariana E. Witgert, M.A., Psychology, University of Houston, 1501 N. Campbell Ave, PO Box 245002, Tucson, AZ 85724. E-mail: mewitgert@hotmail.com*

M. BASSO, C. GHORMLEY, N. LOWERY, D. COMBS, T. WARD, J. JOHNSON & P. ARNETT. Self-reported Executive Dysfunction, Neuropsychological Impairment, and Functional Outcomes in Multiple Sclerosis.

Objective: Although cognitive deficits are common in multiple sclerosis (MS), the relationship between subjective complaints and objective impairment is obscured by inconsistencies across studies. Nonetheless, Goverover et al. (2005) measured symptoms of apathy, disinhibition, and poor problem-solving with the Frontal Systems Behavior Scale (FrSBe). This subjective measure of dysexecutive syndrome correlated with poor performance on a brief neuropsychological battery. Yet, this study was limited by a small patient sample and no control group. It also did not address the relationship between subjective complaints of dysexecutive syndrome and activities of daily living.

Participants and Methods : To address these issues, 44 patients with MS and 10 control subjects were recruited from support groups in the community. Rigorous exclusion criteria were applied. All were administered the FrSBe, a broad battery of neuropsychological tests, and measures of adaptive function.

Results : Regression analyses revealed that FrSBe total score emerged as a significant predictor of executive function, working memory, and new learning, especially intrusion errors across several learning indices. Although it failed to predict tactile imperception, FrSBe scores predicted motor dysfunction. FrSBe scores also predicted poor adaptive function. Across these analyses, large semi-partial correlations for FrSBe were obtained.

Conclusions : Consistent with past research, subjective complaints of dysexecutive syndrome predicted neuropsychological impairment. Notably, the instrument showed excellent construct validity, as convergent and divergent validity were clearly manifest. Moreover, FrSBe scores predicted poor adaptive function. Accordingly, subjective complaints of dysexecutive function in MS may serve as a potent indicator of cognitive impairment. Implications for 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*

E. GIOGKARAKI, C. POTAGAS, G. KOUTSIS, D. MANDELLOS & C. SFAGOS. The Brief Repeatable Battery of Neuropsychological Tests in Greek patients with multiple sclerosis: performance on the memory tasks in subtypes of multiple sclerosis.

Objective: The current study was designed to examine the influence of disease course in multiple sclerosis (MS) on the acquisition and retrieval impairments of verbal and visuospatial material. The memory tasks used are included in the Brief Repeatable Battery of Neuropsychological Tests (BRBN), which is considered to be a sensitive and brief measure of cognitive impairment in MS patients.

Participants and Methods : The whole BRBN was administered to 74 individuals with clinically defined MS (relapse-remitting (RR)= 45, primary progressive (PP)=14, secondary progressive (SP)=14) and to 23 healthy matched control participants. However, for the present study we selected specifically the measures from Selective Reminding Test (SRT) for verbal learning and memory and from 10/36 Spatial Recall Test (SPART) for visuospatial learning and memory. Some clinical variables were used as covariates.

Results : The multivariate analyses of variance indicate that the performances of verbal learning are significantly lower only for the PP group. However, for the delayed verbal recall the SP group has significantly lower performance. When testing visuospatial learning all subtypes of MS show performance significantly below that of the control groups, whereas the delayed recall is significantly lower only for the RR and SP MS groups.

Conclusions : The different patterns of memory deficits observed between MS disease subtypes suggest that differential rehabilitation approaches should be proposed.

Correspondence: *Erasmia Giogkaraki, PhD student (MSc), Neurology, Aginiteion Hospital, 22, Rostand Street, Athens 11141, Greece. E-mail: erasmia_gio@yahoo.fr*

H.M. GENOVA, G.R. WYLIE, F.G. HILLARY, J. BALZANO, B. RYPMA & J. DELUCA. An Examination of Processing Speed Impairments in Multiple Sclerosis Using fMRI.

Objective: Cognitive impairment is common in individuals with MS, specifically in several cognitive domains, including new learning, working memory and processing speed (PS). Through behavioral studies, it has been suggested that PS impairments are the most prominent cognitive deficit, underlying impairments in other aspects of information processing, such as working memory and attention. To date, no study has examined PS in MS using fMRI.

Participants and Methods : Participants consisted of 16 healthy controls (HCs) and 16 individuals with clinically definite MS as defined by the criteria of Poser et al., (1983). All subjects performed a PS task, a modified version of the Symbol Digit Modalities Task in the scanner. In order to examine group differences, a t-test using AFNI was run to examine what brain regions were significantly more active or less active in individuals with MS compared to HCs.

Results : When comparing the two groups it was found that HCs show more extensive activity compared to MS. Although both groups showed extensive activation in both frontal and parietal regions, the MS group showed significantly less activation overall in the lateral frontal lobes, whereas they showed increased bilateral superior parietal activation compared to HCs.

Conclusions : Both groups showed activation patterns consistent with a frontal-parietal information processing neural network. Decreased activity in the frontal lobes in the MS group and greater recruitment of superior parietal regions could indicate a disruption to the frontal-parietal network, potentially due to white matter damage in MS. These findings could potentially explain the nature of processing speed impairments in MS.

Correspondence: *Helen M. Genova, BA, Neuroscience, University of Medicine and Dentistry of New Jersey, KMRREC, 300 Executive Drive Suite 010, West Orange, NJ 07052. E-mail: hgenova@kmrrec.org*

A.C. GLEASON, J.A. BOBHOLZ, S. DURGERIAN & S.M. RAO. Use of fMRI activation patterns as an outcome measure for clinical trials of disease-modifying medications in multiple sclerosis: A pilot study.

Objective: Conventional MRI-derived findings, such as T2-weighted lesion load, have been used as outcome measures for clinical trials of disease-modifying drugs (DMD) in the treatment of multiple sclerosis (MS). Recent findings from our lab demonstrate an association between greater T2 lesion load and increased activation in the left inferior frontal gyrus (LIFG) during recognition memory tasks. Based on these findings, we predicted that patients who began treatment with Avonex at the beginning of the study (Avonex new, AN) would show a lower degree of fMRI activity in the LIFG than patients who had been taking a regimen of Avonex for at least 6 months prior to the study (Avonex Previous; AP). A greater treatment effect, in terms of lower activation, would be expected in patients starting new Avonex treatment compared to those on a stable, chronic dose.

Participants and Methods : Sixteen patients with relapsing-remitting MS (RRMS) were enrolled in a non-randomized, open-label, single-blinded DMD study: 8 RRMS were on a stable dose of Avonex for more than 6 months prior to enrollment, while 8 RRMS patients were naive to DMD treatment. The former group continued on their regimen of

Avonex (AP) and the latter group initiated treatment with Avonex (AN) at study onset. The groups did not differ in age, education, and EDSS. Baseline fMRI was acquired using a verbal episodic memory test and the N-back test of working memory. The same fMRI protocol was repeated at 8 months. A region of interest analysis was performed on the LIFG. **Results :** Percent change in MR signal (% MR Signal) from the LIFG was calculated for each of the scanner sessions. Consistent with our hypothesis, the difference in % MR Signal between the baseline and 8-month follow-up (T2 - T1) was 0.04 (SD= 2.26) in the AN group and 2.01 (SD = 1.55) in the AP group.

Conclusions : This pilot study of 16 RRMS patients suggests a positive treatment effect for the initiation of DMD treatment with Avonex, using fMRI activation in the LIFG as the primary outcome measure.

Correspondence: *Angela C. Gleason, Ph.D., Dept of Neurology, Medical College of Wisconsin, 9200 W Wisconsin Ave, Milwaukee, WI 53226-3596. E-mail: agleason@neuroscience.mcu.edu*

B.C. McDONALD, H.A. WISHART, K.R. DEVIVA, L.A. FLASHMAN, R.M. ROTH, J.W. MACDONALD, A.C. MAMOURIAN, C.E. FADUL, L.H. KASPER & A.J. SAYKIN. Thalamic Atrophy Predicts Cognitive Functioning in Relapsing-Remitting MS.

Objective: Early models of the neural basis of cognitive deficits in MS focused on white matter lesion volume. More recently, whole brain atrophy has been posited to have an even stronger relationship with cognition. Focal subcortical gray matter (GM) volume loss has been demonstrated in MS, with the thalamus and basal ganglia prominently affected. The purpose of the present study was to investigate the relationship of subcortical GM volume changes with cognition in patients with relapsing-remitting (RR) MS.

Participants and Methods : Participants were 37 patients with RRMS and 18 demographically matched healthy controls. Study procedures included neuropsychological assessment and structural magnetic resonance imaging, including a T1-weighted 1.5 mm coronal volume acquired at 1.5 Tesla. GM volume was examined using voxel-based morphometry (VBM), which assesses local tissue volume on a voxel-by-voxel basis throughout the whole brain. Using Matlab and Statistical Parametric Mapping (SPM), scans were spatially normalized, segmented, modulated, and smoothed, and analyzed using the general linear model.

Results : Patients showed focal GM volume loss in the thalamus bilaterally ($p < .001$). The first eigenvariate of signal intensity in the thalamus was extracted as an index of local GM volume for correlation with neuropsychological performance (covarying for intracranial volume). As predicted, thalamic volume showed a direct correlation with cognition, most notably processing speed and executive functions ($p < .001$), as well as verbal and nonverbal memory ($p < .05$ and $.01$ respectively).

Conclusions : The data indicate that focal subcortical GM volume loss is present in RRMS and has a functional significance with respect to cognition. These findings challenge prior models of the neural substrate of cognitive loss in MS that were limited to global atrophy and lesion volume, and highlight the importance of considering focal subcortical GM changes.

Correspondence: *Brenna C. McDonald, Psy.D., Psychiatry, Dartmouth Medical School, DHMC, One Medical Center Dr., Lebanon, NH 03756-0001. E-mail: brenna.mcdonald@dartmouth.edu*

C.J. SCHRAMKE, T.F. SCOTT, A.A. VALERI & C.P. CHIEFFE. Antidepressant Use in Multiple Sclerosis: A Follow Up Study of Newly Diagnosed Patients.

Objective: To examine whether age, gender, type of MS therapy, MRI abnormalities, initial or final ratings of disability, or length of time with MS increases the risk of developing a mood disorder of sufficient severity to warrant antidepressant medication.

Participants and Methods : Records were reviewed of patients who were followed for a minimum of 4 years following initial diagnosis with

MS through the Allegheny MS Treatment Center. Records contained medication prescribed for MS, antidepressants prescribed, and ratings of disability using the EDSS at each appointment. Initial MRI results were rated for degree of abnormality. Independent sample t-tests, chi square, and Kruskal-Wallis tests were used as appropriate to look for between group differences in patients who did and did not receive antidepressants during follow up.

Results : 30 patients were identified who met inclusion criteria. 21 were prescribed antidepressants during follow up. There were no differences that even approached significance (i.e., $p > .10$) between groups in gender (29% vs. 33% female), age at diagnosis (35.3 vs. 38.4 years), years of MS (8.4 vs. 9.5), MS drug (4 no MS drug, 10 Avonex, 1 Betaseron, 6 Copaxone vs. 5 Avonex, 1 Betaseron, and 3 Copaxone), initial EDSS (rank 15.7 vs. 14.9) or final EDSS (rank 16.1 vs. 14.2). Years followed approached significance ($p = .081$) with patients receiving antidepressant medications being seen for a shorter time of follow up (8.7 vs 10.9 years).

Conclusions : We found 70% of patients were prescribed antidepressants during an average follow up period of 9.4 years (average of 8.7 years with a definite diagnosis of MS). Although other studies have found that the variables explored in this study are useful in predicting disease severity in MS or incidence of depression in patients without MS, these results suggest that they are not particularly helpful in predicting the long term development of mood symptoms significant enough to warrant medical treatment in patients with MS.

Correspondence: *Carol J. Schramke, Neurology, Allegheny General Hospital, 420 E. North Ave, Pittsburgh, PA 15212. E-mail: cschramke@yahoo.com*

B.A. PARMENTER, J.L. SHUCARD, R.T. CHO & D.W. SHUCARD. Information Processing Speed Deficits in MS: a Matter of Complexity.

Objective: It has been argued that WM deficits are present only in the more severe cases of multiple sclerosis (MS; DeLuca et al., 2004). The suggestion is that in less severe MS, deficits in WM performance are attributed to impairment of information processing speed (PS).

Participants and Methods : In the present study we tested 28 relapsing remitting (RR) MS patients and controls with a visual sequential letter n-back task in order to examine the relationship between PS (as measured by reaction time; RT) and increasing cognitive load in MS. Participants were administered the 0-, 1-, and 2 back tasks and RTs were recorded.

Results : Analysis of variance (ANOVA) yielded a significant group x n-back task interaction ($p < .02$). As expected, RT for all participants slowed as task complexity/WM load increased (i.e., from 0, to 1, to 2-back), and MS patients had slower RTs than controls across all tasks. However, the interaction indicated that there was a significantly greater slowing of RT from the 0 to 2-back and 1 to 2-back for MS compared to controls. Analysis of task performance (total correct and dyads) indicated that MS patients made significantly more errors than controls only for the 2-back task ($p = .03$).

Conclusions : These findings suggest that PS deficits are present in RR MS patients during a simple RT task (0-back), but become more prominent as WM demand increases. Task performance differences are only present between MS and controls during high WM demand (2-back).

Correspondence: *Brett A. Parmenter, Ph.D., Neurology, SUNY Buffalo, 319 Humphrey Street, Floor 2, New Haven, CT 06511. E-mail: brett.parmenter@gmail.com*

A.H. ROSEN, R.M. ROTH, H.A. WISHART, B.C. McDONALD, J.W. MACDONALD, L.A. FLASHMAN, K.A. RYAN, T.M. BAUMAN, B.J. OLIVER, A.C. MAMOURIAN & A.J. SAYKIN. Fornix Volume in Relapsing-Remitting Multiple Sclerosis.

Objective: The fornix is a major white matter tract within the limbic system (Carpenter, 1991), involved in memory and cognition (Gale et al., 1992) through its connections to the hippocampus. The purpose of this study was to test for atrophy of the fornix in patients with relapsing-remitting (RR) MS.

Participants and Methods : Participants included 20 patients with mild RRMS (EDSS=2.4±1.7) and 20 demographically matched healthy controls. MR imaging included a T1-weighted 1.5 mm coronal volume acquired at 1.5 Tesla. Fornix volumes were obtained by manually tracing the region of interest using the BRAINS program (Andreasen et al., 1993). The parameters used for tracing the fornix in the coronal plane followed a locally developed manual, based largely on guidelines published by Zahajsky and colleagues (2001). Intra- and inter-rater reliabilities for fornix volumes, assessed using the intraclass correlation coefficient, were above 0.90. Intracranial volume (ICV) was obtained using automated local scripts and the Statistical Parametric Mapping package (SPM; Wellcome Department of Cognitive Neurology, University College, London).

Results : After covarying for ICV, there were no group differences in fornix volume ($p > .05$). However, the expected group difference in brain parenchymal fraction emerged ($p < .05$). An unexpected side difference was also observed, with the right fornix volume greater than the left in both patients ($p < .005$) and controls ($p < .001$); this finding warrants further investigation.

Conclusions : Given the potential for white matter deterioration in MS, further examination of fornix shape and tractography may be warranted to detect more subtle changes than are evident in volumetric analysis. Correspondence: *Ariel H. Rosen, B.A., Department of Psychiatry, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756. E-mail: ariel.h.rosen@dartmouth.edu*

P.A. ARNETT, M.M. SMITH, J.M. BRUCE, L.B. STROBER, D.M. POLEN & F.H. BARWICK. MS Patients' Perceptions of the Relative Impact of Several Common Symptoms.

Objective: Individuals with MS commonly experience problems with fatigue, cognition, mood, ambulation, and weakness/paresthesias, among other domains. Although fatigue is often cited by patients as their most disabling symptom, little research has been conducted to evaluate patients' perceptions of the relative impact of the most common MS symptoms. The current study was designed with this goal in mind.

Participants and Methods : Ninety-seven MS patients and 27 demographically matched controls were administered the Multiple Sclerosis Symptom Severity Scale (MS-SSS). The MS-SSS, developed in our lab, consists of 25 items pertaining to MS symptoms that are summarized in 13 subscale domains including fatigue, cognition, mood, and ambulation, among others. Patients rate each item on a 5-point scale.

Results : Multivariate ANOVA with the 13 MS-SSS subscales as dependent measures revealed a significant multivariate effect, $F(13, 110) = 6.68, p < .001$. The largest univariate effect involved the Fatigue subscale, $F(1, 122) = 60.43, p < .001$, partial eta squared (η^2) = .33, followed by subscales for Ambulation/Motor, $\eta^2 = .27$, Weakness/Paresthesias, $\eta^2 = .26$, Bladder/Bowel, $\eta^2 = .16$, and Cognition, $\eta^2 = .14$. Univariate effects for subscales measuring problems with Swallowing, Sex, Vision, Pain, and Sleep were also statistically significant ($p < .05$), but with partial eta squared values $< .10$.

Conclusions : Even when considered in the context of other common MS symptoms, MS patients still view fatigue as their greatest problem. Our study places the impact of cognitive problems, depressed mood, and fatigue—three commonly studied domains within neuropsychology—in the broader context of problems that MS patients experience. Improved understanding of MS patients' perceptions of these problems should help clinicians address the range of difficulties these individuals face.

Correspondence: *Peter A. Arnett, Ph.D., Psychology, Penn State University, 522 Moore Building, University Park, PA 16802. E-mail: paa6@psu.edu*

E.H. TRITTSCHUH, L.H. SWEET, D.F. TATE, S.M. RAO & R.A. COHEN. Decreased gray matter volume among MS patients in regions identified with fMRI.

Objective: While lesions in white matter observed on magnetic resonance imaging (MRI) are key diagnostic features of Multiple Sclerosis

(MS), recent evidence suggests that there are coincident changes in gray matter. These changes have been noted in dorsolateral prefrontal cortices (DLPFC; Sailer, et al, 2003). Our group has previously used functional MRI (fMRI) to demonstrate differences in DLPFC activity between MS patients and healthy controls while performing an n-Back verbal working memory task (Sweet, et al, 2005).

Participants and Methods : To examine how the relationship between gray matter structure and function might be affected by MS in this region of demonstrated activation differences, we contrasted gray matter morphometry among our fMRI study sample, which included nine relapsing-remitting MS patients and eleven healthy control participants matched for age, education, and verbal IQ. Gray matter was identified using a voxel-based technique with high resolution T1 structural images and contrasted between groups in the DLPFC.

Results : Results indicated that the gray matter volume in the DLPFC is significantly reduced in MS patients.

Conclusions : This contributes to a growing literature on the importance of cortical pathology among MS patients. For instance, gray matter changes may correlate with cognitive function better than traditional measures of white matter lesions. This approach appears promising, as prior studies attempting to relate white matter changes to cognitive function have typically yielded weak or mixed results. Our results suggest that a greater focus on gray matter changes may provide a method to better understand the relationship between pathological structure and function among MS patients.

Correspondence: *Emily H. Trittschuh, Psychiatry, Brown University Medical School, 345 Blackstone Blvd, TRG - Weld 2nd floor, Providence, RI 02906. E-mail: ETrittschuh@butler.org*

J.L. SHUCARD, B.A. PARMENTER & D.W. SHUCARD. Event-related Brain Potentials and Processing Speed in MS.

Objective: Information processing speed and working memory (WM) deficits have been observed in multiple sclerosis (MS), mainly with the use of neuropsychological tests. Event-related brain potentials (ERPs) are independent of deficits in motor activity and can provide an index of central processing speed. We explored the relationships among measures of performance, motor processing speed (reaction time; RT), and central processing speed (ERP P3 latency) using a visual sequential-letter n-back task.

Participants and Methods : ERPs were recorded for 18 MS patients (15 relapsing-remitting, 3 secondary progressive) to each letter of the 0,1, and 2-back tasks. ERP latency, amplitude, and RT measures were obtained for correct responses.

Results : RT for correct responses on the 2-back task was significantly correlated with 2-back latency (e.g., P3 at the parietal scalp site; $r = -.57, p < .01$), and with 2-back performance (e.g., 2-back total correct; $r = -.79, p < .001$). Thus, unexpectantly, shorter RT was associated with longer P3 latency and better performance on the 2-back task. Shorter P3 latency at the parietal site, however, was associated with poorer performance on the 2-back for both total correct responses ($r = .71, p < .001$) and percent of chunking responses (an index of decreased working memory burden; $r = -.63, p < .005$).

Conclusions : These findings reveal a dissociation between motor and central processing speed in MS during a demanding WM task. It appears that poorer performers took less time to process the WM stimuli (shorter P3 latency) because WM burden was reduced (more chunking), but they reacted with a slower motoric response than better performers.

Correspondence: *Brett A. Parmenter, Ph.D., Neurology, SUNY Buffalo, 319 Humphrey Street, Floor 2, New Haven, CT 06511. E-mail: brett.parmenter@gmail.com*

W.S. MACALLISTER, A. SOBEL, C. CHRISTODOULOU, M. MILAZZO & L.B. KRUPP. Executive Functioning in Pediatric Multiple Sclerosis.

Objective: To assess executive functioning in pediatric Multiple Sclerosis (MS) patients and identify predictors of impairment.

Participants and Methods : Twenty-six clinically definite pediatric MS patients (ranging in age from 12 to 17 years) were enrolled in the study. Clinical data, including age, number of relapses, disease length, and fatigue were recorded. Parents of these individuals completed the Behavioral Rating Inventory of Executive Functions (BRIEF) Parent Form and scores were compared against age and gender appropriate normative data. Executive functions were considered impaired if T-scores exceeded 65. Correlational analyses assessed the relations between clinical variables and executive functions.

Results : Approximately half of all patients showed deficits in at least one executive function (12/26, 46.2%). Shifting attention was the most frequently impaired executive function (8/26, 30.8%) with inhibition being the least likely to be rated as deficient (4/26, 15.4%). Pearson correlations indicated that only physical disability predicted problems in executive functioning, with $r = .44$ ($p = .023$) between EDSS score and the working memory subscale of the BRIEF. A trend toward a relation between fatigue and organization was evident, but this failed to reach statistical significance ($r = -.37$, $p = .063$).

Conclusions : Pediatric MS patients show a range of deficits in executive functioning with the most frequently problematic area involving flexible problem solving and alternating attention. Level of neurologic disability is related to problems in working memory.

Correspondence: *William S. MacAllister, Ph.D., SUNY Stony Brook, HSC T-12-020, Stony Brook, NY 11794-8121. E-mail: umacallister@notes.cc.sunysb.edu*

J. LENGENFELDER, A. SMITH, N.B. MOORE, D. BRYANT, Y. GOVEROVER & J. DELUCA. Examining Metamemory in MS Using a Complex Working Memory Task.

Objective: One aspect of metamemory involves self-report about one's memory and the prediction of future task performance. Few studies have examined metamemory in MS, and the results of those that have are inconclusive. This study examined the differences between persons with MS and healthy controls (HC) in predicting their performance before and after a complex working memory task.

Participants and Methods : Fifty-two individuals with MS and 27 HC were asked both before and after a complex task to predict how many items they would correctly answer. The task was the Keeping Track Task (KTT), which is a working memory task that uses 4 conditions of different structural and operational load combinations.

Results : Persons with MS significantly differed from HC in 3 of the 4 conditions when predicting their performance before the task compared to their actual performance ($p = .04$, $.02$, $.02$). Specifically, persons with MS significantly underpredicted their performance compared to HC. In contrast, there was no difference between MS and HC groups in their post-test prediction compared to their actual performance. After completing the test, persons with MS were just as accurate in predicting how many correct responses they would have as the HC group.

Conclusions : The findings will be discussed in the context of advancing the understanding of the process of metamemory in MS which can further help in developing strategies or interventions for accurate appraisals of their abilities.

Correspondence: *Jean Lengenfelder, Neuroscience, Kessler Medical Rehabilitation Research & Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: jlengenfelder@kmrrec.org*

J. LENGENFELDER, J.H. KALMAR, N.B. MOORE & J. DELUCA. The Effects of Processing Speed on Reading Difficulties in MS.

Objective: Reading difficulties are a common complaint in individuals with MS yet little research has been done to examine reading impairments in MS.

Participants and Methods : Based on a self-report measure, over 70% of individuals with MS ($N=29$) expressed difficulties in remembering written information (i.e., novel, newspaper, magazine article). To ex-

amine whether processing speed deficits may contribute to reading impairments in MS, performance on a test of single word reading (WRAT-3) and paragraph recall (Logical Memory I) was examined in persons with MS and healthy controls (HC; $N=39$). Persons with MS were subdivided into two groups based on processing speed impairments (MS-impaired [$N=23$] and MS-not-impaired [$N=56$]).

Results : On single word reading, the MS-impaired group read fewer correct words than MS not-impaired and HC groups (MS not-impaired $p < .05$, HC $p < .01$). MS not-impaired did not differ from HC ($p = .67$). On paragraph recall, the MS-impaired group recalled fewer items from the story than MS not-impaired and HC groups (MS not-impaired $p < .05$, HC $p < .01$). MS not-impaired did not differ from HC ($p = .09$). When years of education were taken into account all the results remained unchanged.

Conclusions : These results suggest that processing speed impairments may at least in part underlie reading impairments in MS. Understanding reading problems in MS can contribute to effective remediation techniques and directly impact their daily lives, both to preserve favorite activities and to maintain independent functioning in daily living and work.

Correspondence: *Jean Lengenfelder, Neuroscience, Kessler Medical Rehabilitation Research & Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: jlengenfelder@kmrrec.org*

A. O'BRIEN, J. KALMAR, N. CHIARAVALLI & J. DELUCA. Predicting Objective & Subjective Functional Outcomes in Multiple Sclerosis Using Simple & Complex Processing Speed.

Objective: Processing speed (PS) is frequently impaired in persons with Multiple Sclerosis (MS; Rao et al., 1991) causing significant functional deficits. PS is often discussed as a unitary construct, but it is more accurately defined as simple and complex PS. Simple and complex PS were investigated to see how well they predict objective and subjective measures of functional outcomes. It was hypothesized that both measures of PS would predict objective functional outcomes, but that complex PS would account for significantly more of the variance in objective functioning. It was also hypothesized that depressive symptomatology, not PS, would significantly predict self-reports of functioning.

Participants and Methods : 46 persons with clinically definite MS participated. Average age was 46.3 years ($SD = 8.9$) and 80% were female. Participants completed neuropsychological assessments including PS tasks (i.e., Paced Auditory Serial Addition Task, Symbol Digit Modality Test). Measures of mood, disability, objective functioning (Executive Functioning Performance Test), subjective functioning and demographic information were also completed.

Results : After controlling for age, education, EDSS scores, and depressive symptomatology, simple PS significantly accounted for 25.6% of the variance in objective functioning ($p < .01$). Complex PS contributed an additional 3.0% to the variance, which was not significant. In the second analysis, after controlling for age, education, and EDSS, depressive symptomatology significantly accounted for an additional 36.8% of the variance in subjective functioning ($p < .01$). As expected, neither PS variable accounted for a significant amount of the variance in subjective functioning (2.5%, $p > .05$).

Conclusions : This study demonstrated the significant impact that PS has on everyday functioning in MS. It adds to a growing body of literature that demonstrates that self-reports of cognition are often not related to actual cognitive performance in MS, especially in the presence of depressive symptomatology.

Correspondence: *Amanda O'Brien, Ph.D., Neuropsychology & Neuroscience Lab, Kessler Medical Rehab Research & Education Corp, 300 Executive Drive, Suite 10, West Orange, NJ 07052. E-mail: aobrien@kmrrec.org*

B.A. HOMOLESKI, R.M. ROTH, H.A. WISHART, H.B. CLEAVINGER, B.C. MCDONALD, K.A. RYAN, B.J. OLIVER, T.M. BAUMAN, L.A. FLASHMAN, J.W. MACDONALD, A.C. MAMOURIAN & A.J. SAYKIN. Temporal Stem Volume in Relapsing-Remitting Multiple Sclerosis.

Objective: Global and regional brain volume changes have been observed in patients with relapsing-remitting multiple sclerosis (RRMS). The temporal stem (TS) contains several fiber tracts connecting the temporal lobe with other brain areas, and degeneration within the TS may be associated with neuropsychological changes. We therefore examined whether patients with RRMS show reduced volume of the TS relative to healthy controls, and whether TS volume is related to cognition or mood within the patient group.

Participants and Methods : Participants included 20 patients with mild RRMS (EDSS=2.4+1.7) and 20 demographically matched healthy controls, who completed the CVLT, Trail Making Test, Beck Depression Inventory, and State-Trait Anxiety Inventory. T1-weighted 1.5 mm coronal volumes were acquired at 1.5 Tesla. TS volumes were obtained through manual tracing using BRAINS software, and intracranial volume (ICV) through automated local scripts and the Statistical Parametric Mapping package. TS tracing guidelines were adapted from Bigler et al (2003). Reliabilities for left and right hemisphere TS volume, assessed using the intraclass correlation coefficient, were above .90.

Results : TS volumes, covaried for ICV, were smaller in patients in both hemispheres. Patients scored higher on depression and trait anxiety scales, but there were no group differences in cognition. TS volume was unrelated to memory, executive function, and mood.

Conclusions : These findings indicate that volume loss in the TS can be observed even in patients with relatively mild RRMS. Further research in patients with more advanced disease would be necessary to determine whether TS volume is related to cognition in MS.

Correspondence: Brent A. Homoleski, M.D., Psychiatry, Dartmouth Medical School, 1 Medical Center Drive, Lebanon, NH 03756. E-mail: brent.a.homoleski@hitchcock.org

F. BARWICK & P. ARNETT. Relationship Between Long-Term Cognitive Decline and Depressive Symptoms in MS.

Objective: Declines in intellectual functioning in multiple sclerosis (MS) patients typically occur over many years and may make it more difficult for patients to function over time and thus result in depression. To evaluate this possibility, we compared depression scores in a group of MS patients who showed evidence of intellectual decline with those who showed stable functioning. Because of the neurovegetative depression symptom/MS symptom overlap, we hypothesized that the intellectual decline group would display elevated mood and evaluative, but not vegetative, depression symptoms.

Participants and Methods : 174 MS patients were assessed for current Full Scale WAIS-R IQ using the Shipley Institute of Living Scale. WAIS-R premorbid IQ was estimated from the Barona-Chastain demographic formula. A Cognitively Declined group (n = 32) had current IQ at least 10% below their premorbid estimate, a Cognitively Stable (n = 63) group had a current IQ at or above their premorbid estimate, and the remaining patients comprised a middle group (n = 79). Depression symptoms were measured using the Chicago Multiscale Depression Inventory (CMDI).

Results : Planned comparison following a significant group effect ($p < .01$) in the ANOVA for the combined CMDI mood-evaluative scale revealed significantly higher scores in the Cognitively Declined compared with the Cognitively Stable group ($p < .005$). Neither the ANOVA nor the planned comparison for the CMDI vegetative scale was statistically significant.

Conclusions : Our data suggest that MS patients who experience IQ decline may be at significantly elevated risk for mood and evaluative depression symptoms, and should thus be evaluated thoroughly for possible clinical depression.

Correspondence: *fiona H. barwick, psychology, pennsylvania state university, 522 bruce v. moore building, college of liberal arts, university park, PA 16802-3105. E-mail: fhb103@psu.edu*

D.M. MOSNIK, L.E. STERLING, M. WHEATON, H. SCHMOLCK & P.E. SCHULZ. The Dissociation of Dysarthria from Cognitive Dysfunction in ALS.

Objective: Fifteen percent of patients with amyotrophic lateral sclerosis (ALS), a neurodegenerative disorder of motor neurons, present with dysarthria and the majority eventually develop speech dysfunction. Fifty-one percent of ALS patients have cognitive impairment. It has been suggested that dysarthria is either associated with dementia or it confounds the cognitive testing by producing the apparent impairment observed. We undertook a large scale study to better understand the relationship between dysarthria and cognitive performance.

Participants and Methods : ALS patients completed comprehensive neuropsychological testing and speech assessment (n=175). This included 112 males and 63 females who differed significantly in age (55.5+13.4 vs. 62.0+15), education (14.4+3 vs. 13+3), and overall severity of dysarthria (2.5+1.5 vs. 3.3+ 1.8 Sterling scale; 5.25+2.8 vs. 6.6+3.2 Appel scale).

Results : ANCOVAS with gender as covariate revealed a significant effect of dysarthria on VSAT-time ($p=.003$), but no significant effects were seen on other tests of executive skills, attention, or learning and memory. Post-hoc analyses indicated that this difference was accounted for by older females. When the patients were divided into those with normal to moderate dysarthria vs. those with moderately-severe or worse dysarthria, patients with severe dysarthria were found to perform significantly more poorly on VSAT-time, oral symbol-to-digit transcription, letter fluency, semantic fluency, and immediate and delayed verbal memory recall.

Conclusions : These data suggest that speech dysfunction is not responsible for the cognitive dysfunction seen in ALS. Only severe dysarthria is associated with poorer performance on some tests requiring verbal output, but not all tests assessing executive function.

Correspondence: *Diane M. Mosnik, Ph.D., Neurology, Baylor College of Medicine, 6550 Fannin, Smith Tower 1903, Houston, TX 77030. E-mail: dmosnik@bcm.tmc.edu*

Stroke

S.W. LIU, R.C. CHAN & X.Q. LIU. Care burden experienced by family caregivers of stroke survivors: An exploratory study in Guangzhou.

Objective: The main purpose of this study was to examine the care burden experienced by a group of caregivers of stroke or head-injured survivors. In particular, it aimed to explore the various potential risk factors of care-giving.

Participants and Methods : A total sample of 30 caregivers was recruited and investigated using a comprehensive set of questionnaires.

Results : Care burdens were inversely correlated with life satisfaction and depression, and positively with dysexecutive problems. Most people have got mild depression. More than half of the caregivers did not feel satisfied with their lives. Though there was no gender difference in perceived care burden, female caregivers experienced more depressive state and felt dissatisfied with life. Escape-avoidance and confrontive coping strategies, social support, relation to patient, and time spent on caregiving were found related to care burden. Wscape-avoidance coping strategy was also related to psychological health status.

Conclusions : These preliminary findings suggested that care burden existed among caregivers for stroke survivors. Deprivation of social support, and ways of coping might possibly be the risk factors for the present sample.

Correspondence: *Raymond C. Chan, Ph.D., Psychology, Sun Yat-Sen University, NA, Guangzhou 510275, China. E-mail: rekchan2003@yahoo.com.hk*

S.R. WETTER & K.Y. HAALAND. Predictors of Self-Reported Disability after Unilateral Stroke.

Objective: Investigate whether the cognitive and motor factors that influence self-report of physical activities and instrumental activities of daily living (IADLs) differ after left vs. right hemisphere damage (LHD,RHD).

Participants and Methods : Volunteer right-handed sample; stroke patients with LHD or RHD more than 4 years post-stroke and matched adult participants who served as a healthy control group (HC). Self-report was used because it was highly correlated for both stroke groups ($r = .84$ for IADL, $r = .83$ for Physical).

Results : Physical activities were reported as more impaired in the RHD group, while the LHD group reported no greater deficits than the HC group. IADLs were equally impaired in both stroke groups. Physical activities were equally impaired in the LHD groups regardless of limb apraxia, while the apraxic group was more impaired than the nonapraxic group for IADLs. Regression analyses demonstrated that limb apraxia, aphasia, spatial skills, and contralesional or ipsilesional motor skills did not predict physical activity for the LHD group, but spatial skills and contralesional motor performance were predictive for the RHD group. IADLs were predicted by aphasia and ipsilesional motor performance for the LHD group and by contralesional motor performance for the RHD group.

Conclusions : 1) The pattern of self-reported deficits after unilateral stroke vary for physical and IADLs; 2) Limb apraxia influences IADLs more than Physical self-report; 3) Ipsilesional motor performance was more predictive of IADL self-report for the LHD than the RHD group, further emphasizing the importance of ipsilesional motor skills after LHD. Correspondence: *Spencer R. Wetter, Ph.D., Psychiatry, UC San Diego, 9648 Caminito Del Feliz, San Diego, CA 92121. E-mail: spwetter@yahoo.com*

P.L. EBERT, G.A. ESKES, D. BENEDICT-THOMAS & L. REES. The Role of Neuropsychological Assessment in Predicting Stroke Outcomes.

Objective: With limited healthcare resources, funding for neuropsychological services is often scarce particularly in inpatient rehabilitation. While other professions provide information on motor and functional abilities, neuropsychologists provide unique information on cognitive and emotional functioning. The goal is to better understand relationships between neuropsychological test performance and stroke outcomes, and to emphasize the role of neuropsychological assessment in discharge planning.

Participants and Methods : This study included 163 consecutive admissions to an inpatient rehabilitation unit. Each participant completed neuropsychological screening (e.g., Cognistat, Geriatric Depression Scale, Sunnybrook Neglect Assessment Procedure, Trailmaking Test, Digit Span, Hooper Visual Organization Test, and Verbal Paired Associates) within two weeks of admission. Outcome measures included the Barthels Index at discharge (e.g., ADL), length of stay, discharge destination, and successful completion of training for self-administered medication (e.g., IADL).

Results : In addition to initial functional level and demographic data, neuropsychological scores on orientation, attention, memory, language, verbal reasoning, visuospatial skills, hemispatial neglect, and mood uniquely predicted change in Barthels Index scores at discharge ($F_{10,78}=12.7$, $p<0.001$, $R^2=0.39$; $\Delta R^2=0.161$ $F_{8,78}=2.56$, $p=0.015$). The same neuropsychological measures uniquely predicted success in med-

ication training ($X^2=12.7$, $df=10$, $p<0.001$, $-2LL=75.4$; $\Delta X^2=23.2$ $df=8$, $p=0.003$). Language measures uniquely predicted of length of stay ($F_{2,86}=22.5$, $p<0.001$, $R^2=0.59$; $\Delta X^2=0.037$ $F_{1,86}=4.8$, $p=0.031$), and orientation uniquely predicted discharge destination ($X^2=12.7$, $df=2$, $p=0.001$, $-2LL=75.5$; $\Delta X^2=5.81$ $df=1$, $p=0.016$).

Conclusions : In conclusion, neuropsychological screening is important in predicting ADL and IADL outcomes and contributes valuable information for discharge planning. These results suggest that neuropsychological services have a valuable role in rehabilitation.

Correspondence: *Patricia L. Ebert, M.Sc., KLRU, Baycrest Centre for Geriatric Care, 7 Grackle Trail, Scarborough, ON M1X 2A4, Canada. E-mail: pebert@klaru-baycrest.on.ca*

K. FABRIZIO, L. GONZALEZ-ROTHI, M. DIEHL, S. SEARS, B. STIDHAM, M. MENNEMEIER & B. CROSSON. Automatic and Controlled Cognitive Processes in Post-Stroke Depression.

Objective: A wealth of literature supports the finding that post-stroke depression (PSD) is relatively frequent and is highly correlated with anterior, left-hemisphere lesions. However, literature aimed at replicating these findings has often failed to demonstrate a relationship between lesion location and the development of depression.

The purpose of our study was to examine for possible differences in processing of positive and negative emotional connotation in those with varying levels of depression using a sample consisting of stroke and neurologically uninjured participants.

Participants and Methods : The sample included 42 participants in two groups (23 neurologically uninjured, 19 chronic anterior, left-hemisphere stroke survivors). Two computerized paradigms were used to tap automatic and controlled cognitive processing of emotional, verbal information and depression levels were assessed through a structured interview.

Results : Regression analyses were performed, with results not supportive of either an automatic or controlled processing bias toward affectively negative information in depression, in either group. Group membership was the only predictor of negative priming effects, with stroke participants showing greater priming for negative information. In addition, reactivity to positive information on a controlled processing task differed between the groups.

Conclusions : Results suggest that stroke patients with left-hemisphere, anterior lesions are more biased toward affectively negative information at an automatic level, and that depression affects their interpretation of positive information at a controlled processing level differently than in those without strokes. These results may explain why the probability of depression in patients with left anterior lesions is high.

Correspondence: *Katherine Fabrizio, Ph.D., Neurosurgery, University of Alabama at Birmingham, Clinical Neuropsychology Service, FOT 1062, 1530 3rd Ave South, Birmingham, AL 35294-3410. E-mail: kfabricio@uab.edu*

M.C. WILDE. The performance of Acute Stroke patients on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Objective: The validity of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was evaluated in acute stroke by comparing the performance of patients with left and right hemisphere lesions.

Participants and Methods : This sample included 129 ischemic stroke patients with anterior fossa lesions. The patients had no history of neurologic, psychiatric, or substance abuse disorder. The sample was divided into two groups according to lesion laterality as determined by CT and/or MRI findings. There were 60 left, 69 right hemisphere stroke patients. There were no age, education, chronicity, racial or gender differences. Group comparisons of the five RBANS index scores were analyzed using t tests for independent samples.

Results : Right hemisphere patients outperformed those with left sided lesions on the Immediate and Delayed Memory Index Scores while the

left hemisphere patients outperformed the right hemisphere patients on the Visuospatial/Constructional Index. There was a trend toward the left hemisphere CVA patients outperforming the right sided patients on the Language Index ($p = .07$). There were no group differences for the Attention and Total index scores.

Conclusions : Patients with lateralized cerebral lesions perform as would be expected on the RBANS. The significance of these findings for the validity of the RBANS in stroke is discussed.

Correspondence: *Mark C. Wilde, Psy.D., Department of Physical Medicine and Rehabilitation, UT Medical School Houston, 6431 Fannin 5.220, Houston, TX 77030. E-mail: mark.c.wilde@uth.tmc.edu*

C. VICKERY. Changes in Emotional Functioning Over Time Following Stroke as a Function of Laterality.

Objective: The present study explored differential patterns of emotional self-report over time as a function of laterality in a group of individuals in an inpatient stroke rehabilitation program.

Participants and Methods : A group of 57 patients with stroke (24 right hemisphere, 33 left hemisphere) were administered the Visual Analogue Mood Scales (VAMS) within 72 hours of admission to an inpatient rehabilitation program. The VAMS consists of eight scales (Afraid, Confused, Sad, Angry, Energetic, Tired, Happy, Tense) that are visually presented, with patients indicating degree of each mood state experienced on a 100mm line. Patients were re-administered the VAMS one week later.

Results : Results indicated that there were no differences as a function of laterality on any VAMS scale at either point in time. However, there were significant differences on several VAMS scales between time one and time two, suggesting reductions in self-reported negative mood states. A significant interaction of laterality and time on the Confused scale suggested that the patients with left hemisphere stroke reported a greater reduction in subjective mental confusion than the patients with right hemisphere stroke.

Conclusions : These results suggest that there were no differences between patients with right and left hemisphere stroke in self-reported emotional functioning, and that the patients showed significant improvement in emotional status in a relatively short amount of time. Future research would be helpful in identifying predictors of improvement in emotional status in the rehabilitation setting and exploring the functional implications of this improvement.

Correspondence: *Chad Vickery, Ph.D., Methodist Rehabilitation Center, 1350 E Woodrow Wilson, Jackson, MS 39216. E-mail: chadvickery@hotmail.com*

T. BENNETT & C. VICKERY. Ecological Validity of the RBANS as Pertains to Health and Safety Reasoning.

Objective: Neuropsychological testing is often used to assess patients' cognitive capacity to function independently in the home setting following a stroke. One aspect of this capacity is the ability to engage in effective safety reasoning and to be mindful of health-related issues. The present study explored the cognitive components of health and safety reasoning using the RBANS and measures of abstract reasoning.

Participants and Methods : Thirty patients in an inpatient stroke rehabilitation program were administered the RBANS, the Similarities and Matrix Reasoning subtests from the WAIS-III, and the Health and Safety subtest of the Independent Living Scale.

Results : Correlational analysis indicated significant relationships between the Health and Safety subtest and the Immediate Memory, Language, Attention, and Delayed Memory indices of the RBANS and Similarities. These variables were entered into a stepwise regression analysis with Health and Safety subtest performance as the dependent variable. The results indicated that RBANS Delayed Memory accounted for 33.1% of the variance, and Similarities accounted for an additional 10.2% of the variance in Health and Safety Reasoning performance.

Conclusions : These results suggest that the ability to problem-solve safety and health issues is related to intact memory and abstract verbal reasoning.

Correspondence: *Chad Vickery, Ph.D., Methodist Rehabilitation Center, 1350 E Woodrow Wilson, Jackson, MS 39216. E-mail: chadvickery@hotmail.com*

T. BENNETT & C. VICKERY. RBANS Performance Following Stroke: Effects of Laterality and Corticality.

Objective: The present study explored the effects of laterality (right vs. left hemisphere) and corticality (cortical vs. subcortical) of stroke on RBANS performance.

Participants and Methods : A sample of 106 patients with stroke (right cortical $n = 28$; right subcortical $n = 32$; left cortical $n = 18$; left subcortical $n = 28$) in an inpatient rehabilitation setting were administered the RBANS. Location of stroke was determined on the basis of neuroimaging findings. A MANOVA analysis was performed with the five RBANS indices (Immediate Memory, Visuoconstruction, Language, Attention, and Delayed Memory) in a 2 X 2 design (laterality and corticality as the main factors).

Results : Results indicated a significant overall main effect of laterality, no effect of corticality, and an interaction effect of the main factors. Post hoc analyses indicated significant interaction effects on the Visuoconstruction and Delayed Memory indices, with patients with right cortical strokes obtaining the poorest Visuoconstruction scores and patients with left subcortical strokes obtaining the poorest scores on the Delayed Memory Index.

Conclusions : These results suggest that performance patterns on the RBANS may be helpful in stroke localization beyond a simple right vs. left distinction.

Correspondence: *Chad Vickery, Ph.D., Methodist Rehabilitation Center, 1350 E Woodrow Wilson, Jackson, MS 39216. E-mail: chadvickery@hotmail.com*

C. VICKERY. Early Screening with the Modified Mini-Mental Status Exam and Neuropsychological Performance in the Acute and Post-acute Phases Following Stroke.

Objective: The present study explored the relationship between the Modified Mini-Mental Status Exam (3MS) and neuropsychological test performance during the acute phase of stroke and in the post-acute phase.

Participants and Methods : A group of 35 individuals in an inpatient stroke rehabilitation program were administered the 3MS within 72 hours of admission. These patients were administered the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and the Similarities subtest from the WAIS-III one week later and again approximately three months later.

Results : Regression analysis using admission 3MS scores as the dependent variable and the five RBANS indices (Immediate Memory, Visuoconstruction, Language, Attention, Delayed Memory) and Similarities as the predictor variables showed that delayed memory performance was most related to the admission 3MS scores in the acute phase ($R^2 = .30$) and in the post-acute phase ($R^2 = .41$).

Conclusions : These results suggest that 3MS scores in the early stages following stroke are related to delayed memory consistently across time, and that the 3MS as an early screening device may be useful in predicting cognitive functioning in the later stages of stroke recovery.

Correspondence: *Chad Vickery, Ph.D., Methodist Rehabilitation Center, 1350 E Woodrow Wilson, Jackson, MS 39216. E-mail: chadvickery@hotmail.com*

S. LOMBARDI, D. ORLOV, C.S. LABRISH & N.W. PARK. Performance Errors During the Physical Enactment of Novel Naturalistic Actions in Stroke Patients.

Objective: Previous studies of routine naturalistic actions (NAs; goal-directed series of actions) in stroke patients have shown that high error producers as compared to low error producers demonstrated (a) an increase in the number of central action (crux) omission errors; and (b) no significant difference in the number of crux commission errors. This study assessed performance in stroke patients on the enactment of novel naturalistic actions (NNAs). We wanted to determine whether the pattern of different types of errors observed with routine NAs would also be observed with NNAs to gain insight into the cognitive processes mediating NA performance.

Participants and Methods: A total of 7 stroke patients physically performed four NNAs immediately after viewing a demonstration of each action. Enactment performance error was scored using a system based on the Action Coding System developed by Schwartz et al, 1991. Patients were grouped according to a median split on total error scores. Patients also completed a set of neuropsychological tests to assess cognitive functioning.

Results: Stroke patients categorized as high error producers omitted significantly more crux actions, $M = 3.75$, $SD = 2.598$, than low error producers, $M = 0.83$, $SD = 0.144$, in their enactment of NNAs, $t(5) = 1.896$, $p = 0.044$. Conversely, there was no significant difference between high error producers, $M = 3.31$, $SD = 1.161$, and low error producers, $M = 1.42$, $SD = 0.382$, on their production of crux errors of commission. Further analyses investigated non-crux errors, the relative frequency of errors in both groups, and related NNA performance to neuropsychological test scores.

Conclusions: The similarity of our findings with NNAs to those found with routine NAs suggests that the cognitive processes associated with novel and routine actions may be similar.

Correspondence: *Sabrina Lombardi, BSc., Psychology, York University, Atkinson, Room 026, 4700 Keele Street, Toronto, ON M3J 1P3, Canada. E-mail: slombar@yorku.ca*

D. JOHNSON-GREENE, J. DENNING, H. NISSLEY & P. TOURADJI. Comparison of Psychometric Measures for Assessment of Post-Stroke Depression.

Objective: Post-stroke depression is commonplace, but existing inventories lack normative data, have been associated with several sources of bias, and its association with cognitive impairments has received relatively little attention. The purpose of this study was to evaluate the association between demographic, cognitive impairments, and the prevalence and severity of depressive symptoms across multiple measures of depression in patients with acute CVA.

Participants and Methods: 62 elderly patients with acute CVA were administered in random order the Geriatric Depression Scale (GDS), Centers for Epidemiological Studies of Depression (CES-D), Hamilton Rating Scale (HRS), Stroke Inpatient Depression Scale (SIDI), the Structured Clinical Interview for DSM-IV (SCID) and a self-rating of mood as part of a comprehensive neuropsychological assessment to determine the prevalence and severity of depression and its relationship to cognition.

Results: Major depression was present in only 11% of the sample, but minor depression was present in 30% of patients with CVA. No significant relationships were found for age, gender, education, and side of stroke. Depression was associated with measures of verbal fluency but no other cognitive domains. Self-ratings of mood were most strongly associated with the GDS ($r = .59$, $p < .001$), but other-rated measures (HRS) were most strongly associated with the SIDI ($r = .61$, $p = .001$). Discriminant function analyses showed a 90.3% correct classification for mild, major, and no depression using the HRS and the SIDI, which accounted for 97.9% of the available variance.

Conclusions: These results highlight the high prevalence of post-stroke depression and differences between self and other-rated psychometric inventories. Depression does not appear to be related to most cognitive domains in persons with acute stroke.

Correspondence: *Doug Johnson-Greene, Ph.D., Physical Medicine and Rehab, Johns Hopkins Medicine, 5601 Lock Raven Blvd, Good Sam POB 406, Baltimore, MD 21239. E-mail: johnsong@jhmi.edu*

E.H. DE HAAN, G.M. NYS, M.J. VAN ZANDVOORT & J.L. KAPPELLE. Neuropsychological Sequelae of Cerebellar Stroke.

Objective: Over the last decade, several studies have suggested that cerebellar damage might cause cognitive impairments in addition to motor deficits. In the context of a large scale study in which stroke patients were evaluated neuropsychologically in the sub-acute phase, we included 8 patients with lesions confined to the cerebellum. The aim was to substantiate the claim of cognitive deficits, and if so, to qualify the nature of the impairments.

Participants and Methods: The present study entailed 8 patients with a stroke in the cerebellum and 39 control subjects who were selected on the basis of age (mean-controls = 71.8; mean-patients = 71.9) and education (mean-controls = 4.13; mean-patients = 4.23). The patients were examined at a mean interval of 7 days post-stroke. A test battery was administered covering six major cognitive domains: (1) abstract reasoning: Raven Advanced Progressive Matrices, Similarities (WAIS); (2) verbal memory: Rey Auditory Verbal Learning Test, Digit Span (WAIS); (3) attention and executive functioning: Brixton Spatial Anticipation Test, Visual Elevator (Test of Everyday Attention), Letter Fluency; (4) Visual perception and construction: Judgement of Line Orientation, Test of Facial Recognition, Rey-Osterrieth Complex Figure-copy; (5) visual memory: Corsi Block Span, Rey-Osterrieth Complex Figure-delay; (6) language: Token Test, Boston Naming Test.

Results: There were significant differences between patients and control subjects on three tests. Patients with cerebellar lesion were impaired on the WAIS-similarities, verbal fluency and list learning (immediate recall, delayed recall & delayed recognition). The patients performed within the normal range on most of the other tasks.

Conclusions: These findings suggest that cerebellar damage can affect cognitive functioning and that, in line with for instance Marien et al. (Brain and Language, 2001, 79, 580-600), higher-order verbal processes are particularly at risk.

Correspondence: *Edward H. De Haan, PhD, Psychological Laboratory, Utrecht University, Heidelberglaan 2, Utrecht 3584 CS, Netherlands. E-mail: e.dehaan@fss.uu.nl*

J.B. WILLIAMSON, L. PEDELTY, D. NYENHUIS & P. GORELICK. Baseline Demographic and Cognitive Differences between Reverters and Nonreverters with Vascular Cognitive Impairment No Dementia.

Objective: Reversion (i.e. switching from impairment to no impairment) is a conceptual problem for dementia precursor studies (e.g., Mild Cognitive Impairment (MCI); Vascular Cognitive Impairment No Dementia [VCIND]). Little work has been completed that explores reasons for reversion. We compare demographic and cognitive factors in reverters and nonreverters in an ischemic stroke patient group.

Participants and Methods: Participants were subjects in the Risk Marker for Dementia After Stroke (RMDAS) study. They were > 49.5 years of age; met NINDS stroke databank criteria for ischemic stroke; were free from additional neurological illness and completed both baseline (3-6 months after stroke) and one year follow up examination. 31 were classified with VCIND at a baseline diagnostic consensus conference based on neuropsychological, neurological and medical history data. At one year 14/31 reverted to no cognitive impairment status while 17/31 did not.

Results : There were no group differences in age, education, or sex. On a summary score that spanned Orientation, Attention, Executive, Language, Visuospatial, Psychomotor, and Memory domains, one-way ANOVA revealed greater overall impairment in nonreverters. In addition, nonreverters were impaired in more cognitive domains than reverters (4.35/7 domains versus 2.78/7 domains). Psychomotor, language, and executive domains were most prominently affected.

Conclusions : Nonreverters are more cognitively impaired over a wider range of cognitive functions than reverters at baseline. These differences are not due to demographic factors. In depth analyses of VCIND progression, and specifically reversion have not been previously studied. Further exploration of functional and patient-specific disease process variables may improve diagnostic resolution.

Correspondence: *John B. Williamson, Ph.D., Neurology, University of Illinois at Chicago, 1819 West Summerdale Avenue, Apartment 1, Chicago, IL 60640. E-mail: jwillia2@uic.edu*

S. ZINN. White Matter Involvement in Processing Speed, Short Term and Working Memory: Evidence from Cerebrovascular Disease.

Objective: Microvascular disease can lead to white matter changes resulting in executive function impairment in patients with stroke risk factors and may also contribute to post-stroke cognitive impairment. Degradation of connectivity results in slower processing speed and reduced processing efficiency. Timed tests and those requiring short term retention or complex processing would be affected. We hypothesize that these different aspects of cognitive functioning may be differentially susceptible to microvascular damage in different locations. Specifically, it was predicted that processing speed would relate to deep white matter damage, that short term auditory memory processing would relate to periventricular white matter damage, and that working memory would relate to subcortical gray matter damage.

Participants and Methods : To examine this, a secondary analysis was performed on a dataset of executive function and memory tests collected from cerebrovascular disease inpatients (36 with stroke, 16 with stroke risk factors). Standardized composite scores were created from test indices reflecting either processing speed, short term memory or working memory. White matter lesions from MRIs were consensus rated using the Fazekas and Boyko criteria by two neuroradiologists blind to testing results.

Results : Pearson correlations partially supported the predictions. All three composites were related to deep white matter ($p < 0.05$). Processing speed and working memory were also related to periventricular white matter ($p < 0.05$), but short term memory only showed a trend toward significance ($p = 0.06$). Subcortical gray matter was not significantly related to any composite, although there was a trend for the short term memory composite.

Conclusions : White matter damage may have a broad impact on cognition.

Correspondence: *Sandra Zinn, PhD, Research & Development, Durham VA Medical Center, 508 Fulton St, R&D 151, Durham, NC 27705. E-mail: zinn0001@mc.duke.edu*

J.B. WILLIAMSON, D. NYENHUIS, L. PEDELTY, S. BYRD, M. JHAVERI & P. GORELICK. White Matter Hyperintensities in Vascular CIND Reverters and Nonreverters: A Region of Interest Analysis.

Objective: Reversion of cognitive deficit (from impairment to no impairment) is a conceptual problem for dementia precursor studies (MCI; Vascular Cognitive Impairment-No Dementia [Vascular CIND]). Factors underlying reversion have not been well studied. We compare regional burden of radiological white matter hyperintensities (WMH), a marker for small vessel ischemic disease implicated in the evolution of vascular cognitive impairment, in reverters vs nonreverters 1 year after diagnosis of post-stroke Vascular CIND.

Participants and Methods : 31 participants >49.5 years of age and without prior history of neurodegenerative disease were diagnosed with Vascular CIND 3- 6 months after ischemic stroke (NINDS stroke data-

bank criteria). All underwent entry (baseline) and 1-year follow-up neuropsychological evaluation and MRI. Diagnosis, No Cognitive Impairment [NCI] vs Vascular CIND), was established in diagnostic consensus conferences. WMH, coded according to Scheltens' scale, included frontal, occipital, and periventricular caps and bands, and frontal, parietal, temporal, and occipital subcortical WMH. Reverters to NCI at one year were compared to nonreverters with one-way ANOVA.

Results : At one year follow-up, 14/31 reverted to NCI status; 17/31 did not. Demographic factors, total stroke volume, and left hemisphere involvement did not differ significantly between groups. Non-reverters had greater frontal lobe subcortical WMH ($p = 0.012$). No other WMH variables differed significantly between groups.

Conclusions : Vascular CIND patients who did not revert to NCI had greater frontal subcortical WMH than those who did revert. This is consistent with the demonstrated prominence of executive dysfunction and frontal-subcortical changes in VCI and may underlie greater resistance to cognitive recovery after stroke.

Correspondence: *John B. Williamson, Ph.D., Neurology, University of Illinois at Chicago, 1819 West Summerdale Avenue, Apartment 1, Chicago, IL 60640. E-mail: jwillia2@uic.edu*

Poster Session 8 /10:45 a.m.–12:15 p.m.

Autoimmune Disorders (e.g., CFS, Lupus, Fibromyalgia)

E. KOZORA, M.C. ELLISON, J. GREGG & W. STERLING. Associations Between Negative Life Stress, Disengage Coping and Cognitive Dysfunction in Patients with Systemic Lupus Erythematosus.

Objective: We aimed to examine the frequency of life stress and coping styles using self-report measures in patients with systemic lupus erythematosus (SLE) and healthy controls. We also examined the relationship between a cognitive impairment index (CII) from the American College of Rheumatology (ACR) neuropsychology battery for SLE (ACR ad hoc, 1999) in relation to life stress and coping styles across these groups.

Participants and Methods : Thirty-one SLE patients with overt neuropsychiatric symptoms (NPSLE), 22 SLE patients without overt neuropsychiatric symptoms (non-NPSLE) and 25 healthy controls completed the brief ACR neuropsychology battery for SLE as well as measures of life events (LES) and coping skills (COPE).

Results : Both NP and non-NPSLE patients showed greater use of disengaging coping styles ($p = 0.002$) and more negative life stress events over the past 6 months ($p = 0.018$) and past 6 to 12 months ($p = 0.004$) compared to controls. NPSLE and non-NPSLE subjects were higher on CII compared to controls ($p < 0.001$). Only the NPSLE subjects had significant correlations between CII and negative life events at 0-6 months ($p < 0.001$), negative life events at 6 to 12 months ($p < 0.001$) and negative coping styles ($p = 0.007$).

Conclusions : SLE patients with and without overt neuropsychiatric symptoms demonstrate more negative life events over the past 12 months and tend to utilize disengaging coping styles compared to controls. Only the overt neuropsychiatric SLE patients demonstrated a relationship between negative life events, disengaging coping and cognitive dysfunction. Future studies aimed at understanding the relationship between these behavioral and cognitive factors may lead to multidisciplinary treatments for improved coping and cognitive ability in SLE.

Correspondence: *Elizabeth Kozora, Ph.D., Medicine, National Jewish Medical and Research Center, 1400 Jackson Street, Denver, CO 80206. E-mail: Kozorae@njc.org*

K. MCCOY, E.Y. MCLAURIN, R.L. BREY & S.L. HOLLIDAY. Intraindividual Variability in Cognitive Performance in Systemic Lupus Erythematosus, Fibromyalgia, and Normals.

Objective: Recent studies find cognitive intraindividual variability (IIV) is a unique marker of neurologic dysfunction, independent of level of performance. Many individuals with systemic lupus erythematosus (SLE) experience significant, transitory impairment in cognition. This study assessed IIV in cognitive function in 177 SLE patients, 50 fibromyalgia patients (FB), and 56 normal individuals (NC).

Participants and Methods : Participants were assessed using the Automated Neuropsychological Assessment Metrics (ANAM) in a larger study of neuropsychiatric SLE. ANAM subtests used included Simple Reaction Time (RT), Code Substitution with Immediate and Delayed Memory, Continuous Performance, Simultaneous Spatial Processing, Sternberg, and Matching to Sample. The Coefficient of Variability (CV) was calculated as individual SD/individual Mean RT.

Results : SLE was significantly different from FB and NC groups on Mean RT for 6 subtests ($p < .01$). Average CV across ANAM tests did not differ among the three groups, but SLE individuals were more variable in RT on Code Substitution ($p < .005$), and more consistent on the related Immediate Memory ($p < .05$), when compared to FB and NC. Since age and education were significantly different across the groups, demographically-matched subsets ($n=22$ for each group) were randomly chosen for additional analyses. SLE individuals were slower on Simple RT, Code Substitution, Immediate Memory, and Sternberg ($p < .05$). There were no significant differences across groups in intraindividual variability.

Conclusions : Findings suggest that RT mean level of performance is a more robust predictor of SLE-related cognitive dysfunction. Patterns of intraindividual variability across testing sessions or tests within the battery may better capture the cognitive inconsistency frequently reported by SLE patients.

Correspondence: *Karin J. McCoy, Psychology (116B), South Texas Veterans Health Care System, 7400 Merton Minter Blvd., San Antonio, TX 78229-4404. E-mail: karin.mccoy@med.va.gov*

Endocrine Disorders/Hormones

V. SANTINI, R.A. STERN & R.C. GREEN. Relationship between Thyroid Function and Cognition in Healthy Euthyroid Elderly.

Objective: Both clinical and mild forms of hypothyroidism and hyperthyroidism are associated with cognitive impairments, especially in the elderly. However, previous studies have been limited because of either an incomplete set of thyroid hormone assays or inadequate neuropsychological data. This cross-sectional study examined the specific relationships between thyroid status and cognition in a group of healthy, euthyroid elderly individuals.

Participants and Methods : Participants were 22 euthyroid controls in the research registry of the BU Alzheimer's Disease Center. Extant neuropsychological data from subjects' most recent examination were utilized. Frozen serum samples from the same visit were used for all thyroid assays, including free T3, free T4, and TSH. For each thyroid test, subjects were categorized into high and low groups based on median splits. Relationships between neuropsychological variables and continuous thyroid levels were assessed by correlational analyses. Group differences (high and low thyroid) on neuropsychological variables were assessed by t-tests.

Results : Results indicated that relative hypothyroidism was associated with worse memory performance. For example, the high fT3 group performed significantly better on the WMS-III Visual Reproductions Delayed Recall compared to the low fT3 group ($t=2.42$, $p < .05$). In contrast, relative hyperthyroidism was associated with worse executive functioning. For example, the low TSH group performed significantly worse on COWA than the high TSH group ($t=2.16$, $p < .05$). Similar findings were found with correlational analyses.

Conclusions : Results suggest that in healthy elderly, variations in thyroid hormone status — even with the normal range — covary with cognitive performance, with relative hyperthyroidism associated with reduced executive functioning and relative hypothyroidism associated with reduced memory.

Correspondence: *Robert A. Stern, PhD, Alzheimer's Disease Clinical and Research Program, Boston University School of Medicine, 715 Albany St, Robinson 7500, Boston, MA 02118. E-mail: bobstern@bu.edu*

J. WU, D.C. PERANTIE, A. LIM, S.L. WARREN, M. SADLER, N.H. WHITE & T. HERSHEY. Glucose Control, Cognition and Parent-rated Behavior Problems in Children and Adolescents with Type 1 Diabetes Mellitus (T1DM).

Objective: Children and adolescents with T1DM may be at higher risk for behavioral and psychiatric problems than non-diabetic peers. T1DM children with increased behavioral/psychiatric problems have been reported to have worse blood glucose control, particularly hyperglycemia. However, it is unknown how reduced cognitive abilities, often associated with certain behavioral problems, mediate this effect. To address this issue, we examined the relationship between glucose control, behavioral problems, IQ and memory skills.

Participants and Methods : Children with T1DM ($n=75$) and non-diabetic sibling controls ($n=42$) were assessed. Parents completed the Achenbach Child Behavior Checklist and identified any behavior attributed to diabetes. DSM scale T scores were calculated after removing flagged items and categorized as $T=50$ vs. $T>50$. The most recent hemoglobin A1c (A1c) level was recorded. IQ was estimated from WJ-III subtests; memory skills were assessed with CMS delayed recall tasks.

Results : T1DM children were more likely to be elevated on the attention deficit/hyperactivity scale than sibling controls ($p < .05$). T1DM children with elevated oppositional defiant and conduct scales had higher recent A1c levels than T1DM children with no elevation ($p < .05$). Further, T1DM children with elevated scores on the conduct scale had lower IQ and delayed verbal memory than those with no elevation. However, after controlling for age, age of onset, IQ, memory skills, and attention deficit/hyperactivity and oppositional defiant scores, conduct scores still explained a significant amount of variance in A1c levels ($p \leq .05$).

Conclusions : We conclude that subclinical problems in the conduct domain are closely and uniquely associated with chronic hyperglycemia perhaps by interfering with aspects of self care.

Correspondence: *Tamara Hershey, Ph.D., Psychiatry, Washington University School of Medicine, 4525 Scott Avenue, Campus Box 8225, St. Louis, MO 63110. E-mail: tammy@np.g.wustl.edu*

M. WEBER & M. MAPSTONE. Cognition, Mood and Hormones in Perimenopause.

Objective: Perimenopause is associated with fluctuations in reproductive hormone levels followed by reductions in estrogen as one nears menopause. Many women report memory lapses, cognitive dysfunction and symptoms of depression during this transition. It is unknown if these subjective cognitive complaints represent objective impairments. In addition, the relationship between these symptoms and reproductive hormone levels is unclear. The aim of this study was to examine the association between hormonal levels, cognition and mood during perimenopause.

Participants and Methods : We administered comprehensive neuropsychological, psychological, psychosocial and health assessments and obtained serum estradiol (E_2) and follicle stimulating hormone (FSH) levels from fourteen perimenopausal women (7 early, 7 mid to late) between the ages of 40 and 60.

Results : Correlational analyses revealed an association between depressive symptoms and memory complaints ($p < .05$) and between depressive symptoms and verbal learning ($p < .01$). Depressive symptoms

were not significantly correlated with retentive memory. E_2 was not significantly correlated with any cognitive or psychosocial variable. Women in mid to late perimenopause performed worse than those in early perimenopause on tests of visuospatial ($p < .05$), fine motor, and verbal learning skills, though the latter two did not reach statistical significance.

Conclusions : The results suggest that mood may play an important factor in women's perceptions of their cognitive functioning, and may impact encoding but not retentive memory abilities. They also suggest that mid to late perimenopause may be a critical time period during which objective cognitive changes may occur.

Correspondence: *Miriam Weber, University of Rochester Medical Center, Mt. Hope Professional Building, Suite 100, 1351 Mt. Hope Avenue, Rochester, NY 14620. E-mail: Miriam_Weber@urmc.rochester.edu*

C. MRKOTSKY, A. BOUSVAROS, E. KENNEY, H. CARPENTER, D. WABER & R. GRAND. Executive Functions and Memory in Children Treated for Inflammatory Bowel Disease: Impact of Steroids vs. Disease Factors.

Objective: Inflammatory bowel disease (IBD) (Crohn's Disease-CD, Ulcerative Colitis-UC) is a chronic remitting illness often treated with corticosteroids to control inflammation. These agents adversely affect the nervous system, changing sleep, appetite, and mood. Little is still known about their impact on cognition, especially in children. We investigated the effects of acute high-dose steroids and disease-related confounders on memory and executive functions in children with IBD.

Participants and Methods : Children (age 8-17) with IBD on high-dose steroids (≥ 30 mg/day prednisone) (N=16: 8 CD, 8 UC) were compared to those off steroids for ≥ 6 months (N=22: 19 CD, 3 UC). Assessment included the WRAML2, CMS, ROCF, DKEFS, BRIEF-P/SR, CBCL/YSR, and measures of IQ, attention, pain and sleep.

Results : The high-dose steroid group (M=39.4 mg, range 30-75 mg) had poorer short-term memory for detail (verbal and nonverbal) (all $ps < .05$), slower shifting speed ($p < .10$), and reported more problems with shifting ($p < .01$), mood ($p < .001$), pain ($p < .05$) and sleep ($p < .10$). Demographics, IQ, and attention were comparable between groups. Disease type was unevenly distributed between groups and contributed to differences in verbal memory and speed; UC patients performed more poorly ($< .01$). Levels of inflammation accounted partly for group differences with higher levels associated with poorer memory ($p < .01$) and mood ($p < .05$). Sleep problems and pain variously contributed to group differences in memory, EF, and mood.

Conclusions : Steroids affect aspects of executive functions and memory in children treated acutely for IBD. Sleep, pain, and inflammation may play a role. The impact of steroid- versus disease-related factors will be discussed.

Correspondence: *Christine Mrakotsky, PhD, Psychiatry, Childrens Hospital Boston/Harvard Medical School, 300 Longwood Avenue, Fegan 5, Boston, MA 02115. E-mail: christine.mrakotsky@childrens.harvard.edu*

Epidemiology

S. VITALE, R. AU, H. CABRAL, P.A. WOLF, S. SESHADRI & C. DE-CARLI. Decline in Mini-Mental State Examination is Associated with White Matter Hyperintensities in the Framingham Offspring.

Objective: White matter hyperintensities (WMH), whose etiology has been linked to vascular risk, have been associated with cognitive deficits in largely cross-sectional studies. The MMSE serves as an efficient screening test for cognitive status. In this study we examine whether decline in Mini-Mental scores over a 12 year period was associated with increased WMH volume.

Participants and Methods : 1753 Framingham Offspring participants, free of clinical signs of dementia or stroke, were administered an MMSE in four year cycles from 1991-2001. As part of another study, they also had a brain MRI from 1999-2001. Participants were grouped into

four categories based on MMSE scores: 1) no change; 2) decreased; 3) increased, or 4) fluctuated. WMH were divided into those with no or little WMH volume (WMH-N) and those with large WMH volumes (WMH-L), which was defined as WMH volumes >1 standard deviation above their age and gender based mean. Final analyses were adjusted for age, gender, education level, and Framingham Stroke Risk Profile.

Results : Initial analysis of covariance revealed a significant difference among the 4 MMSE groups. ($p=0.01$). Multiple logistic regression analyses adjusting for age, gender, educational level, and Framingham Stroke Risk Profile suggested those whose MMSE scores declined were significantly more likely to have WMH-L compared to those whose MMSE scores did not change ($p=0.02$).

Conclusions : Decline in performance on the MMSE is associated with larger volumes of WMH, suggesting that disruption in white matter pathways may be related to these changes

Correspondence: *Rhoda Au, Ph.D., Neurology, Boston University School of Medicine, B608, 715 Albany Street, Boston, MA 02118. E-mail: rhodaau@bu.edu*

K. TROLAND, J.T. NICHOLAS, E. THORSEN & M. GRONNING. Neuropsychological Effects After a Saturation Dive with a Low Incidence of Venous Gas Microembolism.

Objective: Decompression stress and exposure to hyperoxia may have effects on the central nervous system (CNS) after deep saturation dives. Previous studies have demonstrated mild-to-moderate changes in neuropsychological tests of motor steadiness, spatial memory, sustained attention and autonomic reactivity, as well as EEG changes and abnormal findings in motor function, reflexes, sensory function and co-ordination in the clinical neurological examination. In the present study, the decompression rate was reduced compared to previous deep dives resulting in a lower load of venous gas microembolism (VGM). Administering oxygen intermittently reduced the hyperoxic exposure.

Participants and Methods : Eight male, experienced divers, age 29-48, participated in a simulated dry helium-oxygen saturation dive to 240 meters corresponding to a pressure of 2.5 MPa. Neuropsychological assessments were done within 3 days before the dive, within 2 days after the dive and 6-8 weeks after the dive. Neuropsychological tests were assigned to one of 5 functional domains 1)Attention and Working Memory 2)Processing Speed, 3)Learning and Memory, 4)Cognitive Flexibility and Abstraction and 5)Motor Function. Neuropsychological function was considered reduced if the participant obtained poorer scores post-dive on at least two of the tests under the domain in question. The tests employed are known to demonstrate considerable improvement upon retest, particularly when re-testing takes place within such a short period of time. Hence, failure to improve was considered alongside actual impaired scores.

Results : Five out of 8 divers demonstrated reduced performance across at least three functional domains immediately after the dive. When failing-to-improve scores were taken into account, all divers showed reduction in three or more functional domains, most frequently in attention and working memory.

Conclusions : Reduction in decompression stress and hyperoxic exposure did not reduce the risk of CNS effects after deep saturation diving.

Correspondence: *Kari Troland, Cand.psychol (Psy D), Dept. Occupational Medicine, Haukeland University Hospital, Haukeland University Hospital, Dept. of Occupational Medicine, Bergen N-5021, Norway. E-mail: kari.troland@helse-bergen.no*

K. TROLAND, M. GRONNING, H. SKEIDSVOLL, A. IRGENS & E. THORSEN. The Haukeland University Hospital Prospective Study of Norwegian Occupational Divers: CNS Effects of Diving.

Objective: Several cross-section studies have suggested long term effects of diving on the nervous system. The present study is a prospective longitudinal study.

Participants and Methods : In the period 1994 through 2004, a total of 67 students from 4 classes at the Norwegian Governmental Diving School were included in a prospective longitudinal study. Participants were given a comprehensive clinical examination at start of school, and at 3 and 6 years after finishing school, including neurological, neurophysiological, neuropsychological and oto-neurological assessments in addition to a comprehensive questionnaire. Diving exposure was assessed through professional diving logbooks, questionnaire and interview-data. Fifty divers had participated in all 3 follow-ups. Based upon their total exposure during the follow-up-period participants were divided into a Low (2-200 dives) ($n = 17$), an Intermediate (240-575 dives) ($n = 12$), and a High Exposure group (700-2000 dives) ($n = 21$). The Low Exposure (LE) group then served as controls for the High (HE) and the Intermediate Exposure (IE) groups. Only one diver had experienced saturation diving. Careful assessment revealed only one case of possible DCI (untreated).

Results : In the clinical neurological data, there were more abnormal findings at the third follow-up in the HE group. The proportion of marginal or borderline pathological EEGs had increased at third follow-up and there was a marked increase in slow waves compatible with drowsiness at both second and third follow-up. The HE group demonstrated poorer performance on tests of attention, psychomotor speed and mental flexibility as well as tactile perception and motor function over time. The HE group performed significantly poorer than the LE group on measures of attention, motor steadiness and tactual perception at the last follow up.

Conclusions : The changes observed, although modest, may suggest long term detrimental effects of diving on the nervous system, even in the absence of DCI.

Correspondence: *Kari Troland, Cand.psychol (Psy D), Dept. Occupational Medicine, Haukeland University Hospital, Haukeland University Hospital, Dept. of Occupational Medicine, Bergen N-5021, Norway. E-mail: kari.troland@helse-bergen.no*

Genetic Disorders

R.M. BILDER. Neuropsychology in the Phenomic Era.

Objective: Completion of the human genome project ushered in the post-genomic era, and we have entered what some have called the "phenomic era." Phenomics - the systematic study of phenotypes - is rapidly evolving as a merger among diverse disciplines, including genetics, informatics, biology, and psychology.

Participants and Methods : With support from the trans-NIH Roadmap Initiative, we have initiated a Center for Cognitive Phenomics (www.phenomics.ucla.edu) at UCLA. The aims of this project include development of catalogs of cognitive phenotypes, developing the informatics infrastructure to examine the relations among these phenotypes, and the relations of cognitive constructs to other biological knowledge-bases including genomic, proteomic, and neuroimaging data.

Results : We have developed initial ontologies comprising hierarchies of concepts representing broad domains of neuropsychological function, and using bioinformatics strategies, specified some of the putative relations among these concepts, and also their relations to non-cognitive domains, including neuroimaging data. Proof of concept examples include using literature mining to extract functional neuroimaging signals associated with cognitive findings in schizophrenia, without requiring data from any single study involving patients.

Conclusions : Application of phenomic strategies may offer promise for enhancing our understanding of neuropsychological constructs, their relations to other biological processes, and the specification of hypotheses that span diverse knowledge sources from genes to complex syndromes. It is hoped that use of these methods will accelerate the discovery of genetic bases and more effective treatment for neuropsychiatric disorders. Correspondence: *Robert M. Bilder, PhD, Semel Institute for Neuroscience and Human Behavior, UCLA, 740 Westwood Plaza, Rm CS-849, Los Angeles, CA 90095. E-mail: rbilder@mednet.ucla.edu*

J.G. FINE, M. SEMRUD-CLIKEMAN, T.Z. KEITH, L. STAPLETON & G. HYND. Why not study differences among family members for heritable disorders?

Objective: Many of the disorders we study, dyslexia, Asperger's, depression, run in families. For many, genetic loci have been discovered. But when we study such disorders we usually compare individuals between families, introducing variance in genetics, education, social experience, exposure and nutrition that may mask the more subtle differences in brain organization or function that underlie the disorder. This paper discusses methods for evaluating within-family variance for familial disorders.

Participants and Methods : A familial study involving 64 participants nested in 24 families is used to describe the methodology for within-family variance for families with and without dyslexia. Structural MRIs and neuropsych data are presented and the methods of evaluation are explained:

1. Determine intra-class correlations.
2. Center each individual's data around the family mean.
3. Adjust the degrees of freedom to N-families.
4. Perform statistical evaluation.
5. Discuss results in terms of differences between family members with varying amounts of the trait.

To determine the amount of variance between families, set individual data to equal the family mean. Set $df = \text{number of families}$. Then rerun the statistics. For structural equation modeling, between- and within-family variance can be run simultaneously.

Results : In the dyslexia study, results for the effects of corpus callosum size on reading ability were stronger when within-family variance was used. Correlations among variables were weaker when data was not centered about the family mean.

Conclusions : This method compares individuals within families who have a trait in varying degrees, thus removing some variance that generally occurs between families such as print exposure, nutrition, other shared environment variables and genetics. In the dyslexia study, reading ability was found to vary with the midbody of the corpus callosum; family members with smaller corpus callosa at the midbody were poorer readers.

Correspondence: *Jodene G. Fine, M.S., University of Texas at Austin, 613 Rocky River Road, Austin, TX 78746. E-mail: jodene.fine@mail.utexas.edu*

B. KENDRA, L. CHARNAS, C.B. WHITLEY, K. DELANEY & E.G. SHAPIRO. Neuropsychological Function in Attenuated MPS I: Possible Decline of Memory and Visual Spatial Function.

Objective: Over the first 3 years of life, cognitive function especially language gradually declines in severe mucopolysaccharidosis I (Hurler syndrome), with no specific neural mechanism identified to date. It is no longer possible to explore these defects because brain functions in Hurler syndrome are altered by hematopoietic stem cell transplant treatment which is offered to all patients. However, attenuated rarer forms of MPS I which are treated with recombinant enzyme (Enzyme Replacement Therapy -ERT) may shed light on presumably similar mechanisms allowing identification of neural mechanisms. ERT in the canine model does not improve enzyme activity across the blood-brain barrier; thus ERT likely does not change neuropsychological function.

Participants and Methods : Four patients with attenuated MPS 1, receiving ERT, had extensive neuropsychological evaluations. 3 siblings (12, 14, and 15) had 3 assessments over 8 years and a 22 year old college student had two evaluations over three months. All had increased mobility and range of motion after ERT. All noted decline in cognitive function prior to ERT and continuing afterwards.

Results : IQ decreased in the siblings and was below expectable levels for the 22 year old college student. Memory encoding dramatically de-

clined at age 12 in the 14 and 15 year olds, and was impaired in the 22 year old. Mild working memory problems were found in the 12 year old. Math, visual-motor, and spatial skills were impaired in all. Attention span, executive functions, reading ability, and adaptive skills were unaffected in all.

Conclusions : Progressive slowing of cognitive development with specific impairment in memory encoding and visual spatial ability occurred in young patients with attenuated MPS I receiving ERT. Possible hippocampal involvement in MPS I, suggested by animal studies, is supported by this data.

Correspondence: *Elsa G. Shapiro, Ph.D., Pediatrics, University of Minnesota, MMC486, 420 Delaware St. S.E., Minneapolis, MN 55455. E-mail: shapi004@umn.edu*

M.A. CARSWELL & K. LAWLER. Neuropsychological Findings of Kallmann's Syndrome Spectrum: A Clinical Case Study.

Objective: Kallmann's syndrome is a heterogeneous genetic disorder characterized by a variety of clinical features including hypogonadism, agenesis of the olfactory bulbs, cleft lip and/or palate, metacarpal abnormalities, and gynecomastia, as well as other physical and neurological features. Although the clinical features of this disorder have been well documented, little is known about the neuropsychological presentation of this disorder. We present the case of an adult with Kallmann's syndrome spectrum disorder.

Participants and Methods : Patient M.V. was a 22 year-old (R.H.) Caucasian male diagnosed with Kallmann's syndrome spectrum disorder in childhood. Previous neurological studies revealed developmental delays in fine and gross motor functions, learning difficulties, behavioral problems, attention and short-term memory difficulties, borderline hypogonadism, and dysmorphic features. M.V. underwent a neuropsychological evaluation to determine his current level of functioning and to better understand underlying neurocognitive aspects of this disorder.

Results : An MRI showed lytic lesions throughout the clivus. Intellectual functioning was Average with Average verbal skills and Borderline non-verbal abilities. Neuropsychological testing revealed moderate impairments on a delayed, contextual verbal memory task, with severe impairments on tasks of simple visuomotor sequencing ability, delayed list learning recall, semantic fluency, and bilateral fine motor speed and coordination. Profound impairments were noted in visual memory, visual recognition, and visuospatial and constructional ability.

Conclusions : M.V.'s pattern of impairments is most consistent with right-hemisphere involvement/impairment. M.V. presented with several cognitive deficits that may or may not be unique to KS. Therefore, future research is needed to identify cognitive patterns that are specific to this disorder.

Correspondence: *Melissa A. Carswell, Psy.D., Neurology, Hospital of the University of Pennsylvania, 3400 Spruce St., Philadelphia, PA 19104-4283. E-mail: mcarswell@excite.com*

J. JANUSZ, L. SELDIN-SOMMER, D. COPENHEAVER & S. CUSHNER-WEINSTEIN. Relationship Between Behavioral Functioning and Symptom Severity in Children with Neurofibromatosis Type 1.

Objective: Neurofibromatosis Type 1 (NF1) is the most common autosomal dominant genetic disorder and has both physical and cognitive manifestations. Among adults, previous research has demonstrated an association between visibility of NF1 symptoms and behavioral functioning, with those with more visible symptoms reporting greater emotional problems. No study to date has explored the relationship between symptom severity and adjustment in children.

Participants and Methods : Children with NF1 (n= 36; age 7-18 years) and their parents completed measures of NF1 symptom severity and behavioral functioning. To assess symptom severity, parents completed the Ablon Symptom Scale which evaluates the effects of NF1 symptoms on lifestyle and general health. Children age 11-18 completed the Skindex-

Teen, a measure of quality-of-life for adolescents with skin disease. Behavioral/ emotional adjustment was assessed with the Child Behavior Checklist (CBCL) and Youth Self-Report (YSR). Correlations between symptom severity and adjustment were calculated. To examine departure from normality on the CBCL and YSR, a non-parametric Kolmogorov-Smirnov test was completed.

Results : Parent and child ratings of symptoms were highly correlated (r= .80). Parents and children endorsing more severe NF1 symptoms also reported greater anxiety, depression, withdrawal, and social problems (r= .49 -.61). Furthermore, there was a relationship between parent ratings of NF1 symptoms and aggressive behavior (r= .48). Scores on these CBCL and YSR scales departed significantly from the normal range for these scales, as well as for the Somatic Problems, Thought Problems, and Attention Problems scales (p < .01).

Conclusions : Findings of this preliminary study suggest that children with more severe NF1 symptoms may be at greater risk for behavioral and emotional problems, especially within the internalizing domain. This provides important information for targeting intervention for at-risk children.

Correspondence: *Jennifer Janusz, Psy.D., Pediatric Neuropsychology, Children's National Medical Center, 111 Michigan Ave., NW, Suite 1200, Washington, DC 20010. E-mail: jjanusz@cnmc.org*

HIV/AIDS

R. SMITH, K. MALEE, R. LEIGHTY, P. BROUWERS, C. MELLINS, J. HITTELMAN, C. CHASE & I. BLASINI. The Effect of Perinatal HIV Infection and Related Risk Factors on Cognitive Development in Young Children.

Objective: Developmental impairments associated with HIV infection have been well documented in infants. In pre-school and school-age children, however, the severity and scope of impairment has not been well-described. Existing studies are difficult to interpret due to a number of limitations. We examined the effect of HIV and other factors on the cognitive development of children perinatally exposed to HIV.

Participants and Methods : Serial assessments were performed with 117 infected children and 422 children exposed but not infected with HIV, in a multicenter natural history, longitudinal study. Repeated measures analyses were used to evaluate cognitive development in 3- to 7-year-old children, as measured by the McCarthy Scales of Children's Abilities.

Results : Children with HIV infection and CDC class C status scored lower in all domains of cognition, across all timepoints, than those who were infected without an AIDS-defining illness, and those who were exposed but noninfected. There were no differences between the two latter groups on the general or domain specific indices. Rate of change was comparable among all groups over a period of four years. Other factors related to lower mean scores were HIV status, number of previously completed exams, primary language, maternal education, and gender. No environmental factors were found to relate to rate of change of any mean domain score.

Conclusions : An early AIDS defining illness increases the risk for a chronic profile of static encephalopathy during the preschool and early school age years in children with HIV. Children with HIV infection but no Class C event perform as well as noninfected children perinatally exposed to HIV on tests of cognitive ability. No differential profiles of strengths and weaknesses were observed among the children with or without HIV infection. A number of environmental factors were found to have a significant affect on the mean scores of children in all three groups, however they were not related to the rate at which learning occurred.

Correspondence: *Renee Smith, PhD, Pediatrics, University of Illinois at Chicago, S40 S. Wood St, M/C 856, Chicago, IL 60612. E-mail: resmith@uic.edu*

J. SUHR, T. HECKMAN, K. SIKKEMA, N. HANSEN & A. KOCHMAN. Relation of Depression to Neuropsychological Performance in HIV+ Older Adults.

Objective: Early research suggested depression was the cause of neuropsychological decline in HIV/AIDS. While recent research confirms HIV is neurotropic, inconsistent findings of neuropsychological impairment in HIV suggest it is still important to consider the contribution of other factors (such as depression) to the neuropsychological presentation of individuals with HIV/AIDS.

Participants and Methods : This study examined associations between depression and neuropsychological status in 162 HIV-infected older individuals (mean age 55.5, range 50-76, mean duration of HIV diagnosis 12.5 years), all of whom were enrolled in a randomized clinical trial examining the effectiveness of psychological interventions for depression in HIV-infected older adults. At pre-intervention, all individuals completed the GDS, 3MS, COWA, TMT, and Grooved Pegboard Test as part of a larger psychological assessment battery.

Results : Depression (GDS) was unrelated to age or education, and there were no gender or racial/ethnic differences in depression (60 white, 70 African American, 30 other). Interestingly, depression was higher in those who had not progressed to AIDS, and they performed worse on COWA and 3MS than those who had AIDS diagnoses. Years since diagnosis was unrelated to depression or neuropsychological performance. Depression was significantly related to measures of complex psychomotor processing speed (TMT A, TMT B, COWA) and general cognitive functioning (3MS), but was not related to fine motor speed (Grooved Pegboard Test).

Conclusions : Results suggest depression is strongly related to neuropsychological functioning in HIV positive older individuals. This relationship is not explained by age, education, gender, race/ethnicity, or duration/severity of illness.

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

R. FAMA, J.C. EISEN, S.A. SASSOON, M.J. ROSENBLOOM, A. PFEFFERBAUM & E.V. SULLIVAN. Upper and Lower Limb Motor Function in HIV, Alcoholism, and their Comorbidity.

Objective: HIV infection (HIV) and alcoholism (ALC) exert untoward effects on motor function, arising from neuropathology associated with each condition. Typically, HIV affects frontostriatal systems, whereas ALC affects frontocerebellar systems. Comorbidity of HIV and alcoholism (H/A), which is highly prevalent, may result in additive or interactive effects on brain structure and function affected by each condition.

Participants and Methods : To examine this possibility, we assessed upper limb functions supported by basal ganglia systems (multiple tests of finger agility and speed) and lower limb functions supported by cerebellar systems (gait and balance), in 32 HIV, 27 ALC, 42 H/A, and 21 control men.

Results : H/A performed worse than controls on all upper limb measures, with the exception of movement time, generally showing a 1 SD deficit. Although HIV and ALC were both impaired on fine finger movement, the H/A showed an even greater impairment. Lower limb function was equivalently impaired in H/A and ALC with or without visual input, showing a 0.7 to 1.0 SD deficit relative to controls. Lower limb function of HIV was deficient (0.5 SD) only with eyes closed. Upper and lower limb impairment was significantly correlated in H/A and ALC but not in HIV. Depressive symptoms did not account for group differences.

Conclusions : These results provide evidence that the effects of HIV and ALC may be additive for upper limb function, but that postural instability is a result of alcoholism. Although both the frontostriatal and frontocerebellar motor systems are implicated in HIV infection and alcoholism, each condition appears to affect functions of these brain systems independently.

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Correspondence: *Rosemary Fama, Ph. D., Neuroscience Program, SRI International, 333 Ravenswood Avenue, Menlo Park, CA 94025. E-mail: rfama@synapse.sri.com*

S. WOODS, M.S. DAWSON, C.L. CAREY, E.E. MORGAN, J. SCOTT, I. GRANT & H. GROUP. Increased Cognitive Load Exacerbates HIV-1-Associated Time-Based Prospective Memory Impairment.

Objective: Emergent evidence indicates that time-based (TB) prospective memory (ProM), which involves the ability to execute an intention at a particular moment in the future, is impaired in persons with HIV-1 disease. The primary aim of this study was to evaluate the effect of cognitive load on TB ProM in HIV-1. In this context, cognitive load refers to the taxation of limited capacity attentional networks whose resources are critical for episodic memory function.

Participants and Methods : The current study examined 49 individuals with HIV-1 infection and 35 demographically comparable HIV-1 seronegative subjects on the TB trials of the Memory for Intentions Screening Test. A median split of the number of intentions "online" when executing a TB ProM trial was conducted to separate high (>3 intentions) versus low (≤ 3 intentions) cognitive load conditions.

Results : Results showed no main effect of cognitive load ($p > .10$) on ProM; however, there was a significant main effect of HIV-1 serostatus ($p < .01$), as well as a significant HIV-1 by cognitive load interaction ($p < .01$). Pair-wise comparisons revealed a large effect size for HIV-1 on high ($p < .01$, $d = -1.15$), but not low load ($p > .10$, $d = -0.15$) trials.

Conclusions : Results suggest that HIV-1-associated TB ProM impairment may be exacerbated by increased cognitive load. Findings highlight the need for future investigations to examine whether interventional strategies to reduce cognitive load might ameliorate the adverse impact of HIV-1-associated ProM impairment on activities of daily living (e.g., medication adherence).

Correspondence: *Steven Paul Woods, Psy.D., Department of Psychiatry, UCSD, HIV Neurobehavioral Research Center, 150 W. Washington St., San Diego, CA 92103. E-mail: spwoods@ucsd.edu*

J.C. SCOTT, S. WOODS, K.A. PATTERSON, E.E. MORGAN, R.K. HEATON, I. GRANT, T.D. MARCOTTE & H. GROUP. Recency Effects in HIV-Associated Dementia Are Characterized by Deficient Encoding.

Objective: The aim of the present study was to investigate the nature and cognitive mechanisms of serial position learning effects in HIV-associated dementia (HAD). HIV infection produces learning and memory impairments consistent with prefrontal-striatal dysfunction. However, the effects of HAD on the serial position learning curve are unknown.

Participants and Methods : Participants consisted of 16 persons with HAD, 50 persons with HIV infection without neurocognitive disorder (HIV+), and 50 seronegative participants (HIV-) who were comparable for age, education, sex, and ethnicity. Between group differences in word list recall were examined from primacy, middle, and recency portions of Trial 1 of the Hopkins Verbal Learning Test-Revised (HVLT-R), as well as on measures of recognition discrimination and retrieval (recognition discrimination minus free recall).

Results : The HAD participants, relative to the HIV+ and HIV- groups, exhibited reduced middle region ($p < .01$) and elevated recency region ($p < .05$) recall on Trial 1, but no primacy region effect ($p > .10$). On recognition testing, the HAD group was impaired in discriminating targets from distractors ($p < .01$) in all three serial position regions; however, they were not impaired on measures of retrieval ($p > .10$).

Conclusions : HAD participants relied disproportionately on recency portions of the HVLT-R list for recall, indicating a passive recall style

of echoing only the words within their auditory attention span. Interestingly, HAD participants did not evidence significant improvement on measures of recognition compared to the other two groups, a finding that suggests that the serial position effects are most consistent with a primary encoding deficit.

Correspondence: *J. Cobb Scott, Psychiatry, University of California, San Diego, 150 West Washington, 2nd Floor — HNRC, San Diego, CA 92101. E-mail: j1scott@ucsd.edu*

R. MELROSE, R.M. POULIN, J. BOER, M.G. COURTNEY & C.E. STERN. Reasoning Ability and Fronto-striatal Circuitry in HIV.

Objective: Neuropsychological studies of HIV+ individuals report deficits in attention, working memory, and executive functioning. fMRI studies examining attention and working memory find increases in prefrontal cortex (PFC) activation in HIV+ patients. We used fMRI to assess the integrity of fronto-striatal circuitry in HIV during executive functioning, specifically by examining reasoning ability.

Participants and Methods : We developed a reasoning task (R) based on the Matrix Reasoning subtest of the WAIS-III, and observed reliable activation of the striatum and prefrontal cortex (PFC) in healthy volunteers. Five non-demented HIV+ (POS) and five HIV- (NEG) age and education matched controls completed this task. We also administered an immediate match to sample task (M) to isolate working memory demands from reasoning. Participants completed 10 event-related fMRI runs (3T scanner, 128 images/scan, TR=2, TE=30, slices=28, voxel size=3x3x5mm³; 40 trials/condition, processed with SPM2).

Results : There were no behavioral differences between groups. During reasoning (R), both groups activated bilateral dorsolateral PFC (DLPFC), ventrolateral prefrontal cortex (VLPFC), and striatum. For both groups, these areas remained active after controlling for working memory (R>M). Direct comparison of the groups yielded increased activity in bilateral striatum in POS (R and R>M contrasts). POS also had increased bilateral PFC activity, surrounding DLPFC and VLPFC areas active in NEG. **Conclusions :** Our results converge with previous fMRI studies in finding changes in PFC functioning. In addition, using a reasoning task dependent upon the striatum, we highlight differential recruitment of this structure in HIV. Compromise to the functional integrity of fronto-striatal circuitry may underlie the cognitive deficits observed in HIV patients.

Correspondence: *Rebecca J. Melrose, MA, Center for Memory and Brain, Boston University, 2 Cummings St., Boston, MA 02215. E-mail: rmelrose@bu.edu*

E.E. MORGAN, S. WOODS, J. SCOTT, M. CHILDERS, R.J. ELLIS, I. GRANT, R.K. HEATON & H. GROUP. Development and Predictive Validity of Demographically-Adjusted Normative Data for the HIV Dementia Scale.

Objective: The aim of the current study was to examine the reliability of the HIV Dementia Scale (HDS) and to develop and validate demographically-adjusted normative standards. Given the association between the HDS summary score and demographic variables, demographically-adjusted normative standards may enhance the classification accuracy of the HDS as a screening measure for HIV-associated neurocognitive disorders.

Participants and Methods : In a sample of 184 seronegative healthy control participants, one-year test-retest reliability was .35, with reliable change indices showing that summary score changes of ± 2.5 may be considered statistically unusual. Results also showed that only age and education (and their interaction) emerged as demographic factors significantly associated with the HDS. Accordingly, normative standards adjusted for age and education were developed and cut points for impairment were derived from the distributions of scores.

The demographically-adjusted cut points were applied to an HIV-1 seropositive validation sample comprised of 140 individuals with multidisciplinary case conference diagnoses of HIV-1-associated neurocognitive disorders (e.g., HIV-associated dementia and Minor Cognitive Motor Disorder) in proportions consistent with published epidemiologic reports.

Results : In comparison to the traditional ≤ 10 HDS cut point, the demographically-adjusted cut points increased positive predictive power as well as the odds ratio for classifying participants with HIV-associated neurocognitive disorders, while maintaining similar levels of sensitivity, specificity, and negative predictive power.

Conclusions : This examination of the psychometric properties of the HDS demonstrated its modest reliability and potentially enhanced the clinical utility of this screening measure by generating reliable change indices and demographically-adjusted normative standards.

Correspondence: *Erin E. Morgan, BA, Psychiatry, University of California, San Diego, 150 W. Washington St, 2nd Floor, San Diego, AR 92103. E-mail: eemorgan@ucsd.edu*

A. SCHILLER, J.M. FOLEY, W. BURNS, C. GOLDEN & A. SELLERS. Evidence for a Subcortical Pattern of Neuropsychological Deficits in HIV/AIDS Patients?

Objective: Research has produced variable results in identifying patterns of memory deficits in HIV/AIDS patients. This study compared an HIV+ sample to several HIV- comparison groups to examine whether the HIV+ group would evidence characteristics of subcortical memory impairment.

Participants and Methods : Participants were recruited in Southeastern and Northeastern regions, from an HIV community agency, an outpatient neuropsychology clinic, and the general community. The study included 22 HIV+, 22 community-dwelling HIV-, 22 learning disordered HIV-, and 22 psychiatric HIV-. Those included were predominantly Caucasian. The groups ranged in age from 39 to 48, had from 13 to 16 years of education, and showed FSIQ standard scores from 101 to 121. There were significant differences among the groups on only FSIQ and education.

Results : One-way ANCOVAs (covarying education and FSIQ) tested group differences on WMS-III indices. Differences were found on Immediate Visual Memory $F(3,84)=3.10, p=.05$, Immediate Memory $F(3,84)=3.14, p=.03$, Delayed Visual Memory $F(3,84)=3.32, p=.018$, Delayed Auditory Memory $F(3,84)=3.61, p=.02$, Working Memory $F(3,84)=6.52, p=.00$, and General Memory $F(3,84)=3.26, p=.03$. In all cases, HIV+ participants scored significantly below the HIV- normal comparison group, but no differences were found between the HIV+ group and psychiatric/LD groups.

Conclusions : WMS-III indices discriminated HIV- normal comparisons from HIV+ participants. Inability to find differences between HIV+ and psychiatric/LD comparisons points to possible similarities in cognitive functioning, and highlights the need for separating deficits of psychological origin versus organic origin caused by HIV. A subcortical pattern was partially supported, and nature and implications of this finding will be discussed.

Correspondence: *Jessica M. Foley, MS, Center for Psychological Studies, Nova Southeastern University, 1040 Seminole Dr #1052, Fort Lauderdale, FL 33304. E-mail: jfoley@nova.edu*

A. GONGVATANA, S.P. WOODS, M.J. TAYLOR & I. GRANT. Semantic Clustering Inefficiency in HIV-Associated Dementia.

Objective: HIV-associated dementia (HAD) is a debilitating condition characterized by severe neurobehavioral dysfunction accompanied by

significant disruption in instrumental activities of daily living. Converging evidence from neuroscientific studies of HAD support a preferential disruption of the fronto-basal ganglia systems. Decreased use of semantic clustering, a measure of organizational strategy during learning and retrieval of verbal material, has been demonstrated in patients with frontal systems dysfunction. Such impairment is therefore expected in individuals with HIV-associated cognitive disorders, especially HAD. **Participants and Methods :** The current study examined the use of semantic and serial clustering during a verbal list learning task (the Hopkins Verbal Learning Test - Revised) in 16 individuals diagnosed with HAD, 44 non-demented participants with HIV-infection and 24 healthy, seronegative comparison subjects.

Results : A Jonckheere-Terpstra nonparametric test for ordered alternatives showed a stepwise decline in the use of semantic clustering with severity of general cognitive impairment, with the greatest level of impairment evident in the HAD group. A Kruskal-Wallis test showed comparable degrees of serial clustering between the groups.

Conclusions : In light of existing literature, these findings suggest that the episodic verbal memory impairment in HAD is associated with inefficient use of higher-level encoding and retrieval strategies, perhaps mediated by a disruption of fronto-basal ganglia systems.

Correspondence: *Assawin Congvatana, M.A., Psychiatry, UC San Diego, 3750 Arizona St., San Diego, CA 92104. E-mail: agongvatana@ucsd.edu*

S. WOODS, B.C. SCHWEINSBURG, A.D. SCHWEINSBURG, I. GRANT & H. GROUP. Neural Substrates of Mental Rotation in HIV-1 Infection.

Objective: Although it is widely held that HIV-1 infection does not affect spatial abilities, HIV-1-associated neuropathology nevertheless impacts the structure and function of fronto-striato-parietal networks, which are essential to normal spatial cognitive functions. The present study aimed to elucidate the neural substrates of mental rotation (i.e., the mental manipulation of visual images in space), which is an extensively studied spatial construct that has not previously been examined in HIV-1.

Participants and Methods : Study participants included 11 individuals with HIV-1 infection and 13 seronegative controls matched on age (HIV = 41.8 ± 6.1 ; HIV- = 42.5 ± 14.5), education (HIV = 13.9 ± 2.4 ; HIV- = 14.9 ± 2.1), sex (HIV = 9M/2F; HIV- = 10M/3F), handedness (HIV = 9R/2L; HIV- = 11R/2L), and ethnicity. All participants performed a modified Shepherd & Metzler (1971) mental rotation task during functional magnetic resonance imaging in which they indicated whether pairs of 3-D geometric figures rotated at either 45, 105, or 165 degrees were identical.

Results : Consistent with our a priori hypotheses, HIV individuals displayed significantly increased brain response to mental rotation (clusters > 762 microliters, $p < 0.05$) in prefrontal (e.g., BA 13 and 47) and posterior parietal (e.g., BA 7) cortices, striatum, and thalamus, with significant HIV-1 by angle interactions emerging in the prefrontal cortex (e.g., BA 13) and striatum.

Conclusions : Results indicate that HIV-1 infection is associated with altered brain response to mental rotation in fronto-striato-parietal pathways. These findings may reflect compensatory strategies, recruitment of additional brain regions, and/or increased neuroenergetic demands during mental rotation needed to offset underlying HIV-1-associated neural injury.

Correspondence: *Steven Paul Woods, Psy.D., Department of Psychiatry, UCSD, HIV Neurobehavioral Research Center, 150 W. Washington St., San Diego, CA 92103. E-mail: spwoods@ucsd.edu*

F. GOULD, J. JACOBUS & E. MARTIN. The Relationship between Subjective Memory Rating and Performance on Objective Measures in Midlife HIV + Women.

Objective: Although there continues to be nearly 40,000 new cases of HIV per year in the United States, the fastest-growing demo-

graphic group appears to be women. Despite this fact, there remains a dearth of research on the cognitive and neuropsychological sequelae of HIV in women. Early detection of mild cognitive disorder and cognitive deficits in this population may enhance treatment interventions. Subjective report of memory function may be the first indication of possible neurocognitive disorder in this population. We examined performance on the RCFT and the HVLIT measures of memory.

Participants and Methods : Participants were 24 HIV+ women ages 22-60 with a mean education of 11.66 years. Women rated their current memory performance on a scale of 1-10. The mean subjective memory rating was 7.75.

Results : Pearson correlations were computed for the HIV + women to assess the relationship between subjective memory rating and measures of delayed visual and verbal memory. Subjective memory rating did not significantly correlate with performance on any memory measure derived from the RCFT or the HVLIT-R.

Conclusions : SMR did not significantly correlate with performance on the RVLIT or on the HVLIT. These findings suggest that self-reported memory concerns may not signify objectively measured memory performance. Further research is needed to ascertain whether the presence of subjective memory complaints should impact upon evaluation of mild cognitive disorder in HIV + persons.

Correspondence: *Felicia Gould, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, IL 60064. E-mail: felicia.gould@students.rosalindfranklin.edu*

D.J. MOORE, S. WOODS, D.L. LAZZARETTO, C.A. DEPP, J. ATKINSON, R.K. HEATON, I. GRANT & H. GROUP. Cognitive Impairment Among Individuals with Bipolar Disorder and HIV Infection.

Objective: HIV infection is known to cause cognitive impairment and there is increasing evidence that bipolar disorder (BD) may also have harmful cognitive effects. The objective of the present study was to determine severity of cognitive impairment among individuals with comorbid BD and HIV infection (BD+/HIV+).

Participants and Methods : We examined the rate of cognitive impairment among 30 BD+/HIV+ and 21 BD+/HIV- individuals and a comparable group of 30 BD-/HIV+ and 21 BD-/HIV- individuals in terms of demographics (except for sex), lifetime substance dependence, and Hepatitis C infection. No significant differences were found for level of depression (Beck Depression Inventory; BDI) among the BD+/HIV+, BD+/HIV-, and BD-/HIV+ groups. The BD+ groups had significantly worse BDI scores as compared to the BD-/HIV- group. Participants completed a comprehensive neuropsychological battery and expert clinical ratings of neuropsychological performance were used to classify participants as globally impaired or unimpaired.

Results : A Cochran-Armitage Trend Test revealed a significant linear trend ($p = .001$) of increasing prevalence of global neuropsychological impairment among those with no risk conditions (BD-/HIV-; 24%), 1 risk condition (either BD-/HIV+ or BD+/HIV-; 61%), and 2 risk conditions (BD+/HIV+; 70%).

Conclusions : These preliminary results suggest that persons with BD+/HIV+ may be at greater risk for cognitive impairment as compared to individuals with HIV or neither condition. Further prospective studies are needed to understand the underlying neurobiological mechanisms and functional consequences (e.g., medication adherence) of cognitive impairment among BD+/HIV+ individuals, as well as the potential influence of psychotropic and antiretroviral medications, psychiatric disease severity, and nature and pattern of substance use on these findings. Correspondence: *David J. Moore, Ph.D., Psychiatry, University of California San Diego, 3350 La Jolla Village Dr., MC 116-A13, San Diego, CA 92161. E-mail: djmoore@ucsd.edu*

C.L. CAREY, S.P. WOODS, E.E. MORGAN, J.D. RIPPETH, M. DAWSON, I. GRANT & T. HNRC GROUP. Prospective Memory Complaints in HIV-1 Infection.

Objective: Individuals with HIV-1 infection demonstrate impairment in prospective memory (ProM), a form of episodic memory involving the execution of future intentions. This study sought to examine the nature, frequency, and determinants of self-reported daily ProM failures in persons infected with HIV.

Participants and Methods : Forty-two individuals with HIV-1 infection and 26 demographically comparable HIV seronegative subjects were administered the Prospective and Retrospective Memory Questionnaire (PRMQ), which is a valid and reliable self-report inventory that assesses both ProM and retrospective memory ([RM]; i.e., recall for past events).

Results : Main effects were observed for HIV status ($p < .05$, $\eta^2 = .08$) and memory complaint type (i.e., ProM and RM; $p < .0001$, $\eta^2 = .379$), with no significant interaction. Pair-wise comparisons indicated that within both samples, complaints of ProM failures were more frequent than RM failures ($ps < .0001$). Performance on an objective ProM task (i.e., Memory for Intentions Screening Test), overall cognitive status (i.e., impaired/unimpaired) as determined by performance on a comprehensive neuropsychological battery, CD4-lymphocyte count, and self-reported depression (i.e., nonsomatic items on the BDI) were entered into a regression model to predict ProM complaints within the HIV-1 sample. The only significant predictor was self-reported depression ($p < .05$, $\beta = .72$ [.31]).

Conclusions : Results replicate prior research demonstrating an association between cognitive complaints and depression in individuals with HIV-1 infection; more importantly, these findings also indicate that ProM complaints are common in this population and highlight the need for including ProM assessment when investigating subjective cognitive complaints in clinical research and practice.

Correspondence: *Catherine L. Carey, Ph.D., UCSF, 491 29th Street, San Francisco, CA 94131. E-mail: ktcarey@gmail.com*

J. HASSENSTAB, M. RIVERA MINDT, D. BYRD, E. RYAN & S. MORGELLO. Ethnic Differences in Risk for HIV-associated Neuropsychological Impairment: Role of Depression and Low Literacy.

Objective: The Hispanic community is disproportionately impacted by the HIV/AIDS epidemic, as well as socioeconomic deprivation, low education/literacy and depression. However, little has been done to evaluate how such risk factors contribute to neuropsychological (NP) impairment in HIV-infection. The aim of this study was to evaluate whether low socioeconomic status (SES), low literacy (as a proxy for cognitive reserve) and depression increase risk for global NP impairment among HIV+ Hispanics and non-Hispanic Whites.

Participants and Methods : One-hundred HIV+ adults with advanced HIV (51 Hispanic; 49 non-Hispanic White) completed neuromedical, psychiatric and NP evaluations. Groups were matched on age, gender, education and CD4 count (all p 's $> .10$). All participants were fluent English-speakers.

Results : While the Hispanic group had significantly lower SES and literacy than their non-Hispanic White counterparts (all p 's $< .001$), rates of diagnosed depression were equivalent ($p > .10$). Separate logistic regressions using SES (median income), literacy (WRAT-3 Reading T-score) and diagnosed depression status (PRISM interview) to predict global NP status (NP-normal vs. NP-impaired; e.g., overall average T-score from a comprehensive NP battery using demographically corrected T-scores) yielded a significant NP model for the Hispanic group ($X_{(4)}^2 = 19.53$; $p < .001$), but not the non-Hispanic White group ($X_{(4)}^2 = 0.42$; $p > .10$). For the Hispanic group, diagnosed depression ($OR = 13.88$; $p < .01$) and low literacy ($OR = 7.07$; $p < .05$) significantly increased risk of global NP impairment.

Conclusions : Determinants of global HIV-associated NP impairment differed by ethnicity. Depression and low literacy appear to lessen cognitive reserve and increase risk of NP impairment among predominately English-speaking Hispanics with advanced HIV.

Correspondence: *Jason Hassenstab, MA, Psychiatry-Neuropsychology, Columbia University, 16 East 60th St., Suite 400, New York, NY 10021. E-mail: jasonhassenstab@yahoo.com*

M.A. RICHARDSON, E.E. MORGAN, M.J. VIELHAUER, C.A. CUEVAS, L. BUONDONNO & T.M. KEANE. Effects of Depressed Mood or Major Depression on Learning and Memory Among Triply-Diagnosed HIV+ Adults.

Objective: There is little consensus regarding the effects of depression on memory functioning among adults living with HIV. Extant literature variously suggests that memory deficits are associated with advanced disease progression or to significant depression, not necessarily to their combined effects. The present study examines the impact of varying levels of self-reported depressive symptoms versus evidence of recent major depression on learning and memory among HIV seropositive adults with a co-morbid history of psychiatric and substance use disorders, and hypothesized that the more rigorous diagnostic method would demonstrate greater sensitivity to deficits in learning and memory.

Participants and Methods : Forty HIV+ adults (65% male; mean age: 41 years; mean education: 12.4 years; 50% African American, 30% Caucasian) were recruited for a study of the impact of brief therapies on relapse prevention, treatment adherence, and anxiety; they also completed an extensive battery including tests of working memory (WMS-III Digit Span, Spatial Span), verbal list learning and delayed free recall (AVLT), non-verbal learning and recognition memory (Rey Complex Figure), symptoms of depression (BDI II) and mood disorder (SCID-IV).

Results : After controlling for age, education and viral load, a series of ANCOVAs demonstrated that a significant majority performed in the impaired range on measures of learning and memory. However, independent adverse effects of depressive symptoms were not observed, at the mild (BDI II score ≥ 13), moderate (≥ 19) or severe level (≥ 28). Further, a recent diagnosis of Major Depression (SCID-IV) had a significantly adverse impact on only verbal working memory (Digit Span Total, Digit Span Backwards).

Conclusions : The present findings suggest the need for careful consideration of the purpose and utility of measures of depressive symptoms or affective disorder when developing clinical and research protocols, particularly for cognitively vulnerable populations.

Correspondence: *Mark A. Richardson, PhD, Psychology, Boston University, 648 Beacon Street, 2nd floor, Boston, MA 02215. E-mail: markrich@bu.edu*

T.R. BARCLAY, E. SINGER, A. LEVINE, D. COMMINS, S. CASTEL-LON, O. URENO & C. HINKIN. Neuropsychological Effects of HIV and Hepatitis C Co-Infection.

Objective: While the deleterious effects of HIV infection on neuropsychological function are well-established, it has only recently been recognized that infection with the hepatitis C virus (HCV) is also associated with neurocognitive compromise. Even less attention has been focused on whether HIV/HCV co-infection may lead to disproportionate impairment over and above mono-infection with either virus alone.

Participants and Methods : The present study examined neuropsychological performance among a cohort of 183 HIV+ individuals, 52 of whom were also HCV infected. Subjects were participants in the Los Angeles site of the National NeuroAIDS Tissue Consortium (NNTC), a multi-site, longitudinal study designed to assemble a specimen bank of clinically well-characterized brains and associated tissue.

Results : Participants were predominately male (80.3%) and averaged 42.93 (SD=8.6) years of age. The HIV/HCV co-infected group was significantly more likely to have used injection drugs [$\chi^2 = 12.2$, $p < .001$]. All subjects were administered a standard battery of neuropsychological tests. Results of logistic regression analysis revealed that the co-infected subjects were 2.3 times more likely to evidence global cognitive dysfunction than were those subjects who were only HIV+ [$\beta = .85$,

SE=.43, Wald=4.0, $p=.05$, OR=2.3, 95% CI = 1.02–5.4]. Follow-up analyses revealed that this was largely attributable to deficits in memory [$\beta=.89$, SE=.38, Wald=5.4, $p=.02$, OR=2.4, 95% CI = 1.2–5.1] and to a lesser degree, learning [$\beta=.64$, SE=.37, Wald=2.9, $p=.09$, OR=1.9, 95% CI = .91–3.9].

Conclusions : In summary, HIV/HCV co-infected adults are at increased risk for neurocognitive dysfunction. Whether this is due to the additive, if not synergistic, effects of HIV/HCV co-infection, or simply to the deleterious effects of drug use on cognition, remains to be determined through larger scale prospective study.

Correspondence: *Terry R. Barclay, Ph.D., Department of Psychiatry and Biobehavioral Sciences, University of California Los Angeles, UCLA Neuropsychiatric Institute, 760 Westwood Blvd., #CS-746, Los Angeles, CA 90095. E-mail: tbarclay@mednet.ucla.edu*

M.A. COLE, S.A. CASTELLON, M.J. REINHARD, T.R. BARCLAY, A.C. PERKINS & C.H. HINKIN. The Relationship between Neuropsychiatric Status and Cognition in HIV.

Objective: This study evaluated the hypothesis that the neuropsychiatric symptoms of apathy and irritability seen among patients with human immunodeficiency virus (HIV) are generated directly from disease related processes, whereas other affective symptoms (i.e. anxiety and depression) may reflect secondary processes. The degree to which apathy, irritability, depression and anxiety were associated with performance on neurocognitive measures that are dependent upon frontal-subcortical circuitry, and therefore thought to be sensitive to the potential CNS effects of HIV, was evaluated.

Participants and Methods : Rating scales assessing irritability, apathy, depression and anxiety were administered to 208 HIV-seropositive participants who completed a battery of neuropsychological tests assessing relevant cognitive domains.

Results : Executive functioning was significantly associated with neuropsychiatric status. More specifically, multiple regression analysis revealed that irritability, apathy, depression and anxiety together accounted for 9.1% of the variance in dual task performance. Follow-up regression analysis revealed that only irritability and apathy were significantly related to dual task performance. Further, irritability and apathy accounted for 5.7% of the variance in the dual task performance when controlling for depression and anxiety, while depression and anxiety only accounted for 0.4% of the variance in performance when controlling for irritability and apathy.

Conclusions : HIV associated CNS involvement, such as disrupted frontal-subcortical circuits, likely underlies the presence of irritability and apathy as these symptoms were significantly related to impaired frontal systems functioning. Similarly, apathy and irritability have been observed in other neurological conditions affecting frontal systems. Depression and anxiety may be more related to secondary sequelae of HIV such as illness and reaction to diagnosis.

Correspondence: *Michael A. Cole, Doctorate, Neuropsychology, University of California, Los Angeles, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, #CS-746, Los Angeles, CA 90095. E-mail: micole@mednet.ucla.edu*

Hydrocephalus

J. KOOP, A.K. HEFFELFINGER, B.A. KAUFMAN & S.M. LEW. Unshunted Compensated Hydrocephalus in Three Preschoolers: Neuropsychological and Clinical Outcomes.

Objective: We have followed three cases of unshunted compensated hydrocephalus from neuropsychological and neurosurgical perspectives. The similarities in birth and early developmental histories are striking and include preterm birth and a history of intraventricular hemorrhage

that proceeded development of hydrocephalus. Repeated imaging studies of all have demonstrated seemingly stable ventriculomegaly and intracranial pressure. Given apparent stability of neurological status, periodic neuropsychological evaluations were requested to assess for subtle signs of dysfunction or functional change to assist in determining whether or not surgical intervention was warranted.

Participants and Methods : An age appropriate neuropsychological battery assessing cognition, as well as motor, attention, and language functioning was administered at baseline and 6-month follow-up. Despite no parental report of significant cognitive concerns, all demonstrated atypical performances reflecting profiles commonly associated with hydrocephalus.

Results : Case 1 was a 5-year, 4-month-old female who demonstrated stable visuospatial difficulties with declining attention and motor functioning. Case 2 was a 3-year, 9-month-old female who evidenced lack of progress in visuospatial abilities and subtle decline in motor functions. Case 3, a 5-year, 8-month-old female, demonstrated comparable average verbal and visuospatial abilities, but evidenced a subtle decline in attention and motor functioning. Verbal cognition and language functioning for all three cases were within the average range.

Conclusions : The significance and implications of these subtle neuropsychological findings were considered in the context of conflicting opinion presented in the literature of whether or not surgical intervention is appropriate. However, detection of these mild difficulties demonstrates the efficacy of neuropsychological evaluations in preschoolers for uncovering subtle functional differences.

Correspondence: *Jennifer Koop, PhD, Neurology, Medical College of Wisconsin, 9200 West Wisconsin Ave., Milwaukee, WI 53226. E-mail: jkoop@neuroscience.mcu.edu*

B.A. PYYKKONEN, T. DO, M. LACY, D. MOTTLOW & D. FRIM. Long-Term Cognitive Effects In Shunted Hydrocephalus Patients.

Objective: To investigate long-term cognitive effects in hydrocephalus patients shunted in the first year of life.

Participants and Methods : Thirty-Six children ages 6-15 (mean=9.7 years), with a history of hydrocephalus, shunted within the first year of life underwent neuropsych testing. Eleven controls aged 6-15 (mean=10.3 years) were used for comparison.

Results : Independent samples t-tests (two-tailed) indicated significant group differences in FSIQ; $t(45)=3.78$, $p<.001$, VIQ; $t(45)=3.59$, $p=.001$, and PIQ; $t(45) 3.37$, $p=.002$. Specific IQ domains evidenced significant group differences in verbal comprehension; $t(45)=3.51$, $p=.002$, perceptual organization; $t(45)=3.48$, $p=.001$; and distractibility; $t(45)=2.37$, $p=.022$. Significant differences were also noted on verbal and nonverbal memory measures for both immediate and delayed recall (RCFT-Immediate; $t(40)=2.87$, $p=.007$, RCFT-Delay; $t(39)=2.83$, $p=.007$, CVLT-Total; $t(45)=3.00$, $p=.001$, CVLT-Delay; $t(45)=3.39$, $p=.001$, and CVLT-Discriminability; $t(45)=2.80$, $p=.007$). Group means on verbal and non-verbal measures of abstract reasoning were significantly different (WISC-III; Similarities; $t(45)=3.28$, $p=.002$, Picture Completion; $t(45)=2.49$, $p=.016$). Significant differences between group means were also noted on attention measures (CAS, EA; $t(45)=4.02$, $p<.001$, CAS, PC; $t(45)=2.76$, $p=.008$, CAS, Attention-Index; $t(44)=2.29$, $p=.027$, and Gordon Diagnostic Systems, Distractibility Total; $t(44)=2.83$, $p=.007$). Regression analysis revealed CAS Expressive Attention, CVLT-C LDFR, and CAS Attention Index as significant predictors ($R=.698$, $p=.014$).

Conclusions : Consistent with previous research hydrocephalus patients evidenced impairment in intellectual functioning, memory, and attention. Contrary to previous research academic ability, visuospatial abilities, fine motor functioning and cognitive processing speed were not significantly different. Finally, measures of attention and delayed verbal memory were significant predictors of group membership. Implications will be discussed.

Correspondence: Benjamin A. Pyykkonen, Illinois Institute of Technology, 515 Kipling Court, Wheaton, IL IL. E-mail: pyyken@iit.edu

M. LACY, B.A. PYYKKONEN, V. BOLENDER, T. DO, D. MOTTLOW & D. FRIM. Cognitive Outcome as a Function of Surgical Intervention in Hydrocephalus.

Objective: The current study examines neurocognitive outcome related to different treatment interventions for hydrocephalus.

Participants and Methods : Twenty-three adults who underwent surgical intervention for hydrocephalus completed a neuropsychological battery of tests. The performances of 16 patients with a programmable valve shunting system were compared with 7 individuals with a non-shunting obstructive bypass system (Endoscopic Third Ventriculocisternostomy) across the test battery.

Results : Inspection of data revealed scores for both groups were consistently one standard deviation below normative means (e.g., RBANS Total=83), despite normal estimates of premorbid intellect (WTAR FSIQ=98). Independent samples t-tests revealed significant group differences (Shunt vs. ETV) on MMSE [$t(20)=2.743.78$, $p=.01$], RBANS Figure Copy [$t(21)=2.05$, $p=.05$], and Stroop Interference [$t(20) 3.37$, $p=.03$]. In addition, a trend towards significance was noted on the BVMTR learning scale [$t(20)=1.81$, $p=.086$]. The remaining memory, attention, motor, and depression scales did not differ between the groups.

Conclusions : While hydrocephalic individuals continue to perform slightly below age peers following treatment, those who undergo ETV perform more poorly than shunted patients. Specific impairments were evident on a global measure of cognitive functioning, along with planning and response inhibition tasks. The enlarged ventricles post ETV may result in increased disruption of frontal networks in this patient population. In summary, adults with hydrocephalus continue to display reduced cognitive functioning following treatment, with individuals undergoing ETV at the highest risk. Recommendations regarding treatment will be presented.

Correspondence: Maureen Lacy, Ph.D, Psychiatry Dept, University of Chicago Medical Center, 5837 S. Maryland, Chicago, IL 60637. E-mail: mlacy@yoda.bsd.uchicago.edu

A. URBAN, K. KEARNS, M. LACY, T. DO & D. FRIM. Cognitive Functioning Pre and Post Lumbar Drain Trial in Normal Pressure Hydrocephalus.

Objective: Although studies have indicated that treatment of normal pressure hydrocephalus with ventriculoperitoneal shunt improves gait, the effects of treatment on cognition have been inconsistent. Assessment of cognition during lumbar drain trials has been proposed as a first step in determining need for surgical intervention. We hypothesize that a hydrocephalic state places unique pressure on frontal networks. Thus, acute reduction in intracranial pressure should result in improved performances on frontal measures.

Participants and Methods : Cognitive functioning was examined in thirty-six patients with idiopathic NPH just prior to and three days post external lumbar drainage.

Results : At baseline, patients displayed significant cognitive impairment: (e.g., MMSE Total=22, RBANS Total Index=70). Following reduction in intracranial pressure, significant improvement was seen on the RBANS Immediate Memory Index and the Immediate List Learning subtest ($p < .01$). There was also a trend towards change in delayed figural memory ($p>.06$).

Conclusions : Changes in immediate recall suggests improved attentional focus. This finding is consistent with improved functioning in frontal networks secondary to decreased CSF pressure. This study also suggests that the RBANS may be useful in assessing post-drain changes in cognitive functioning.

Correspondence: Maureen Lacy, Ph.D, Psychiatry Dept, University of Chicago Medical Center, 5837 S. Maryland, Chicago, IL 60637. E-mail: mlacy@yoda.bsd.uchicago.edu

C.A. CLANCY, K.O. YEATES & B.G. ENRILE. Corticosensory Impairments and their Neuropsychological Correlates in Children with Spina Bifida and Shunted Hydrocephalus and Healthy Siblings.

Objective: The study examined corticosensory impairments and their relationship with neuropsychological functioning in children with spina bifida and shunted hydrocephalus (SB/HC) and healthy siblings.

Participants and Methods : Tests of double-simultaneous tactile stimulation, tactile finger recognition, and fingertip number writing, as well as a comprehensive battery of neuropsychological tests were administered to 33 children with SB/HC and 27 healthy siblings. The children were all between 9 and 14 years of age and had IQs greater than 70. Error scores on the three corticosensory tasks were converted to corresponding scores on the Halstead-Reitan neuropsychological deficit scale and summed to compute an overall corticosensory deficit score.

Results : The SB/HC group made more errors bilaterally than the siblings on all three corticosensory tasks. In addition, they also showed more variability in the total number of errors than the siblings, and made more left-sided errors regardless of handedness. For the SB/HC group only, the overall corticosensory deficit score was negatively correlated with performance on visual-motor, visuospatial/constructional and attention measures.

Conclusions : The findings suggest a pattern of corticosensory impairments consistent with the regional brain abnormalities and neuropsychological deficits that are characteristic of children with SB/HC. Moreover, the results indicate that variability in corticosensory functioning is predictive of individual differences in neuropsychological functioning among children with SB/HC.

Correspondence: Christine A. Clancy, PhD, Psychology Department, Columbus Children's Hospital, 4th Floor Timken Hall, 700 Children's Drive, Columbus, OH 43205. E-mail: clancy@chi.osu.edu

Medical Disorders

A. D'APRILE, D.F. TATE, K. BRAMLEY, J. GUNSTAD, A.L. JEFFERSON, A. POPPAS, D. FORMAN, R.H. PAUL & R.A. COHEN. Lacunar Lesion Load and Attention in Treated Cardiovascular Disease.

Objective: Cardiovascular disease (CVD) patients are thought to be at increased risk for both cognitive and neuroimaging changes. The purpose of this study was to quantify lesions among a group of treated CVD patients and determine the relationship between lesion load and attention.

Participants and Methods : Twenty-five CVD patients (mean age=71) with MMSE scores greater than 27 were studied. Using the T1 weighted MPRAGE sequence, small lacunar infarctions were quantified using thresholding methods. Lesion location was separated into two regions: sub-cortical (in and around basal ganglia and thalamus) and neocortical (superior to lateral ventricles). Patients were also administered the Adaptive Rate Continuous Performance Test (ARCPT) to measure sustained attention. ARCPT scores were compared to controls using normative data.

Results : ARCPT scores significantly differed from normative data on measures of response consistency, with overall slower response times. Additionally, scores for the ARCPT were more variable than expected. Lesions were most prominent in subcortical regions and patients with increased subcortical lesion volumes were more variable in their response

style between block(s) (ARCPT Bias; $r = -.40$, $p = .05$) with an overall tendency toward responding much slower (ARCPT Interstimulus Interval; $r = .70$, $p < .001$). Patients with increased subcortical lesions also tended to produce more false-positive responses (ARCPT False Positive; $r = .63$, $p = .001$). In contrast, neocortical lesion volumes were unrelated to any ARCPT measure.

Conclusions : From these results, it appears that subcortical lesions play a critical role in mediating measures of attention and speed of processing when compared to neocortical lesions. This is likely due to cognitive processes functionally mediated by subcortical circuits.

Correspondence: *Arielle D'Aprile, BA, Providence College, 8 Sylvia Street, Newburgh, NY 12550. E-mail: Escarole1@aol.com*

J. GUNSTAD, R.H. PAUL, R.A. COHEN, D.F. TATE, M.B. SPITZ-NAGEL & E. GORDON. Elevated Body Mass Index and Executive Dysfunction in Healthy Adults.

Objective: There is growing evidence that obesity is linked to adverse neurocognitive outcome, including reduced cognitive functioning and Alzheimer's disease. However, no study to date has determined whether the relationship between body mass index (BMI) and cognitive performance varies as a function of age.

Participants and Methods : Using a cross-sectional design, we examined attention and executive function in 408 adults (20-82 years) from the Brain Resource International Database. Prior to enrollment into the Database, all study participants were rigorously screened for medical and psychiatric conditions with the potential to influence cognitive performance.

Results : Bivariate correlation showed BMI was inversely related to performance on all cognitive tests. Though modest in size (range from $r = 0.11$ to $r = 0.23$), all correlations were in the expected direction. A separate MANCOVA was then conducted for attention and executive function tests. To reduce the possible confound of demographic or psychosocial variables, covariates included estimated IQ, years of education, sex, and self reported levels of depression, anxiety, and stress. MANCOVA showed overweight and obese adults ($BMI > 25$) exhibited poorer executive function test performance than normal weight adults ($BMI 18.5-24.9$). Corrected posttest showed normal weight persons performed better on a task of verbal interference and a complex maze test. No differences emerged in attention test performance and there was no evidence of a BMI X Age interaction for either cognitive domain.

Conclusions : These results provide further evidence for the independent relationship between elevated BMI and reduced cognitive performance and suggest this relationship does not vary with age. Further research is needed to identify the etiology of these deficits and whether they resolve following weight loss.

Correspondence: *John Gunstad, Psychiatry and Human Behavior, Brown Medical School, 1 Hoppin St, Coro-West 3rd Floor, Providence, RI 02903. E-mail: JGunstad@lifespan.org*

M.C. WILDE, R.J. CASTRIOTTA, J.M. LAI, S. ATANASOV, B. MASEL & S. KUNA. Cognitive Impairment in Patients with Traumatic Brain Injury (TBI) and Obstructive Sleep Apnea (OSA).

Objective: The objective of this research is to examine the impact of comorbid Obstructive Sleep Apnea (OSA) on the cognitive functioning of traumatic brain injury (TBI) patients.

Participants and Methods : This sample included 19 TBI patients who were newly diagnosed with OSA. These patients were compared to a group of TBI patients without sleep disorders. All OSA diagnoses were based on a standard polysomnogram and Multiple Sleep Latency Test (MSLT). The groups were equated on age, education, severity of injury (when available); time post injury, and Glasgow Coma Scale (GCS)

(when available). The neuropsychological outcome measures were: Digit Span Test (DST), Rey Complex Figure Test (RCFT), Rey Auditory Verbal Learning Test (RAVLT), Finger Tapping Test (FTT), and the Psychomotor Vigilance Test (PVT). Test performances were compared between the groups using t tests for independent samples.

Results : There were no significant differences between the groups on the FTT for the dominant ($p > .05$) and nondominant hands ($p > .05$), DST Forward ($p > .05$) or Backward, ($p > .05$) RCFT-Copy, ($p > .05$) or the RAVLT Total learning in trials 1-5 ($p > .05$). The OSA/TBI patients performed significantly worse than the non OSA/TBI patients on the RCFT Delayed Recall ($p < .05$), the RAVLT short ($p < .05$) and long delay free recall trials ($p < .05$), the RAVLT percent retention between trial 5 and long delay free recall ($p < .05$), and the number of PVT lapses (Reaction times greater than 500 ms) ($p < .05$).

Conclusions : The presence of OSA seems to have an additional impact on vigilance and memory functioning of TBI patients. The clinical and research significance of these findings will be discussed.

Correspondence: *Mark C. Wilde, Psy.D., Department of Physical Medicine and Rehabilitation, UT Medical School Houston, 6431 Fannin 5.220, Houston, TX 77030. E-mail: mark.c.wilde@uth.tmc.edu*

J.G. WHITE, R.O. HOPKINS, E.W. GLISSMEYER, N. KITTERMAN & C. ELLIOTT. Comparison of Cognitive Complaints and Neurocognitive Impairments in Patients with Pulmonary Arterial Hypertension.

Objective: Neuropsychological impairments are common in patients with pulmonary arterial hypertension (PAH). Relationships between reported and measured cognitive impairments have been investigated in other populations. We compared the reported cognitive complaints with measured neuropsychological impairments in PAH patients.

Participants and Methods : There were 46 PAH patients, 83% female, mean age 48 SD 12 years, and mean education 13.6 SD 3 years. A cognitive questionnaire and formal neuropsychological tests were administered to determine if the questionnaire correctly classified patients with neuropsychological impairments.

Results : 19.6% had a New York Heart Association Class II, 67.4% Class III, and 2.2% Class IV. The mean duration from PAH diagnosis to testing was 2.6 SD 2.6 years. The patients mean PaO₂ was 63.7 SD 12.5 mmHg, and mean pulmonary artery pressure was 52.7 SD 13.5 mmHg. Measured FSIQ (mean = 103 SD 12) was within the normal range but lower than their estimated premorbid FSIQ (mean = 111 SD 9; $p < 0.0001$). There were no significant correlations between reported and measured cognitive impairments for memory ($r = -0.24$ to 0.15), attention (-0.18 to 0.14), executive function (-0.22 to 0.31), or processing speed (-0.16 to 0.17). The sensitivity and specificity for memory were 77% and 53% respectively (15 misclassified), attention 60% and 80% (17 misclassified), executive function 89% and 29% (9 misclassified), and processing speed 10% and 94% (11 misclassified).

Conclusions : Our cognitive questionnaire had variable sensitivity and specificity and incorrectly classified many patients. Formal neuropsychological testing should be used to assess neuropsychological impairments in patients with PAH.

Correspondence: *Joanne G. White, Clinical Psychology, Brigham Young University, 6249 W Oak Gate Dr, West Jordan, UT 84088. E-mail: cakeaholic@earthlink.net*

S.K. LAGEMAN, L. YUILL, K. VELLINGA-SUPRATA & E.B. FENNELL. The Long-Term Cognitive and Emotional Impact of Standard Adjuvant Treatments on Women With Early-Stage Breast Cancer.

Objective: This study longitudinally investigated cognitive changes related to stage I-IIIa standard adjuvant breast cancer treatments.

Participants and Methods : Twenty-three women with early-stage breast cancer were administered a comprehensive neuropsychological battery, measures of mood, anxiety, and quality of life (QOL). Patients

completed three assessments over the course of one year; baseline assessment 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) commenced. Three treatment groups were analyzed (CT+ET $n = 7$, 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 : In general, depression and anxiety were found to decrease over time and QOL improved over time. Changes in cognition were not detected in this sample when covariates of RT, age, education, stage of breast cancer, and self-reported emotional functioning were included, regardless of treatment type. However, education level obtained was found to significantly moderate the pattern of practice effects demonstrated in this sample. In general, the higher the education patients had completed, the more they benefited from repeated exposure to neuropsychological tests.

Conclusions : While replication of these findings with larger samples is needed, cognitive changes experienced during and after treatments for early-stage breast cancer may not be treatment-induced. Future studies need to explore alternative mechanisms for cognitive complaints in breast cancer patients to improve the functional outcome of women receiving early-stage breast cancer treatments.

Correspondence: Sarah K. Lageman, M.S., *Clinical and Health Psychology, University of Florida, 1502 Lakeside Village, Morgantown, WV 26505. E-mail: slageman@hsc.wvu.edu*

S. LUND GELB, W.J. THORNTON, R.J. SHAPIRO & A. HILL. **Memory Performance after Kidney Transplantation.**

Objective: While memory impairments have been identified in patients with chronic kidney disease (CKD) prior to renal replacement therapy, few studies have examined memory in adults following kidney transplantation. With kidney transplantation comes resolution of the metabolic derangements associated with kidney failure, and cognition is presumed to recover. Nevertheless, premorbid diseases commonly associated with kidney disease (i.e., hypertension, diabetes) often persist. Since hypertension and diabetes are independently associated with cognitive impairment, kidney transplant patients may remain at risk for memory impairment.

Participants and Methods : We used a cross-sectional case-controlled design to assess the hypothesis that memory difficulties will exist in kidney transplant recipients. Using the CVLT-2, we assessed memory performance in 20 medically stable post-kidney transplant recipients, (age: 51.60 yrs; time since transplant: 4.15 yrs), 30 outpatients with chronic kidney disease (CKD) (age: 55.00 yrs), and 20 community-dwelling volunteers (age: 56.65 yrs). Groups were matched on age and education, and were carefully screened for other conditions (i.e., head injury, stroke) with known neuropsychological sequelae. Depressive symptoms did not differ between groups (CESD).

Results : We used ANOVA techniques, with Group (transplant, CKD, and healthy control) as the independent variable, and three CVLT-2 measures ("trial 1", "trials 1-5", and "% retention") as the dependent measures. No significant Group differences emerged on either "trial 1" or "trials 1-5" performance. However, both post-transplant and CKD patients demonstrated significantly poorer memory retention than matched controls.

Conclusions : Results suggest that memory retention difficulties persist following successful kidney transplantation. Future research is needed to determine the etiology and extent of this apparent deficit.

Correspondence: Shannon Gelb, B.Sc., *Psychology, Simon Fraser University, RCB 5246, 8888 University Drive, Burnaby, BC V5A 1S6, Canada. E-mail: slund@sfu.ca*

I. BRANDS, S.M. MANSCHOT, E. VAN DEN BERG, J.L. KAPPELLE, G.J. BIESSELS, E.H. DE HAAN & R.P. KESSELS. **Cognition and Psychological Distress in Type 2 Diabetes Mellitus.**

Objective: Type 2 diabetes mellitus (DM2) is a common metabolic disorder in elderly people and is associated with clinically significant cognitive impairments. Depressive symptoms occur in about one third of patients with DM2. In the current study we examined the cognitive profile and the psychological well being in patients with DM 2 and matched controls.

Participants and Methods : 119 DM2 patients (DM2: mean age: 66 \pm 6; mean duration: 9 \pm 6) were compared with 55 age and education matched control participants. Neuropsychological assessment covered all cognitive domains. Psychological well-being was assessed by two questionnaires.

Results : DM2 patients performed significantly worse than controls on memory, attention and executive functioning and speed of information processing ($p \leq 0.05$), although the differences were modest (effect size ≤ 0.6). Patients with DM2 also had significantly higher scores on the SCL-90-R ($p \leq 0.001$) and on the BDI ($p \leq 0.001$) than controls, but levels of psychological distress did not correlate with cognition or biomedical characteristics.

Conclusions : DM2 patients probably have a diminished ability to efficiently process unstructured information and to flexibly use stored information. This results in a slower performance on neuropsychological tasks. Given the mild nature of the impairments DM2 patients probably can reach the same level of performance as non-diabetics of the same age, but need more mental effort to do so. While these impairments are accompanied by greater levels of psychological distress, we did not find a correlation between these two variables. We hypothesise that cognitive impairment and depressive symptoms are independent symptoms of the same underlying pathology.

Correspondence: Ineke Brands, Msc, *neuropsychology, Hofpoort hospital, Blekerijlaan 3, Woerden 3447 AC, Netherlands. E-mail: i.brands@altrecht.nl*

T.D. PARSONS, S.A. ROGERS, A.J. BRAATEN, S.P. WOODS & A.I. TROSTER. **Cognitive Sequelae of Subthalamic Nucleus Deep Brain Stimulation in Parkinson's Disease: A Meta-Analytic Review.**

Objective: Deep brain stimulation (DBS) of the subthalamic nucleus (STN) is an increasingly common treatment for Parkinson's disease (PD). Qualitative reviews have concluded that diminished verbal fluency is common after STN DBS, but that changes in global cognitive abilities, attention, executive functions, and memory are only inconsistently observed and, when present, often nominal and/or transient. Lacking is a quantitative meta-analysis that enhances understanding of the variability and clinical significance of cognitive dysfunction after STN DBS.

Participants and Methods : Searches of MedLine (1990-2004), PsycLIT (1990-2004), and ISI Web of Science electronic databases (1990-2004) yielded 32 neuropsychological studies, and of these, 24 studies (including 477 subjects) met the eligibility criteria for inclusion in the meta-analysis.

Results : After adjusting for heterogeneity of variance in study effects sizes, the meta-analysis revealed small, albeit statistically significant declines in executive functions and verbal learning and memory. Moderate declines were only found in semantic ($d = .54$) and phonemic verbal fluency ($d = .46$).

Conclusions : STN DBS, in select patients, appears relatively safe from a cognitive standpoint. Changes in verbal fluency are interpreted in the context of research describing an association between verbal fluency and left frontal-subcortical networks.

Correspondence: Thomas D. Parsons, PhD, *Neurology, CB # 7025, UNC Chapel Hill School of Medicine, 3114 Bioinformatics Building, CB # 7025, Chapel Hill, NC 27599-7025. E-mail: tparsons@neurology.unc.edu*

A. RAMATI, J.A. SWEENEY, J. REILLY, J.W. FINK, R.J. ERWIN, E.N. BODNAR, K. KELLEY, R.C. LEE & N.H. PLISKIN. Oculomotor Abnormalities as an Indication of Cognitive Dysfunction in Electrical Injury Patients.

Objective: Cognitive deficits in attention, processing speed and learning are commonly reported following electrical injury (EI) although their pathophysiology is not well understood. Oculomotor studies offer a promising approach for investigating the integrity of a widely distributed neocortical and subcortical brain systems.

Participants and Methods : Five EI patients and six healthy controls performed two oculomotor tasks. A visually guided saccade task required shifts of attention in response to the displacement of visual stimuli. A predictive saccade task, a serial reaction time task, assessed the ability to learn to make saccades based on learned spatial-temporal predictions.

Results : EI patients demonstrated significantly longer latencies on the attention shifting task, and slower rates of implicit learning on the predictive saccade task. Groups did not differ in accuracy, duration or velocity of saccades.

Conclusions : These findings provide objective evidence for impaired visual attention and implicit learning in EI. The prolonged latencies on the attention shifting task suggest neurophysiological dysfunction in projections from the cortical eye fields and basal ganglia to the superior colliculus that are critical for shifts of attention and eye movement. The reduced rate of implicit learning on the predictive saccade task suggests an abnormality in the frontostriatal system supporting implicit learning. The lack of group differences in the accuracy, duration and velocity of primary saccades is inconsistent with medication or low effort confounds as a source of the observed deficits.

Correspondence: *Alona Ramati, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Rd., North Chicago, IL 60064. E-mail: ramati_a@yahoo.com*

M.J. LARSON, R.O. HOPKINS, R. STECKLEY, C.B. MAUER & L.K. WEAVER. Neurocognitive Sequelae in ARDS Patients With and Without Recall of the Intensive Care Unit.

Objective: Cognitive impairment may occur following critical illness and intensive care unit (ICU) stay. Some critically ill patients have dramatic recollections of the ICU experience, while 23%-50% have no recollection of the ICU. Relationships between ICU recall and neurocognitive sequelae have not been reported.

Participants and Methods : We assessed ICU recall and neurocognitive functioning at hospital discharge, one- and two-years post-discharge in 70 consecutive acute respiratory distress syndrome (ARDS) patients. Seventeen patients (26%) denied recall of their ICU experience. The recall and no-recall groups differed for the number of comorbid disorders ($p < 0.02$), but there were no differences for demographic variables, indices of illness severity, or days receiving sedative, analgesic, or paralytic medications (all p values > 0.1).

Results : Patients with no-ICU recall had a higher prevalence of neurocognitive sequelae at hospital discharge ($p < 0.002$), but not at one- or two-years (all p values > 0.07). Profile analysis found reliable group differences for general cognitive function ($p < 0.02$), executive function ($p < 0.01$), mental processing speed ($p < 0.05$), and visuo-spatial skills ($p < 0.04$) at hospital discharge and parallel, but non-significant profiles at one- and two-years. Canonical correlations indicated pre-morbid estimated IQ scores were inversely related to neurocognitive sequelae, suggesting that higher premorbid IQ may be somewhat neuroprotective.

Conclusions : ARDS patients who do not recall their ICU experience had a higher prevalence of neurocognitive sequelae at hospital discharge compared to those who recalled the ICU. Further research is warranted to assess neurocognitive changes in patients with and without recall of their ICU experience.

Correspondence: *Michael J. Larson, M.S., Department of Clinical and Health Psychology, University of Florida, 2114 SW 39th Drive, Gainesville, FL 32607. E-mail: mlarson@hp.ufl.edu*

M. DICKINSON & C. MEYERS. Cognitive Effects of Marimastat in Individuals with Primary Brain Tumors.

Objective: Treatments for primary brain tumors are designed to attack the tumor itself, with less concern about their effect on surrounding brain tissue. This study explored the cognitive effects of the drug Marimastat when used in the treatment of individuals with primary brain tumors. Marimastat is a matrix metalloproteinase inhibitor thought to slow tumor angiogenesis and metastasis through destruction of the extracellular matrix of tumor cells. Given its proposed mechanism of action on tissue surrounding tumor cells, there exists the possibility of neurotoxic side effects when targeting brain tumors.

Participants and Methods : Participants were 29 patients with primary brain tumors, all received conventional first-line therapy (including surgical resection and one course of radiotherapy) prior to participation. In study 1, participants were randomly assigned in a double-blind fashion to receive Marimastat or placebo immediately following radiotherapy. In study 2, participants were given Marimastat while also receiving adjuvant chemotherapy. All participants were assessed with a neuropsychological battery prior to initiating Marimastat and at three month follow-up.

Results : Analyses indicated that individuals receiving Marimastat evidenced no declines in cognitive functioning above and beyond those attributable to standard treatment effects and disease progression. This was true when Marimastat was directly compared to placebo and when given concurrently with chemotherapeutic agents. However, participants receiving Marimastat in study 1 evidenced greater decline in upper extremity strength compared to placebo.

Conclusions : This investigation revealed that there were no measurable neurotoxic effects of Marimastat when used alone or in combination with other agents in the treatment of primary brain tumor patients. However, participants receiving Marimastat demonstrated decreased upper extremity strength at follow-up. This finding may be related to the drug's side effect profile which includes musculoskeletal complaints.

Correspondence: *Mercedes Dickinson, MA, University of Houston, 7575 Cambridge #3205, Houston, TX 77054. E-mail: mddickinson@uh.edu*

M.P. KELLY & D.D. MCNINCH. Neuropsychological Functioning in Sandfly Fever Encephalitis.

Objective: Encephalitis is an inflammation of the brain that may be caused by a broad spectrum of microbes. Acute symptoms include fever, headache, seizures, altered consciousness, and cognitive impairment. Neuropsychological deficits may persist after the acute stage and are often the major cause of disability. While neuropsychological correlates of Herpes Simplex Virus (HSV) Encephalitis have been well characterized, little is known about the non-HSV encephalitides. The objective of the present case study is to describe the neuropsychological profile and two-year outcome in a case of Sandfly Fever Encephalitis.

Participants and Methods : The patient is a 31 year-old right-handed Army officer who contracted Sandfly Fever Encephalitis during a desert deployment. Prolonged status epilepticus heralded the illness. This paper is based on a single case study methodology reporting results of comprehensive neuropsychological assessment five weeks after the onset of the illness, with two-year follow-up assessment.

Results : Baseline assessment revealed impairment in multiple cognitive domains including general intellectual functioning, academic achievement, fluency, visuoconstructive skills, attention, executive function, and motor skills. Learning and recent memory were mostly unimpaired, with the exception of incidental memory for a complex figure. Confrontation naming also was intact. Two-year follow up found the patient had returned to duty and shown significant improvement in cognition, though there were mild residual deficits.

Conclusions : Data from the present case adds to the literature as the first reported cognitive profile in a case of Sandfly Fever Encephalitis. The profile is dissimilar to that typical for HSV Encephalitis, where amnesia and naming disorders are common (Hokkanen and Launes, 2000).

Correspondence: *Mark P. Kelly, PhD, Psychology, Walter Reed Army Medical Center, 6900 Georgia Ave NW, Building 6, Washington, DC 20307. E-mail: mark.kelly@na.amedd.army.mil*

H. NYMAN, J. VEDIN, A. ERICSSON & J. VAAGE. Cognitive Function after Off Pump Compared to On Pump Coronary Artery Bypass Grafting.

Objective: To investigate cognitive outcome after on and off pump coronary artery bypass grafting.

Participants and Methods : 70 patients were randomized to on or off pump surgery. Neuropsychological tests were administered before, and one week, one month and six months after surgery. A battery of standard tests were used, selected to represent attention, verbal and visuo-spatial short-term and working memory, verbal learning and delayed recall, visuo-motor speed, and aspects of executive functions.

Results : The on pump patients performed marginally worse than off pump patients in most of the tests at each of the follow-ups. Significant differences were found only in tests of verbal working memory and visuo-motor speed. These differences may not be clinically relevant. There was a trend that more patients on pump were impaired (20% worse in at least 2 tests) at the one month follow-up, but this difference disappeared at six months.

Conclusions : This study showed only marginal differences in cognitive outcome in off pump compared to on pump coronary artery bypass grafting up to six months postoperatively in low risk patients.

Correspondence: *Hakan Nyman, PhD, Psychiatry, Karolinska Institutet, Karolinska University Hospital, Stockholm SE-17176, Sweden. E-mail: hakan.nyman@nrso.sll.se*

J.G. WHITE, R.O. HOPKINS, K.J. VALENTINE, K. NATALIE, E.W. GLISSMEYER & C. ELLIOTT. Predictors of Cognitive Sequelae in Patients with Pulmonary Arterial Hypertension.

Objective: Neuropsychological impairments are common in patients with pulmonary arterial hypertension (PAH). The risk factors associated with cognitive sequelae in patients with PAH are unknown. We investigated demographic and medical predictors for cognitive sequelae in PAH patients.

Participants and Methods : There were 46 PAH patients, 83% female, mean age 48 ± 12 , and mean education years 13.6 ± 3 . Univariate analyses were performed to determine significant demographic or medical factors associated with the presence of cognitive sequelae. All factors from the univariate analyses with $p \leq 0.1$ were included in the multivariable analysis using backwards stepwise regression. Factors in the multivariable analysis were considered significant if $p \leq 0.05$.

Results : Factors with $p < 0.1$ from the univariate analyses were higher New York Heart Association Class (classes I & II or classes III and IV; $p = 0.03$), shorter initial distance walked in 6 minutes at PAH diagnosis (≤ 415 meters walked or ≥ 415 meters; $p \leq 0.001$), longer time from diagnosis to cognitive testing ($p = 0.07$), lower initial PaO₂ mmHg (≤ 62 mmHg or ≥ 62 mmHg; $p = 0.08$), and presence of a Hickman Catheter (yes or no; $p = 0.04$). The only risk factor associated with cognitive sequelae in the multivariable model was shorter initial distance walked in 6 minutes [OR = 6.69; 95% CI = 1.37 to 32.61; $p = 0.02$].

Conclusions : Decreased exercise tolerance measured by shorter distance walked in 6 minutes at PAH diagnosis predicted cognitive sequelae in our PAH patients. Thus impaired cardiac and pulmonary function in PAH patients resulting in reduced exercise tolerance, may predict cognitive sequelae.

Correspondence: *Joanne G. White, Clinical Psychology, Brigham Young University, 6249 W Oak Gate Dr, West Jordan, UT 84088. E-mail: cakeaholic@earthlink.net*

A. MILLER, E.K. HILL, C.S. WEINSTEIN & V. BYRNES. Neurobehavioral and Neurocognitive Changes in Chronic Hepatitis C patients with Interferon Treatment.

Objective: Patients with chronic Hepatitis C (CHC) treated with Interferon-alpha

(IFN-a) demonstrate increases in depression and mixed cognitive findings, with some studies showing decrements in executive and motor functioning, attention, and learning. The current study explored whether specific neurobehavioral and neurocognitive deficits were driving mood changes in CHC patients treated with IFN-a.

Participants and Methods : Nine CHC patients were evaluated before IFN-a treatment and 3 months into treatment. Unlike previous studies, subjects with a history of depression (prior to IFN-a treatment), heavy alcohol use, HIV, or significant cognitive/neurological injury were excluded from the sample.

Results : Results revealed a significant trend on the Beck Depression Inventory, with a an overall increase from mild to moderate depression levels

($p = .08$); BDI changes were due to apathy ($p = .012$) and sleep related items ($p = .047$). No differences were seen on the Trail Making Test, Grooved Pegs, Stroop, or the Hopkins Verbal Learning Test. Verbal fluency (i.e., FAS) decreased. Subjects' recall for the Rey Osterrieth Complex Figure improved over time and within testing after patients were shown how to structure their copy. Though no practice effects were found for verbal memory over time, improvement was found for visual memory when subjects were provided with structure.

Conclusions : These findings indicate that apathy and sleep related symptoms are the primary effects of IFN-a treatment on CHC. No decrement was found in cognitive functioning during treatment (excepting verbal fluency, which may be driven by depression symptoms) Patients, however, improved with structure on the ROCF, highlighting the benefit of structure for clinical applications.

Correspondence: *Anne Miller, MA, Suffolk University, 2443 Massachusetts Ave #3, Cambridge, MA 02140. E-mail: aebmiller@gmail.com*

M.E. ZIMMERMAN, J. ARNETT, M. STANCHINA, R.P. MILLMAN & M.S. ALOIA. Normalization of Memory Performance with PAP in Memory-Impaired Patients with Obstructive Sleep Apnea.

Objective: Although treatment of Obstructive Sleep Apnea (OSA) with positive airway pressure (PAP) has been shown to be an effective therapeutic intervention, nightly adherence remains poor. Few studies have examined the moderating effects of PAP adherence on cognitive function. The objective of the current study was to examine the degree to which PAP adherence normalizes verbal memory function at 3-months in patients with OSA who were memory-impaired prior to PAP initiation.

Participants and Methods : Participants were administered the Hopkins Verbal Learning Test-Revised (HVLT-R) prior to initiation of PAP treatment and at a 3-month follow-up visit. Fifty-eight participants who were memory-impaired at baseline were categorized into three groups based on 3-month average PAP adherence: 1) Poor Users ($n = 14$), participants who used PAP 2 or fewer hours/night; 2) Moderate Users ($n = 25$), participants who used PAP 2-6 hours/night; and, 3) Optimal Users ($n = 19$), participants who used PAP 6 hours/night or more. A binary logistic regression analysis was performed to examine the differential effect of categorized PAP adherence on the prediction of verbal recall memory performance improving to the average range at 3-months in participants with memory impairment at baseline.

Results : Logistical regression analyses revealed that Optimal Users were 8.0 times ($p = 0.01$) more likely to exhibit normalization of verbal memory functioning following 3 months of PAP use compared to Poor Users. Calculation of cognitive change scores indicated that HVLT-R performance generally improved from baseline to the 3-month follow-up visit, with Optimal Users demonstrating relatively larger performance gains.

Conclusions : Optimal Users were eight times likely to demonstrate a return to normal memory performance at 3-month follow-up visit compared to Poor Users. These findings suggest that memory impairment may be improved in patients with OSA with consistent use of PAP at least 6 hours per night.

Correspondence: *Molly E. Zimmerman, PhD, Psychiatry and Human Behavior, Brown University, Brown University, Box G-BH Duncan Building, Providence, RI 02912. E-mail: Molly_Zimmerman@Brown.edu*

L.J. BEGLINGER, K. DUFF, S. VAN DER HEIDEN, K. PARROTT, S. VIK & R. GINGRICH. Neuropsychological and Psychiatric Characteristics of Adults Patients Undergoing Hematopoietic Stem Cell Transplant.

Objective: To characterize performance on standard neuropsychological and psychiatric measures in a sample of adult cancer patients just prior to hematopoietic stem cell transplant.

Participants and Methods : Thirty adults (M age=44.6 [11.1]; M education=11.6 [3.4] years) participated in this study an average of less than two weeks prior to transplant (M =11.6 [19.2] days). An equal number received allogeneic and autologous transplants (n =15 each). Participants completed a battery of neuropsychological tests, including: Wechsler Abbreviated Scale of Intelligence (WASI), Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), and Symptom Checklist 90-R (SCL-90-R).

Results : Although the group had an average score on the WASI 2-subtest IQ (105.4 [14.6]), their overall neuropsychological functioning on a screening battery was nearly a standard deviation below that (RBANS Total = 92.5 [17.4]), with the poorest performances occurring on measures of learning (Immediate Memory Index = 88.3 [20.2]) and attention (Attention Index = 88.8 [19.7]). Global measures of psychiatric functioning were significantly elevated compared to normative data (SCL-90-R Global Severity Index t -score = 58.6 [11.3]), with the highest elevation occurring on the depression subscale (t -score = 61.9 [10.9]).

Conclusions : Shortly before hematopoietic stem cell transplant, cognition and mood were mildly abnormal in this sample of patients. This lowered "baseline" may create a risk for potential complications (e.g., delirium) and further decline post-transplant. Education about these possible pre-transplant sequelae may be helpful to patients and families as they prepare for this treatment and the recovery period.

Correspondence: *Leigh J. Beglinger, PhD, Psychiatry, University of Iowa, 200 Hawkins Dr., 1-321 MEB, Iowa City, IA 52242. E-mail: leigh-beglinger@uiowa.edu*

A.B. INSCORE, T.D. VANNORSALL, M. KRAUT, G.D. PEARLSON & D.J. SCHRETLEN. Serum Uric Acid and Aggregate Volume of Cerebral White Matter Hyperintensities.

Objective: We recently demonstrated that higher serum uric acid (UA) levels are associated with poorer performance on cognitive tests of processing speed and working memory. Given the known association between heightened UA and risk of cardiovascular disease, we hypothesized that serum UA concentration might correlate with the burden of ischemic changes as measured by white matter hyperintensities (WMH) on brain magnetic resonance imaging in a community sample.

Participants and Methods : Participants were 163 reasonably healthy adults enrolled in the Johns Hopkins Aging, Brain, and Cognition study of normal aging. Neuroimaging and laboratory blood tests were conducted on the same day. Total, periventricular, and subcortical WMH volumes were measured via manual tracing on axial T2 and proton density images. Partial correlation, correcting for age, sex, education, weight, diabetes, hypertension, and alcohol and tobacco use, was used to examine the relationship between serum UA and WMH volume.

Results : As hypothesized, partial correlation analyses controlling for the demographic and cardiovascular risk variables listed above revealed that higher concentrations of serum UA correlated with significantly greater WMH volumes in periventricular ($r = 0.28, p < .001$), subcortical white matter ($r = .28, p < .001$), and combined ($r = 0.30, p < .001$) brain regions.

Conclusions : Even sub-clinical elevations of serum uric acid are associated with the presence of mild ischemic changes in the brain. Despite previous evidence that UA acts as an anti-oxidant, it might acquire pro-oxidant properties that can damage the vascular endothelium and accelerate atherosclerosis. This might explain the relationship between serum UA and cognitive functioning.

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*

D.E. FRUCHTER, M. CLEMENTS, D. BUCKWALTER & T. GOODWIN. Neuropsychological Functioning of Women in the First Trimester of Pregnancy.

Objective: Many pregnant women report concomitant cognitive impairments, including problems with memory and concentration (e.g. Parsons & Redman, 1991; Poser, Kassirer, & Peyser, 1986). Although the self-perception of cognitive decline due to pregnancy is prevalent, studies utilizing objective measures of cognition have yielded equivocal results (e.g. Casey et al., 1999; Keenan et al., 1998). The aim of the current study was to examine objective cognitive functioning in first-trimester pregnant women, utilizing standardized neuropsychological measures to assess a variety of cognitive domains.

Participants and Methods : Neuropsychological and demographic data were obtained for a total of 26 ethnically diverse (31% Caucasian), well-educated (M years education = 14.1) pregnant women in their first trimester. Participants' obtained standardized scores were compared to expected scores utilizing a paired sample t -test. Expected scores were taken from the 50th percentile, which is conservative for such a highly educated sample.

Results : The sample as a whole scored significantly lower than expected on measures of divided attention (Letter-Number Sequencing), phonemic verbal fluency (FAS), confrontation naming (Boston Naming Test), and verbal learning and memory (CVLT-II). In contrast, the sample was above average on a measure of semantic verbal fluency (Animals/COWA). Obtained differences were largely consistent in magnitude and direction across ethnic groups, with Digit Span as a notable exception.

Conclusions : Women in the first trimester of pregnancy evidenced relative deficits across several areas of cognitive functioning. Results suggest caution in interpreting neuropsychological test findings during pregnancy. Ongoing data collection will further examine these women's pregnancy and postpartum cognitive functioning.

Correspondence: *Diane E. Fruchter, MA, Department of Clinical Psychology, Fuller Theological Seminary, 135 N. Oakland Ave., Pasadena, CA 91182. E-mail: defruchter@gmail.com*

J.E. DEEN, J.D. AWERBACH & A. SPIRO. Lipid Profile and Cognitive Impairment.

Objective: Current lipid management therapies focus on lowering levels of low-density lipoprotein (LDL-C). Low levels of high-density lipoprotein (HDL-C) and high levels of triglycerides (TG) also contribute to cardiovascular disease (CVD). Because they often appear concomitantly, a high ratio of TG to HDL-C (T:H) may be an important predictor of CVD. We hypothesize that individuals with normal LDL-C levels (<130 mg/dL) but a high T:H ratio, will show impairment in cognitive function.

Participants and Methods : Cognitive performance was assessed for 180 men (aged 60-92, mean \pm SD, 74.7 \pm 6.2) from the VA Normative Ag-

ing Study with no history of diabetes or CVD. Cognitive tests included the MMSE, backwards digit span (BDS), verbal fluency, word list memory, pattern comparison, and grooved pegboard. A fasting lipid profile was obtained on the morning of cognitive testing. We divided T:H values into three groups: low (0.47 to 1.49, n=41), moderate (1.50 to 2.99, n=89), and high (3.00 to 8.92, n=50).

Results : An ANOVA showed significant differences between the T:H tertiles for MMSE scores ($p=.017$), with men in the high T:H group scoring significantly lower than those in the low and moderate groups (mean \pm SE, 26.84 \pm .20, 27.50 \pm .22, 27.54 \pm .94, respectively). BDS also differed significantly across T:H groups (span $p=.003$, correct $p=.004$), with worst performance in the high group (span 4.52 \pm .18, correct 4.02 \pm .27), better performance in the moderate group (5.02 \pm .15, 4.83 \pm .23), and best performance in the low group (5.49 \pm .20, 5.49 \pm .33)

Conclusions : A high T:H ratio was associated with impaired cognitive function, specifically working memory. The study indicates that a potential CVD risk factor, T:H, affects cognition in older men, even those with low levels of LDL-C.

Correspondence: *Jennifer E. Deen, BS, Normative Aging Study (151N), VA Medical Center, 150 South Huntington Avenue, Boston, MA MA. E-mail: deenj711@gmail.com*

B. BAUGHMAN, D. COMBS & M. BASSO. Neuropsychological Recovery from Medication-induced Hyperthyroidism: A Case Study.

Objective: Relatively little research has systematically examined the association of thyroid function and neurocognition. Nonetheless, there is evidence that hypothyroidism corresponds with unique psychiatric and cognitive complaints (Munte, 2004). Likewise, hyperthyroid individuals may manifest certain cognitive deficits (Stern, 1996). However, cognitive function upon return to euthyroid states is not well defined (Bommer, 1990). The present case study attempts to advance the understanding of thyroid function and cognition.

Participants and Methods : A 60 year old, Caucasian female was evaluated for neuropsychological impairment following admission to an adult inpatient psychiatric facility. Prior to admission, she underwent thyroidectomy secondary to cancer, and replacement hormone therapy was provided. At the time of admission, she mismanaged her medication, and became hyperthyroid. Laboratory studies of thyroid function were collected upon admission and twice more during her 3-week admission. Neuropsychological testing was performed in accordance with these laboratory studies. Likewise, a clinician rating of psychiatric symptomatology was collected over these same intervals.

Results : Upon initial evaluation, thyroid function was grossly abnormal, and indicative of hyperthyroidism. Her performance on measures of executive function, new-learning, and working memory were impaired. As time progressed, she became euthyroid, and all aspects of neuropsychological function became normal. Emotional distress was moderately severe upon admission, and improved to non-clinical status as she became euthyroid.

Conclusions : Similar to previous research, it appears that hyperthyroidism is associated with cognitive impairment. However, contrary to other research, residual symptoms were not found upon re-test. This suggests that successful thyroid medication treatment is associated in improvements in both mood state and cognitive function.

Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

J.R. SADEK, K.Y. HAALAND, S. PERGAM, L. ECHEVARRIA, L.E. DAVIS, D. GOADE, R. NOFCHISSEY, S. ARGUELLO, P. ETTESTAD & M. SEWELL. West Nile Neuroinvasive Disease Produces Mild Chronic Cognitive Deficits.

Objective: West Nile Virus (WNV) was studied in 1937 in Uganda and first reported in the U.S. in 1999. CDC data indicate that WNV out-

breaks remain a significant public health problem. Most studies have focused on hospitalized patients with West Nile Neuroinvasive Disease (NID), which is commonly characterized by encephalitis or meningitis. The assumption has been that only a small proportion suffers significant cognitive deficits, whether diagnosed with NID or with West Nile Fever only (WNF). However, studies of self-report show that a significant proportion of NID patients have cognitive complaints up to 1-year post-discharge. No study has assessed cognitive deficits objectively, sampled from the population of reported WNV cases of an entire state, or compared those with NID to those with WNF.

Participants and Methods : In this study, we attempted to contact all surviving adults in New Mexico who were reported as WNV-positive in 2003. Sixty-eight percent were reached and agreed to participate in a telephone evaluation approximately 9-months post-diagnosis. This evaluation included the Telephone Interview for Cognitive Status (TICS), a measure highly correlated with the MMSE. Subjects were classified either as WNF (n=77) or NID (n=39).

Results : The two groups were similar in age, education, ethnicity, and gender. The NID group obtained lower TICS total scores than the WNF group (31.3 vs. 33.1, $p<.05$). Item analysis revealed significant group differences on president/vice president names. The NID group also obtained lower (nonsignificant) means on most other items than the WNF group.

Conclusions : These results suggest that NID may have subtle cognitive impact beyond the acute symptomatic period.

Correspondence: *Joseph R. Sadek, Ph.D., Behavioral Health, VA New Mexico, 1501 San Pedro SE, (116), Albuquerque, NM 87108. E-mail: jsadek@unm.edu*

L.S. MILLER, M. BOYD & A. COHN. Prevalence of sub-optimal effort in Disability applicants.

Objective: The purpose of this study was to describe the prevalence of sub-optimal effort in persons routinely applying for Disability benefits as assessed within a University Clinic. The relationship between effort scores and mental status, intellectual test performance, and neurocognitive screening methods is also evaluated.

Participants and Methods : One hundred and five (105) participants seen for evaluation of disability between 2002 and 2004 were given the Computerized Assessment of Response Bias (CARB) as well as other effort screens during the course of their assessment. CARB "passers" and "failers" were identified, followed by a comparison of their scores on a mental status exam, intellectual test performance, and neurocognitive screening.

Results : More than 50% of participants failed a conservative criteria for the CARB (<90% correct as cutoff for suboptimal effort). As would be expected, significant mean differences were found between passers and failers on the Mini Mental State Exam (MMSE; 21.59 vs 29.19) intellectual performance (WAIS FIQ 65.68 vs 79.80), and neurocognitive screening (NCSE raw scores; 55.32 vs 70.86). Age was not related to effort, nor was a premorbid estimate of IQ.

Conclusions : Findings suggest a high probability of sub-optimal effort in persons applying for disability in this non-population-based participant pool. Need for effort testing as a routine process in evaluation 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: lsmler@egon.psy.uga.edu*

A.R. GROFF, M. VASHCHENKO & W. DINN. The Relationship Between Obesity and Frontal Lobe Functions.

Objective: Obesity a complex multifactorial chronic disease and has been associated with a number of comorbid conditions, including coronary heart disease, hyperinsulinemia, insulin resistance, type 2 diabetes,

and hypertension. Separate lines of research have shown that individuals with these comorbid conditions show diminished performance on tests of frontal lobe function. Only a few studies have examined performance on individual tests in obese samples. The aim of this study is to assess an obese sample (without medical comorbidity) using a large, comprehensive battery to assess and describe frontal lobe performances.

Participants and Methods : Twenty-two obese women without medical comorbidity and with no history of an eating disorder were compared to 22 matched non-obese controls on a large battery of neuropsychological tests of attention, executive function, and behavioral disinhibition, strategy implementation, and decision making. Participants also completed self-report symptom inventories of Axis I disorders and were assessed using a structured clinical interview.

Results : Results indicated that the obese group performed significantly worse on tests of executive function, vigilance, strategy implementation, and decision-making. The groups did not differ on general intelligence or behavioral disinhibition. Axis I comorbidity was controlled for in all analyses.

Conclusions : The results provide support for the claim that mild frontal lobe impairments in specific domains may underlie obesity and contribute to the performance deficits in frontal functioning that are associated with the many comorbid medical conditions associated with obesity.

Correspondence: *April R. Groff, M.A., Boston University, 1766 Sand Hill Rd., #30S, Palo Alto, CA 94304. E-mail: agroff@bu.edu*

E. HODGES, B. GIORDANI, R. CHERVIN, D. RUZICKA, R. WEATHERLY, J. DILLON, S. GARETZ, K. GUIRE & E. ANDERSON. Neuropsychological and Behavioral Functioning in Children Scheduled for Adenotonsillectomy in Comparison to Controls.

Objective: The aim of the present study was to examine the neuropsychological and behavioral morbidity in children scheduled for AT in comparison to children from other surgery clinics and to examine the influence of SDB on these factors.

Participants and Methods : Participants included 78 children ages 5 to 12.9 years scheduled for AT (40 with SDB), and 27 children recruited from non-SDB surgical clinics. Upon admission, children underwent a polysomnography and were administered a neuropsychological test battery the following day. Parents rated their child's attentional, emotional and behavioral functioning.

Results : Results showed that parents of children in the AT group were more likely to report cognitive problems, as well as internalizing and externalizing behavioral symptoms, regardless of their SDB status. In addition, children in the AT group without SDB performed more poorly on measures of visuospatial ability and learning in comparison to the control group. Correlations for neuropsychological measures with parental ratings of sleepiness, and with physiological indices of SDB were found.

Conclusions : Results suggest that children scheduled for AT without SDB may exhibit similar cognitive and behavioral concerns as children with SDB. Further, both groups are likely to demonstrate greater cognitive, emotional and behavioral difficulties in comparison to control children.

Correspondence: *Elise Hodges, Ph.D., Neuropsychology Section - Dept. of Psychiatry, University of Michigan, Box 0840, Med Inn Bldg., University of Michigan, 1500 E. Medical Center Drive, Ann Arbor, MI 48109-0840. E-mail: ekhodges@umich.edu*

H. ROGERS, D. ZHAO, W. WANG, J. HE & J. CHEN. Cognitive Profile of a Sample of Middle-aged Chinese Hypertensive Patients.

Objective: To determine the cognitive profile of a sample of Chinese middle-aged hypertensive patients with a normal fMRI scan.

Participants and Methods : Socio-demographic, behavioral, medical history, and physiological data were collected via interview and medical examination. A comprehensive computerized neuropsychological battery was administered. All participants received an fMRI scan. Those with lacuna infarction or identifiable brain lesions were excluded from the study. Sample consisted of 112 participants: 46 hypertensive patients and 66 controls.

Results : Univariate analyses revealed significant or marginally significant differences between hypertensive and controls on body mass index, serum glucose levels, high density lipoprotein levels, and smoking status ($p < 0.10$). MANOVA analyses controlling for these factors showed that those with hypertension performed significantly worse on digit discrimination response time ($F = 4.099, p = 0.045$), Chinese character rotation test total time ($F = 4.765, p = 0.031$), dual word recognition test correct answer total, error total ($F = 4.937, p = 0.016$ for each) and total score ($F = 5.220, p = 0.024$), and Mini-Mental State Examination (MMSE) total score ($F = 5.145, p = 0.025$).

Conclusions : Compared to controls, patients with hypertension performed worse on neuropsychological tasks involving response time, visuo-spatial orientation, verbal recognition memory, and general cognitive ability. Cognitive deficits appear to be present in people with hypertension in middle age without fMRI brain abnormalities. Future studies with advanced functional neuroimaging techniques (e.g., PET, SPECT) are warranted to explain the interrelationships among cognitive deficits, potential brain abnormalities, and consequent brain functioning in middle-aged hypertensive individuals. Correspondence: *Heather Rogers, MA, Medical and Clinical Psychology, Uniformed Services University of the Health Sciences, 3401 Jones Bridge Rd., Bethesda, MD, MD 20814. E-mail: hrogers@usuhs.mil*

D.D. ROMAN, E. HOLKER, L. MILLER & M. COLVIN-ADAMS. Effects of Heart Failure on Brain Functioning.

Objective: This study was designed to investigate the effects of heart failure on brain functioning. We hypothesized that right atrial pressure, cardiac index, and wedge pressure are the best cardiac indicators of brain functioning. We further hypothesized that heart failure is characterized by mild attentional, memory, and processing speed deficits.

Participants and Methods : Participants were 756 adult cardiology patients (572 male) who underwent neuropsychological evaluation as a routine part of a heart transplant workup at the University of Minnesota Medical Center. Demographic and descriptive statistics are provided. Correlations for select cardiac and neuropsychological variables were obtained, controlling for age.

Results : Examination of all neuropsychological variables reveals generally low average to mildly impaired performance on most measures. The hypotheses were partially supported. No relationship was found between ejection fraction and cognitive functioning. Right atrial pressure (RA), wedge pressure (PCW), and cardiac index (CI) were correlated with processing speeds in the expected direction, but memory functioning did not strongly correlate with any of the variables.

Conclusions : Severe heart failure is associated with mild global cognitive impairment. The absence of more severe brain dysfunction in the presence of greatly reduced cardiac output suggests protective cerebrovascular mechanisms. Select cardiac measures (RA, PCW, CI) are associated with processing speed deficits but not memory functioning.

Correspondence: *Deborah D. Roman, Psy.D., Physical Medicine & Rehabilitation, University of Minnesota, MMC 390, 420 Delaware St SE, Minneapolis, MN 55455. E-mail: decke003@umn.edu*

Sex Differences/Sex Hormones

A.M. CLEMENTS, M. O'DONNELL, J. ABEL, S. RIMRODT, J.J. PEKAR & L.E. CUTTING. Do sex differences in cerebral laterality exist in children on language and visuospatial tasks?

Objective: Sex differences on language and visuospatial tasks have been documented in adults. Previous studies have shown that for lan-

guage tasks, cerebral activation in males is more left lateralized, but is more bilateral in females; however, on visuospatial tasks, females show more right lateralized activity, but males show more bilateral activity. Few studies have examined whether these same sex differences exist in children.

Participants and Methods : For this study, fifteen children, ages 7 through 15, performed phonological and visuospatial fMRI tasks. Region of interest analyses (inferior frontal gyrus, IFG; inferior parietal lobe, IPL) were used to test differences in cerebral laterality.

Results : Results indicated that there were differences, however, not in the expected patterns. There were no significant laterality differences between males and females on the visuospatial task. However, for the phonological task, females showed more left lateralized IPL activity than males, whereas males showed more right lateralized IPL activity. Correlations between regions of interest and age showed that there were significant negative correlations on the visuospatial task between age and IFG as well as IPL for females ($r = -.68; -.89$), but not for males ($r = .60; -.07$), suggesting more right lateralization in females with increasing age. A significant positive correlation was found between age and IFG on the language task for males ($r = .68$) but not for females ($r = -.07$), indicating greater left lateralization with increasing age for males.

Conclusions : Findings suggest that sex differences for language and visuospatial processing may be developmental and may become more distinct with age.

Correspondence: Amy M. Clements, Kennedy Krieger Institute, 707 N. Broadway, Suite 232, Baltimore, MD 21205. E-mail: clements@kennedykrieger.org

A.S. YI, J. BUCKWALTER, L.R. MITCHELL & V.C. CROOKS. A Methodological Approach to Gender Differences in Cognition Among Older Adults.

Objective: Many findings on gender differences in cognition suggest female superiority on language ability and perceptual speed and male superiority on motor ability, mental rotation, and spatial perception tasks. Great variability is present across many gender-based cognitive difference studies, which suggests the possibility of one or more confounding variables. The current study will determine whether observed gender differences are impacted by the shared variance present between all cognitive tests.

Participants and Methods : Participants over the age of 65 were recruited from the Kaiser-Permanente Southern California patient population to participate in a larger NIH-funded study that was designed to measure a telephone screening cognitive measure. Two hundred and eleven of the participants (103 females, mean age = 74.2; 107 males, mean age = 74.1) were part of the validation study and were administered a neuropsychological battery. A single principal component factor was extracted that reflected the shared variance, and was then used as a control variable in determining if the effect of gender was minimized on standard neuropsychological factors.

Results : Gender was found to be significant on two out of six uncorrected neuropsychological factors (Memory factor $p = .00$, Mental Control factor $p = .03$). When common variance was controlled, significant gender differences were found in the corrected factor reflecting verbal memory as measured by the California Verbal Learning Test ($p = .001$).

Conclusions : When controlling for shared variance, gender differences were found only for a factor reflecting verbal episodic memory as measured by a wordlist. Findings suggest both that there may be robust gender differences in a specific cognitive domain and that some previous studies may be impacted by the presence of shared variance among neuropsychological tests. Correspondence: Angela S. Yi, M.A., Psychology, Fuller Graduate School of Psychology, 527 E. Union St. #202, Pasadena, CA 91101. E-mail: angyi78@yahoo.com

K. HOLLAND, G.A. MOLLET & D.W. HARRISON. Sex Differences in Motor Precision as a Function of Cerebral Asymmetry.

Objective: Sex differences in cerebral asymmetry were investigated before and after exposure to an arousing stimulus. Increased right cerebral activation is thought to occur during an aroused state (Heilman & Gilmore, 1998). Due to increased laterality in men, it was thought that an arousing stimulus would increase strength at the left hand and increase precision as evidenced by increased accuracy during estimation of half hand strength.

Participants and Methods : Grip strength at the right and left hands was tested in thirty-eight healthy, right-handed participants (women = 19, men = 19). Participants were asked to squeeze a hand dynamometer as hard as they could (full hand strength). Next, they were asked to estimate half of their full hand strength by squeezing the dynamometer half as hard as they could (half hand strength). Participants then listened to 45 seconds of white noise. A second full and half hand grip strength measurement was then taken.

Results : A sex x condition x trial interaction ($F(1, 36) = 4.69, p < .05$) was found at the left hand, but not at the right hand ($F(1, 36) = 0.07, p > .05$). Men demonstrated better ability to estimate half hand strength after white noise. Women had a tendency to overestimate half hand strength while decreasing their full hand strength after exposure to arousal.

Conclusions : Left hand differences in precision in men and women may be related to sex differences in right brain activation to arousal. Data suggest that cerebral activation in response to arousal was more right lateralized in men.

Correspondence: Gina A. Mollet, M.S., Psychology, Virginia Tech, Psychology Department, Blacksburg, VA 24061. E-mail: gmollet@vt.edu

A.S. YI, P.H. LU & J.L. CUMMINGS. Gender Differences in Subtypes of Mild Cognitive Impairment.

Objective: The ratio of women to men with Alzheimer's disease (AD) ranges from 1.2:1 to 1.5:1. Conversely, men are more likely than women to manifest Dementia with Lewy bodies (DLB) and frontotemporal dementia (FTD). Amnesic mild cognitive impairment (MCI) is considered to be a prodromal stage for AD but other subtypes emphasizing non-memory impairments are likely to progress to a non-AD dementia such as DLB and FTD. This study investigates whether gender differences exist between subtypes of MCI.

Participants and Methods : Participants were consecutively referred individuals from the UCLA Memory Disorders Clinic diagnosed with MCI after clinical interview and neuropsychological evaluation. Subjects were further stratified into amnesic (with memory impairment) and non-amnesic (impairment in non-memory domains including attention, language, visuospatial abilities, or executive functions) subtypes.

Results : The amnesic-MCI group was composed of 38 males and 36 females while the non-amnesic-MCI group had 8 male and 7 female participants indicating equal gender distribution between the two MCI subtypes. Age, education, and MMSE score did not differ significantly between genders for either MCI subtype. Within the non-amnesic MCI group, a robust though non-significant difference ($p = .06$) was detected in age of symptom onset between genders with younger age of onset for males (mean age = 64.4 years) relative to females (mean age = 72.2 years). No gender difference in age of onset was observed in amnesic-MCI.

Conclusions : There were no gender differences between our sample of amnesic and non-amnesic MCI subjects. In the non-amnesic MCI group, the age of symptom onset was earlier in male participants though the difference was not statistically significant.

Correspondence: Angela S. Yi, M.A., Psychology, Fuller Graduate School of Psychology, 527 E. Union St. #202, Pasadena, CA 91101. E-mail: angyi78@yahoo.com

Symposium 10

11:00 a.m.–12:30 p.m.

Cognitive Rehabilitation and Functional Outcomes in Spanish-Speaking TBI Survivors

J.C. ARANGO, J. DELUCA, M.O. PONTON, A. BILBAO, J.C. ARANGO, R.J. ECHEMENDIA & J.L. CARRION. Cognitive rehabilitation and functional outcomes in Spanish-speaking TBI survivors.

Symposium Description : Traumatic Brain Injury (TBI) is one of the most common causes of brain damage in Spanish-speaking countries and in the United States. TBI often causes a number of physical, behavioral, cognitive and emotional changes in the person, as well as a dramatic change in the individual's life course, a profound disruption in his/her family, an enormous loss of income or earning potential, and costly lifetime expenses. During the last two decades, rehabilitation of individuals who have suffered TBI has received increasing interest. However, there are many controversies surrounding best practice approaches to working with Spanish-speaking individuals with TBI who have cognitive impairments. The aim of this symposium is to bring together a group of international leaders in the area of cognitive rehabilitation and functional outcomes who have focused their research efforts specifically on Spanish-speakers with TBI in the US and abroad. Determining best practice approaches for cognitive rehabilitation of this population requires an in-depth understanding of the unique issues that face the Spanish-speaking community. Dr. Ponton will speak about the neurocognitive factors which best predict return-to-work status among Latino patients with mild to moderate head injuries and Dr. Bilbao will explore cognitive predictors of activities of daily living and occupational functioning in Spanish-speaking brain-injured patients. Dr. Arango will examine the relationship between Hispanic ethnicity and rehabilitation outcomes in TBI survivors and Dr. Echemendia will discuss key cultural factors that may be important for ensuring maximal functional outcomes following TBI among Hispanics. Finally, given the time course of recovery for individuals with TBI, Dr. Carrion will describe an exemplary cognitive rehabilitation program for Spanish-speakers with TBI and provide insight into appropriate ways to evaluate the effectiveness of such programs.

Correspondence: *Juan Arango, Ph.D, Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmrrec.org*

M.O. PONTON. Brain injury and the Hispanic patient: A retrospective study.

The field of neuropsychological assessment with Hispanic populations in the U.S. is in its infancy and the study of factors impacting the rehabilitation of Hispanic patients with brain injury has received little to no attention. Latinos have high rates of work injuries (and particularly head injuries) which are disproportionate in relation to non-Hispanic peers. The objective of this study was to look retrospectively at the neurocognitive factors which best predicted return-to-work status among Latino patients with mild to moderate head injuries. Thirty Spanish-speaking, Latino patients were evaluated at two different times after their brain injuries in a private practice setting. They were all injured in work-related accidents. Their average age was 36.7 years (SD 9.8) and their average level of education ranged from illiteracy to 17 years (mean 8.4; SD 4.2). The main outcome measures included the NeSBHIS Battery (Ponton, et al, 1996), Wisconsin Card Sorting Test, Grooved Pegboard Test, WMS-R (LM1, LM2, VRI, VRII), Rey 15 Memory Test, Hooper Visual Organization test, Judgment of Line Orienta-

tion Test, Beck Anxiety Inventory, and Beck Depression Inventory. Statistical analyses of the tests revealed that there were no significant differences between scores obtained from the initial and the second evaluation. However, patients with higher levels of education were either employed at the time of their second evaluation or in the process of completing Vocational Rehabilitation. The data revealed that the best predictor of return to work in this population was the patient's level of education, regardless of the severity of the injury. Implications and directions for research are discussed.

Correspondence: *Juan Arango, Ph.D, Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmrrec.org*

B.O. ALVARO, I. BOMBIN, C. GONZALEZ & M. SANCHEZ. Cognitive predictors of functional outcome in a post acute TBI rehabilitation setting.

Introduction: Current developments in managed care have had a substantial impact on traumatic brain injury (TBI) rehabilitation services. Cognitive predictors of functional outcomes in brain injury rehabilitation programs are crucial in determining length and objectives of treatment. **Objective:** To explore cognitive predictors of activities of daily living (ADL) and occupational functioning in brain-injured patients. **Setting:** National Brain Injury Rehabilitation center in Madrid, Spain. **Participants:** A sample of 100 subjects with severe brain injury (GCS < 6) who participated in individualized treatment programs at the center lasting from 3 to 18 months. **Procedure:** Functional and cognitive measures (including orientation, attention, verbal learning and memory, divided attention, and executive functioning) were obtained during the first two weeks of treatment. **Main outcome measures:** The Lawton iADL Scale, the Independent Living Scale, and the Functional Independence Measure. **Statistical Analysis:** Linear regression techniques were used to determine which cognitive measures predicted change in functional outcome. **Results:** Results indicated that pre-morbid intelligence, general cognitive deficit (as measured using the Rancho los Amigos Scale), and verbal learning measures were the best predictors of functional outcome of brain injury rehabilitation for this sample. **Conclusions:** We conclude that general cognitive status, ability to learn new material, and cognitive reserve are useful prognostic indices of functional recovery.

Correspondence: *Juan Arango, Ph.D, Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmrrec.org*

J.C. ARANGO, M. ROSENTHAL & J. DELUCA. Functional outcomes after inpatient rehabilitation in Hispanics with TBI.

Objective: To examine the relationship between Hispanic ethnicity and rehabilitation outcome in Traumatic Brain Injury survivors. **Design:** Retrospective study. **Setting:** Longitudinal dataset of the TBI Model Systems National Database. **Participants:** 3,114 individuals with moderate to severe TBI (2,798 Caucasians vs. 316 Hispanics) hospitalized between 1989 and 2003. **Main Outcome Measures:** Functional outcomes at discharge and one-year follow-up (Disability Rating Scale and Functional Independence Measure). Glasgow Outcome Scale-Extended and Community Integration Questionnaire were measured at follow-up only. **Results:** At admission, Hispanics were less educated ($p < 0.001$) earned less money ($p < 0.05$) and were slightly younger ($p < 0.001$) than Caucasians. Hispanics were twice as likely to suffer a violence-related TBI. Hispanics had lower Glasgow Coma Scale scores ($p < 0.01$) compared to Caucasians, but received similar minutes of rehabilitation therapies. Hispanics received significantly more minutes of psychotherapy ($p < 0.01$) before discharge. Even though there were no significant differences in functional outcome at discharge, Hispanic ethnicity was associated with poorer functional outcomes at 1 year post-injury (DRS, GOS-E, FIM, and CIQ), after controlling for age, length of post traumatic amnesia, injury severity, and pre-injury educational level ($p < 0.05$). **Conclusions:** Hispanics showed significantly reduced long-term func-

tional outcome after rehabilitation relative to Caucasians. Rehabilitation professionals must recognize the impact of individual differences and diverse socio-demographic, injury, and rehabilitation characteristics so that health disparities among TBI survivors can be reduced or eliminated.

Correspondence: *Juan Arango, Ph.D., Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmmrrec.org*

R.J. ECHEMENDIA. Cultural factors in brain injury rehabilitation among Hispanics.

Introduction: Traumatic Brain Injury (TBI) is common and studies have suggested that ethnic minority individuals sustain TBIs at a rate that is greater than the general population. Additionally, there is convincing evidence that disparities exist in the provision of emergency health care to ethnic minorities. As the Hispanic population in the U.S. continues to grow, there will be increasing numbers of Hispanics who require rehabilitation for TBI. Ethnic and cultural factors have been identified as key variables that should be incorporated into TBI rehabilitation. Objective: The goal of this presentation is to describe and discuss key cultural factors that may be important for ensuring maximal functional outcomes following TBI among Hispanics. Design: The empirical and theoretical literature will be reviewed with an eye towards identifying which cultural factors appear to have the greatest impact on rehabilitation outcomes. Conclusions: Cultural factors are important in the diagnosis of TBI, the identification of functional impairments, and the development of comprehensive rehabilitation plans for Hispanics. The need for greater inclusion of cultural issues in our training programs will be emphasized as will the need for rigorous empirical research in this area. Correspondence: *Juan Arango, Ph.D., Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmmrrec.org*

J. LEON-CARRION & M.R. DOMINGUEZ-MORALES. The time course of recovery of TBI cognitive deficits during rehabilitation.

Introduction: Neurocognitive and neurobehavioral disorders are common after severe traumatic brain injury (TBI). During the last several years, some authors have raised doubts concerning the effectiveness of cognitive rehabilitation after brain injury, causing a controversy in this field. Objective: To evaluate the effectiveness of an intensive, holistic, and multidisciplinary outpatient cognitive rehabilitation program. Participants: 19 patients with severe head trauma. Inclusion criteria were the presence of at least three impaired cognitive functions and a Glasgow Coma Scale Score of 8 or less within the first 24 hours after hospital admission following a traumatic brain injury. Design and setting: The CRECER Neurorehabilitation Program was applied to all patients. This program is holistic, intensive and multidisciplinary, and includes treatment specifically tailored to the physical, emotional, behavioural, and cognitive needs of each patient, and, when needed, includes medication. Each cognitive function was clinically scored daily on a scale from 1 to 10 by the same therapist who conducted the session with the patient. Main Outcome measure: The CRECER Clinical Outcome Scale (CRECOSS). Results: The course of cognitive recovery after TBI is not uniform, with many ups, downs, and plateaus on the charts. For a patient to achieve a score above 7 (good response and nearing normal), over 400 hours of rehabilitation, distributed over a continuous period of six months, were required. Conclusion: Consolidation of the progress made in cognitive neurorehabilitation requires time, and discharge is not recommended until the consolidation of cognitive improvement is established. Correspondence: *Juan Arango, Ph.D., Physical Medicine and Rehabilitation, UMDNJ, 1199 Pleasant Valley Way, West Orange, New, NJ Jersey 07052. E-mail: jcarango@kmmrrec.org*

Symposium 11

11:00 a.m.–12:30 p.m.

Neuropsychological Impairments as Endophenotypes for ADHD

E.G. WILLCUTT, N. CHHABILDAS, C. BIDWELL & B.F. PENNINGTON. Twin Study of the Etiology of the Relation Between ADHD and Executive Dysfunction.

Objective: Multiple methods were used to evaluate the relation between ADHD and weaknesses in executive functions (EF), and to assess the potential utility of EF measures as endophenotypes for molecular genetic studies of ADHD. Method/ Participants: Twins with DSM-IV ADHD (N = 308) and without ADHD (N = 520) completed a battery of EF measures as part of their participation in the Colorado Learning Disabilities Research Center twin study. Results: Phenotypic analyses indicated that ADHD is associated with impairment on a variety of EF measures, with the largest effect sizes on measures of response inhibition (stop-signal reaction time and continuous performance test commission errors), vigilance (CPT omission errors), verbal working memory (sentence span), and executive processing speed (Trailmaking). Moreover, bivariate twin analyses suggest that the relation between ADHD and each of these EF domains is primarily due to common genetic influences, although bivariate heritability is higher for symptoms of inattention than symptoms of hyperactivity-impulsivity. Preliminary analyses indicate that unaffected fraternal cotwins of ADHD probands also exhibit weaknesses on the inhibition, vigilance, and processing speed measures, suggesting that these tasks may be useful endophenotypes for molecular genetic studies of ADHD. Conclusion: Taken together, these results suggest that although EF weaknesses are neither necessary nor sufficient to cause all cases of ADHD, executive dysfunction in domains such as response inhibition, planning, vigilance, and working memory plays an important role in the complex neuropsychology of ADHD.

Correspondence: *Alysa E. Doyle, PhD, Pediatric Psychopharmacology, Massachusetts General Hospital, YAW 6900, 55 Fruit Street, Boston, MA 02446. E-mail: doylea@helix.mgh.harvard.edu*

J.T. NIGG, M. MARTEL, K. FRIDERICI & I.D. WALDMAN. Executive Functioning as an ADHD Endophenotype: Familial and Molecular Genetic Evidence.

Objective: As endophenotypes for ADHD, neuropsychological executive function measures have rarely been examined beyond simple association with ADHD. In three studies, we evaluated the relative promise of widely used executive function measures as ADHD endophenotypes. Method/ Participants: Our sample included 176 well-characterized children, including 79 with ADHD combined type, 35 with ADHD inattentive type and 62 controls. They and 365 parents and 60 siblings completed a neuropsychological battery designed to tap major components of executive functioning, and provided DNA samples via buccal brush collection. Results: In Study 1 (Nigg et al., 2004) after statistical control of their own ADHD status, first degree relatives of children with ADHD performed worse than relatives of control children on set-shifting (Trails B, $\beta = .11$, $p < .05$) and response inhibition ($\beta = .34$, $p < .05$), although the second result involved an interaction with child and parent gender. In Study 2 (Park et al., 2005) we examined molecular genetic correlates, emphasizing a haplotype analysis of the noradrenergic alpha-2-A receptor gene, which is expressed in prefrontal cortex. The Dra1 (T allele) haplotype was associated with ADHD and, using QTL analysis, with ADHD symptoms of inattention ($X^2 = 9.10$, $p = .003$) and hyperactivity ($p = .015$). In Study 3 (Waldman et al., submitted)

we examined association of molecular and neuropsychological effects. Conclusion: These three studies illustrate the multiple types of data that are needed to evaluate endophenotypes, and suggest that some commonly used executive measures do have promise, particular Trailmaking and Stopping tests. Other measures, including the Stroop test are less promising.

Correspondence: *Alysa E. Doyle, PhD, Pediatric Psychopharmacology, Massachusetts General Hospital, YAW 6900, 55 Fruit Street, Boston, MA 02446. E-mail: doylea@helix.mgh.harvard.edu*

A.E. DOYLE, S.V. FARAONE, L.J. SEIDMAN, A. JAKUBOWSKI & J. BIEDERMAN. Familial Aggregation of ADHD Symptom Dimensions and Executive Functions.

Objective: In order for neuropsychological impairments to be useful as "endophenotypes" for understanding the genetic architecture of attention-deficit/hyperactivity disorder (ADHD), family studies should indicate that they are part of the underlying familial risk for the disorder. Thus far, data on this issue have been equivocal. Possible reasons for the lack of robust familial overlap in previous studies include measurement error, heterogeneity and low power due to sample size. The current study assessed the familial aggregation of ADHD symptoms and neuropsychological impairments while addressing these issues. Method/ Participants: We examined 1) factor analyzed neuropsychological measures to reduce error associated with individual tests and still allow for examination of multiple constructs of interest; 2) inattention and hyperactivity symptom dimensions separately; and 3) over 3,000 individuals from family studies of ADHD conducted at Massachusetts General Hospital. The neuropsychological battery included subscales from the Wechsler intelligence scales, the Wisconsin Card Sorting Test, the Stroop Color Word Test, the Rey-Osterreith Complex Figure and a measure of verbal learning. Familial aggregation of each neuropsychological factor, as well as co-aggregation with inattention and hyperactivity symptoms, was examined using multivariate regression modeling. Results: Principal components analysis revealed two factors reflecting organization/abstract problem-solving and working memory/processing speed, which, together, accounted for 45% of the variance. Both neuropsychological factors were familial and showed modest co-aggregation with inattention and hyperactivity symptoms. Conclusion: Results suggest that neuropsychological impairments show partial familial overlap with the disorder and thus may be useful in molecular genetic studies of ADHD.

Correspondence: *Alysa E. Doyle, PhD, Pediatric Psychopharmacology, Massachusetts General Hospital, YAW 6900, 55 Fruit Street, Boston, MA 02446. E-mail: doylea@helix.mgh.harvard.edu*

A.E. DOYLE, L.J. SEIDMAN, E.G. WILLCUTT, J.T. NIGG & I.D. WALDMAN. Neuropsychological Impairments as Endophenotypes for ADHD.

Symposium Description : Attention-deficit/hyperactivity disorder (ADHD) is a heritable condition with a multi-factorial pattern of inheritance. For complex disorders such as this, biologically-based phenotypes that lie in the pathway from genes to behavior, i.e. endophenotypes, may provide a more powerful targets for molecular genetic studies than the disorder as a whole. Neuropsychological impairments, particularly in executive functions (EF), are candidate endophenotypes because of the large literature showing their association with ADHD and because several etiological theories posit that an executive deficit is the primary impairment in ADHD from which symptoms derive. Nonetheless, few studies have examined neuropsychological measures in molecular genetic studies of ADHD or have even addressed fundamental questions of whether relevant measures show familial/ genetic overlap with ADHD or are heritable themselves. The current symposium presents data examining these issues. Dr. Doyle will use family studies to show familial overlap of EF factor scores with both the inattention and hy-

peractivity symptom dimensions of ADHD. Dr. Willcutt will use a twin study to show that the overlap between ADHD symptoms and EF weaknesses is due to common genetic influences. Dr. Nigg will assess the familial overlap of response inhibition and set shifting measures with ADHD and their association with the noradrenergic alpha-2A receptor gene (ADRA2A) which is expressed in the prefrontal cortex. Dr. Waldman will evaluate four commonly used EF measures against proposed criteria for useful endophenotypes and examine their association with ADRA2A. Together, these data suggest that neuropsychological impairments offer promise as endophenotypes for understanding the genetic architecture of ADHD.

Correspondence: *Alysa E. Doyle, PhD, Pediatric Psychopharmacology, Massachusetts General Hospital, YAW 6900, 55 Fruit Street, Boston, MA 02446. E-mail: doylea@helix.mgh.harvard.edu*

I.D. WALDMAN, I. GIZER, J.T. NIGG & K. FRIDERICI. Assessing the Validity and Utility of Executive Function Endophenotypes for ADHD: Associations with the Adrenergic Receptor 2A Gene (ADRA2A).

Objective: There is increased interest in the use of endophenotypes in psychiatric genetic research, and executive function (EF) measures have begun to be used as endophenotypes in studies of association between candidate genes and childhood ADHD. In this presentation, we outline several recently proposed criteria for the validity and utility of endophenotypes in candidate gene association studies. These criteria include the endophenotype's psychometric properties, its relation to the disorder in the population and within families, its expression in probands' unaffected relatives, its heritability and common genetic influences with the disorder, its association with candidate genes that underlie the disorder, and its mediation and moderation of association between the candidate gene and the disorder. We illustrate the use of such criteria to evaluate the validity of indices from four commonly used EF measures (i.e., Tower of London, Response Inhibition, Trailmaking test, and Stroop Test of Interference) as endophenotypes for ADHD, as well as evaluate the utility of such indices for finding associations with the Adrenergic Receptor 2A Gene (ADRA2A). Method/ Participants: Our sample included 176 well-characterized children with ADHD and 62 controls. They and 365 parents and 60 siblings completed a neuropsychological battery designed to tap major components of executive functioning, and provided DNA samples via buccal brush collection. Results: We demonstrate that some of the putative endophenotypes show association with the ADRA2A gene, and meet most (but not all) of the criteria proposed for their validity and utility. Conclusion: Measures of EF may be of use as endophenotypes in molecular genetic studies of ADHD.

Correspondence: *Alysa E. Doyle, PhD, Pediatric Psychopharmacology, Massachusetts General Hospital, YAW 6900, 55 Fruit Street, Boston, MA 02446. E-mail: doylea@helix.mgh.harvard.edu*

Symposium 12

11:00 a.m.–12:30 p.m.

Language, Executive Function, and Aging

M. GORAL, L.K. OBLER, M. GROSSMAN, A. WINGFIELD, C. BRADY & D. KEMPLER. Language, Executive Function, and Aging.

Symposium Description : Research studies have documented that language skills, particularly in the areas of lexical retrieval and auditory comprehension, change as people get older. Recent findings have implicated executive system dysfunction in accounting for these language changes. In this symposium we will present four new studies that examine the relations between executive function and language performance in older adults.

A brief introduction by Loraine Obler will review age-related language and executive function changes.

Murray Grossman and colleagues will present clinical and fMRI data to demonstrate the nature of the resources contributing to sentence processing and the neuroanatomic basis for these sentence-processing components.

Arthur Wingfield and colleagues will examine the bi-directional interaction between sensory limitation and processing resource in performance on auditory-comprehension tasks. They will discuss the effect of the extra effort older adults with even mild hearing loss may require for perceptual success on the cognitive resources.

Mira Goral and colleagues will examine the relative contribution of executive function, verbal working memory, and hearing sensitivity to older adults' performance on comprehension of spoken sentences and discuss the interaction of these variables with syntactic complexity and pragmatic plausibility.

Christopher Brady and his colleagues will present health data and their interaction with cognitive and language measures. They will consider evidence that semantic fluency is more sensitive than letter fluency to frontal system dysfunction associated with age-related vascular disease risk factors.

To conclude, Daniel Kempler will offer brief comments on our current understanding of executive function and language change in older age. Correspondence: *Mira Goral, Ph.D., Language in the Aging Brain, Boston University School of Medicine, 150 S. Huntington Ave., 12-D, Boston, MA 02130. E-mail: mgoral@bu.edu*

M. GROSSMAN. The Aging of Language: Clinical and fMRI Data Investigating Executive Resources in Sentence Processing.

Objective: We hypothesize that sentence processing is supported by a large-scale, adaptive, neural network that varies in its precise constituents depending on the demands of the sentence. One major component supports core language functions by activating left peri-Sylvian brain regions; and a second component supports language-related resources during sentence processing by recruiting working memory, planning, and selective attention as needed. **Methods:** Healthy aging participants studied linguistically, and fMRI studies of healthy young and healthy seniors. **Results:** We present linguistic data from healthy aging and focal dementia to demonstrate the nature of the resources contributing to sentence processing, and we present fMRI data to demonstrate more directly the neuroanatomic basis for these sentence processing components in healthy young adults. We also provide imaging data demonstrating the selective breakdown of this large-scale network in aging and focal dementia. **Conclusion:** Executive resources supported by frontal cortices contribute to sentence processing. Correspondence: *Murray Grossman, MD, Neurology, University of Pennsylvania School of Medicine, 2 Gibson, 3400 Spruce Street, Philadelphia, PA 19104-4283. E-mail: mgrossma@mail.med.upenn.edu*

M. GORAL, R. CLARK-COTTON, L. OBLER, A. SPIRO, R. WILLIAMS & M. ALBERT. Age, Executive Function, and Hearing as Predictors of Comprehension of Syntactically Complex Sentences.

Studies have shown that increasing age, poorer hearing, and lower executive function abilities (including verbal working memory [VWM] span and inhibition skills) are associated with increased difficulty in the auditory comprehension of syntactically complex sentences, but the contribution of these variables to comprehension deficits has not been adequately dissociated. In this study, participants were native speakers of English (age range 46-90), screened for evidence of stroke, traumatic brain injury, or neurodegenerative disease. Whole sentences were presented at a natural speech rate, and comprehension was measured with a plausibility judgment and latency of judgment. To vary the VWM load imposed on the listener, sentences contained embedded subject- and object-relative clauses. Regression analysis was used to predict separately comprehension performance measured by accuracy and by response latency (RT). Models included age, hearing acuity (pure tone and speech recognition thresh-

olds), VWM span (month and digit ordering, sentence listening), and the Stroop interference test. Neither hearing measures nor VWM span accounted for the variability in RT or accuracy, even for the sentences with higher VWM load. Age predicted performance as measured by RT but not by accuracy. Interference on the Stroop test predicted accuracy but not RT. Age and Stroop interacted with sentence type and outcome measure; for example, older participants were less accurate judging plausible, but not implausible sentences.

We discuss the interaction among components of executive-function skills and the demands exerted by the task (sentence complexity, plausibility judgment) in accounting for age-related changes in auditory comprehension.

Correspondence: *Mira Goral, Ph.D., Language in the Aging Brain, Boston University School of Medicine, 150 S. Huntington Ave., 12-D, Boston, MA 02130. E-mail: mgoral@bu.edu*

C. BRADY, A. SPIRO, R.K. WILLIAMS, M. GORAL, M.L. ALBERT, L.K. OBLER & S.R. SCHALMAN-BERGEN. Semantic and Letter Fluency Tasks: Indices of Frontal Systems Function in Older Adults?

Verbal (semantic and letter) fluency tasks are commonly used to assess both language and frontal systems functions. The generation of lexical items in verbal fluency tasks is posited to be mediated by two strategic components: clustering and switching (e.g., Troyer et al., 1997). Troyer et al., and others, have defined clustering as the production of words within a semantic (e.g., birds) or phonemic (e.g., rhymes) subcategory, and switching as the ability to move between subcategories. Analyses of verbal fluency performance suggest that switching may be more dependent on frontal systems function. Aging and vascular disease risk factors are associated with frontal systems dysfunction. Previous studies have shown that older adults' reduced fluency performance is related to problems with switching, suggesting that age-effects on fluency tasks are due to frontal systems dysfunction. Furthermore, age effects are found more consistently on semantic than letter fluency tasks. What is less clear, however, is whether semantic and letter fluency tasks are differentially sensitive to frontal systems dysfunction associated with vascular disease risk factors (e.g., hypertension). We will present analyses of relations among verbal fluency measures and other measures of language and frontal systems functions in older adults, and discuss evidence that semantic fluency is more sensitive to frontal systems dysfunction associated with vascular disease risk factors.

Correspondence: *Christopher B. Brady, Ph.D., VA Boston Healthcare System/Harvard and Boston University Schools of Medicine, GRECC (182JP), 150 South Huntington Ave., Boston, MA 02130. E-mail: christopher_brady@hms.harvard.edu*

A. WINGFIELD. Sensory and Cognitive Interactions on Comprehension and Memory for Spoken Language in Older Adulthood: An Effortfulness Hypothesis.

Comprehension of rapid speech in complex environments and memory for its content is constrained by a number of factors. On the sensory side the listener must deal with rapid, often poorly articulated speech, a challenge that is often exacerbated in older adults by an age-related hearing loss and other auditory processing declines. These "bottom up" declines can be ameliorated by "top down" use of linguistic context for recognition of words as the speech unfolds in time, and also for retrospective recognition of an indistinct word based on the context that follows it. In all adults, and especially older adults, these operations are constrained by limitations in attentional or processing resources, a factor that shows bi-directional interaction with sensory challenge. We will discuss evidence for the view that the extra effort older adults with even mild hearing loss may require for perceptual success may deprive the cognitive system of resources that would ordinarily be available for "downstream" operations such as encoding the materials in memory and/or higher-level comprehension operations at the discourse level.

Correspondence: *Arthur Wingfield, Ph.D., Volen National Center for Complex Systems, Brandeis university, 415 South Street, Mailstop 013, Waltham, MA 02454-9110. E-mail: wingfield@brandeis.edu*

FRIDAY AFTERNOON, FEBRUARY 3, 2006

Poster Session 9 /12:30–2:00 p.m.

Executive Abilities/Frontal System

M.A. SEDO & M. SUEIRO. Multicultural Digital Stroop: The Ability to Mobilize Mental Effort Differentiates Normals from Neurological Patients.

Objective: Five Digit Test (FDT) is a non-reading version of the Stroop, which is appropriate for culturally diverse populations. The test implies the use of only five images and five words. On its Parts 1 and 2 the test implies automatic reading and counting of groups of 1 to 5 digits; Parts 3 and 4 require controlled decisions, such as selecting responses and alternating tasks. The test requires the mobilization of additional resources; and sharply differentiates between intact and neurological populations.

Participants and Methods : A sample of the Spanish population (including seven groups from ages 17-29 to 80+) was compared to a sample of neurological patients. ROC curves helped compare the proportion of false negatives and false positives obtained from the scores.

Results : Intact subjects performance at controlled tasks (selecting, alternating) reflected a change of speed after the age of 60. Also, the means of intact and neurological subjects clustered around very different score levels.

Conclusions : FDT requires high levels of sustained, selective and alternate attention. It may be useful to populations with a lower cultural level (including non-readers); to subjects lacking color perception and to subjects with a limited knowledge of the language. The testing materials can be easily adapted for multicultural research: comparing identical functions in totally different languages.

Correspondence: *Manuel A. Sedo, Ph.D., Test Development, MultiLingual Testing, Manuel A. Sedo, 9 Ingleside Rd., Natick, MA 01760. E-mail: manuel@mltesting.com*

R.C. CHAN, M.K. LAI & V.Y. DENG. The latent structure of multitasking behaviour: A confirmatory factor analytical study.

Objective: The present aims to further examine three set of multitasking tasks, which are supposedly ecologically valid and developed from the same theoretical framework of supervisory attention system, among a group of healthy participants.

Participants and Methods : A total sample of 153 healthy Chinese participants were recruited. Three set of multitasking tests were administered to all participants, namely the modified Six elements test, Hotel test, and Greenwich test. Confirmatory factor analysis was used to analyze the latent structure of these multitasking tests.

Results : A five-factor model for the 13 items from the three ecologically equivalent scales (SET 3 items, Greenwich 6 items and Hotel 4 items) was tested by confirmatory factor analysis (CFA). Satisfactory fits ($\chi^2(56) = 73.480, p = 0.059; RMSEA = 0.039; CFI = 0.978; GFI = 0.935$) were observed for the model with factors of intentionality, strategy, planning, learning and monitoring. The magnitudes of the correlation coefficients among factors ranged from 0.302 to 0.505.

Conclusions : The present study provides further evidence on the latent structure of three sets of multitasking tests among a group of healthy participants. These findings are consistent with previous preliminary exploratory factor analysis on another sample.

Correspondence: *Raymond C. Chan, Ph.D., Psychology, Sun Yat-Sen University, NA, Guangzhou 510275, China. E-mail: rekchan2003@yahoo.com.hk*

V.Y. DENG & R.C. CHAN. Exploration of Multitasking Behaviour in Patients with Brain Damage.

Objective: Clinical studies indicate that damage to the frontal lobes may result in deficits in performing multitasking tests in experimental conditions and is most probably associated with subjective complaints of performing simultaneous tasks in everyday life scenarios. Multitasking assessments can also be sensitive to dysexecutive impairments that are not revealed on conventional executive function tasks. Most recently, some more ecologically valid tests of multitasking have been developed. The purpose of this study aimed to explore the multitasking behaviour within a group of patients with brain damage in mainland China.

Participants and Methods : Fifteen patients with brain damage and fifty demographically matched controls were recruited. Each of them received a set of multitasking tests (Six Elements Test, Hotel Test, and Greenwich Test) and another comprehensive set of neuropsychological tests.

Results : Patients showed remarkably poorer performance than the controls in most aspects of multitasking performance: intentionality, strategy allocation, prospective memory & planning, memory & learning, and showed a poorer tendency in monitoring. Moreover, patients with lesions in different brain area showed different deficient profile on multitasking performance. Patients with lesions in frontal lobe have poorer performance in all multitasking components, while lesions in temporal lobe have poorer performance in strategy allocation, prospective memory & planning, memory & learning.

Conclusions : The results suggest that patients with brain damage exhibit a general deficit in multitasking behaviour. In particular, frontal lobe lesions may contribute most to the poor component performance of intentionality, strategy allocation, prospective memory & planning, memory & learning, and monitoring.

Correspondence: *Raymond C. Chan, Ph.D., Psychology, Sun Yat-Sen University, NA, Guangzhou 510275, China. E-mail: rekchan2003@yahoo.com.hk*

E. ANDERSON & P.J. DONOVICK. Incentives, Decision-Making, and the Young Adult Prefrontal Cortex.

Objective: This study investigated methods of improving decision-making strategies in young adults. Attention, incentive, impulsivity, and gambling behavior were examined as predictors of performance of the Iowa Gambling Task (IGT; Bechara, Tranel, & Damasio, 2000), a well-validated measure of reasoning and decision-making.

Participants and Methods : Two hundred twelve undergraduate college students, 50% male, were randomly assigned to four conditions 1) attention to the task, 2) monetary compensation, 3) competition for monetary compensation, and 4) a control condition. Each participant played the IGT and completed self-report measures of impulsivity, decision-making, and gambling behavior.

Results : The monetary incentive conditions out-performed the attention and control conditions on the overall IGT performance ($p < .05$). There was no association between impulsivity and gambling on self-report measures and performance on the IGT. Despite verbalizing the correct contingencies of the task, the majority of the young adults elected disadvantageous strategies on the IGT.

Conclusions : Motivation by monetary incentive improved decision-making, but not to the level of normal adults as published in the liter-

ature (e.g., Bechara & Damasio, 2002). This study provides further evidence that disadvantageous decision-making is a stable behavioral associate of the neurodevelopment of the prefrontal cortex in the young adult brain. However, the results of this study suggest that tangible incentives can significantly improve decision-making in young adults.

Correspondence: *Emily Anderson, MA, Psychology, Binghamton University (SUNY), PO Box 6000, Binghamton, NY 13902-6000. E-mail: eanderso@binghamton.edu*

K.K. DEROCHE, M. WELSH & E. SEEVER. Meta-Analysis of Executive Function and Intelligence Outcomes in Early-Treated Phenylketonuria.

Objective: Primary research studies conducted on the neuropsychological outcomes of early treated phenylketonuria (PKU) display inconsistent findings regarding the nature and degree of impairment in the domains of intelligence and executive function. The current study employed meta-analysis techniques to draw general conclusions regarding four research questions involving group differences between PKU individuals, familial controls, and non-familial controls on measures of intelligence and executive function abilities.

Participants and Methods : Performance on the sub-groupings of executive function (flexibility, inhibition, working memory, planning, and other measures of executive function) and intelligence (performance IQ, verbal IQ, full scale IQ, and other measures of intelligence) were collected from 34 primary studies published between 1990 and 2005, and effect sizes (Hedge's *g*) were compared.

Results : Most sub-groupings of intelligence and all sub-groupings of executive function displayed moderate to high effect sizes (.316 to 1.249), showing significant group differences between PKU individuals and non-familial controls. PKU individuals and controls differed more in executive function abilities (effect size of .760 favoring the control group) than in intelligence (effect size of .378 favoring the control group).

Conclusions : The general findings of the meta-analysis support the current model of PKU in which deficient dopamine in the prefrontal cortex leads to impaired executive function skills.

Correspondence: *Kathryn K. DeRoche, M.A., Applied Statistics and Research Methods, University of Northern Colorado, 1016 Banyan Ct., Loveland, CO 80538. E-mail: dero8934@unco.edu*

R.L. WOOD & C. LIOSSI. The relationship between general intellectual ability and performance on ecologically valid executive tests in a severe brain injury sample.

Objective: Recent studies in brain injured and healthy individuals have provided empirical support for the theoretical proposition that executive function and general intelligence are closely associated by demonstrating that performance on tests of executive function is highly correlated with general intellectual ability (*g*). In the present investigation, the relationship between performance on the Wechsler Adult Intelligence Scale-III (WAIS-III) as a measure of *g* and performance on recently developed ecological tests of executive function i.e. Hayling and Brixton, Zoo Map and Key Search sub-tests from the Behavioural Assessment of the Dysexecutive Syndrome (BADS) battery was examined in a sample of severely brain injured individuals. In addition, two established tests, Trails B and the COWAT, were included as key reference measures to allow comparisons with the ecologically valid tests.

Participants and Methods : 118 severely injured individuals (Glasgow Coma Score < 12; Post Traumatic Amnesia > 24 hours) were administered the following tests:

- 1) The Wechsler Adult Intelligence Scale,
- 2) The Hayling & Brixton Tests,
- 3) The Zoo Map and Key Search,
- 4) The Trail Making Test,
- 5) Controlled Oral Word Association.

Results : The results indicated that a) performance on tests of executive function shares significant variance, b) a large proportion of that shared variance is associated with performance on the WAIS-III. Correlations between conventional measures of executive function (i.e. Trails B, COWAT) and WAIS-III were of comparable magnitude to the correlations between ecologically valid executive tests and WAIS-III.

Conclusions : This study offers further support to the notion that tests of executive function measure primarily a non specific intellectual function reminiscent of *g*.

Correspondence: *Christina Lioffi, DPsych, Psychology, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom. E-mail: c.liossi@swansea.ac.uk*

J. SUHR, D. HAMMERS & J. TSANADIS. Does a Generally Risky Personality Contribute to IGT Impairment in Substance Abuse?

Objective: Individuals who abuse substances consistently show deficits on Iowa Gambling Task (IGT). It is unclear whether IGT impairment is a consequence of substance use or whether it is related to personality/behavioral characteristics of individuals who abuse substances (reward sensitivity, general riskiness, negative affect). We attempted to dissociate the effects of general riskiness from substance abuse on IGT, Wisconsin Card Sorting Task (WCST), and personality, accounting for negative affect.

Participants and Methods : Participants were 89 undergraduates divided into three groups based on sex-based norms on substance use subtests of the Cognitive Appraisal of Risky Events (CARE). Participants also completed the Positive and Negative Affect Scale (PANAS), the Behavioral Inhibition /Behavioral Activation Scale (BIS/BAS), IGT, and WCST.

Results : Groups were not different in age or PANAS, but were different in general riskiness, as judged by scores on all other CARE subtests. Analyses of covariance tested group differences on IGT, BIS/BAS, and WCST perseverative errors, controlling for general riskiness. General riskiness was a predictor of WCST perseverative errors, but not of IGT or BIS/BAS. As expected, the group scoring highest on substance use did worst on IGT, scored higher on BIS/BAS (indicating approach tendencies), and made more WCST perseverative errors, compared to the other groups, even after controlling for general riskiness. Cognitive modeling analysis (Busemeyer & Stout, 2002) suggested that substance abusers showed more influence by gains on IGT, relative to other groups.

Conclusions : Findings suggest that the relation between substance abuse and reward sensitivity/ executive functioning is not entirely explained by a generally risky personality style.

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

M. WELSH, P. GORMAN BARRY, N. SPERKAS, N. ZOOK, J. HOLLAND & K. MCFADDEN. Executive Function in High-risk Children and Adolescents Before and After the BrainWise® Intervention Program.

Objective: There is substantial interest in understanding the executive function skills (e.g., planning, impulse control, self-monitoring) of children and adolescents, as well as the degree to which "thinking skills" intervention programs can facilitate their acquisition and application in everyday contexts.

Participants and Methods : The Tower of London-Revised (TOL-R) and the Stroop Test were administered to 36 male and female students in fifth grade, middle school, and high school who participated in the BrainWise® intervention during the 2004-2005 academic year.

Results : During the pretest phase (October-November), both the TOL-R and Stroop test scores were positively correlated with age, and neither test exhibited gender differences. Both the TOL-R and the Stroop test performance demonstrated significant improvements from the pretest to the posttest session (April-May 2005). Neither test showed an Age X

Session interaction, suggesting similar improvement across the three groups. Regarding test-retest stability, both the TOL-R ($r = .81$) and the Stroop ($r = .60$) demonstrated adequate reliability. Twenty-eight of 34 children (82%) exhibited improved performance on at least one of the measures, and 16 of 34 children (47%) showed improvement on both measures.

Conclusions : It is very important to point out that all or some portion of this improvement may be due to maturation and cognitive development presumably occurring during the six months that elapsed between the pre- and posttests. Studies underway include a matched control group to determine the extent to which this improvement is due to maturation, the BrainWise® intervention, or some combination of the two factors.

Correspondence: *Marilyn Welsh, Ph.D., Psychology, University of Northern Colorado, McKee Hall 14, Campus Box 94, Greeley, CO 80639-0121. E-mail: marilyn.welsh@unco.edu*

D.M. VIGIL, M. WELSH, L. COMER, T. HILL & E. STRONG. Dietary Restraint and Working Memory Skills in College Women: The Role of Preoccupying Cognitions.

Objective: This study investigated the relationship between college women's restrained eating behaviors and their working memory capacity when preoccupying cognitions concerning food are elicited. Previous research suggested a link between high levels of restrained eating (i.e. eating less than desired) and working memory capacity, in which the higher the restraint, the lower the available working memory capacity. One cognitive explanation for such an association is that thoughts about food and eating are consuming a portion of the limited pool of working memory resources.

Participants and Methods : Thirty-five female college students (19.15 years) were administered the Dutch Eating Behavior Questionnaire to assess dietary restraint, and the Modified Mental Counters task of working memory in two interference conditions: food word and non-food word distractors. It was hypothesized that the highly restrained group would show a larger increase in errors with increasing workload than low restrained eaters, but only in the food-word interference condition and only at higher load levels.

Results : The results showed a main effect for working memory load with errors increasing linearly with increasing load. There was also a main effect found for interference type, with food-word distractors causing more errors than non-food word interference. The three-way interaction between interference type, working memory load and level of dietary restraint was not significant, but a trend towards significance suggests that low statistical power (i.e., small sample size) may be one explanation.

Conclusions : These preliminary results indicate that both dieting and food-related cognitions consume limited working memory resources.

Correspondence: *Dawn M. Vigil, Psychology, University of Northern Colorado, box 94, Greeley, CO 80639. E-mail: vigi0143@blue.unco.edu*

A.J. VERDEJO, M. PEREZ-GARCIA & M. SEDO. Multicultural Assessment Of Different Forms Of Response Inhibition And Impulsiveness In Individuals With Substance Dependence.

Objective: The Five Digit Test (5DT) is a low academic loaded alternative form of the Stroop. This task consists of four conditions: 1 and 2 are associated with processing speed, while 3 and 4 are associated with response inhibition. The aim of this study was to examine the performance of Individuals with Substance Dependence (ISD) on measures of response inhibition and impulsiveness, including the 5DT as a multi-lingual measure.

Participants and Methods : We administered the 5DT, along with a number of tests of response inhibition and impulsiveness in a sample of 76 ISD and 30 age-matched healthy comparison participants (HC). Drug

of choice was cocaine for 56.6%, heroin for 32.9%, and alcohol for 10.5% of ISD participants. We used repeated-measures ANOVAs to examine possible differences between ISD and HC across the four different conditions of the 5DT. We used performance time and number of errors on each condition of the 5DT as the main dependent variables.

Results : Correlation analyses showed that 5DT performance was not associated with years of education. Results from factorial ANOVAs showed main effects of 5DT Condition ($F=337.11$, $p<.001$), Group ($F=13.68$, $p<.001$), and Condition x Group interaction ($F=3.79$, $p<.05$) for the performance time dependent variable. Results also showed main effects of 5DT Condition ($F=32.64$, $p<.001$), Group ($F=17.43$, $p<.001$), and Condition x Group interaction ($F=8.80$, $p<.001$) for the number of errors dependent variable. This pattern indicates that SA showed progressively poorer performance when response inhibition demands were included in the task. Furthermore, we found significant differences between groups on the Stroop and on a Go-No Go Task measuring motor inhibition.

Conclusions : These results suggest that abstinent ISD present consistently poorer performance on tests measuring different forms of response inhibition/impulsiveness. The 5DT is sensitive to drug-induced response inhibition deficits, and can be used in low educated participants.

Correspondence: *Antonio J. Verdejo, Personalidad, Evaluacion y Tratamiento Psicologico, Universidad de Granada, Campus de Cartuja S/N, Granada 18071, Spain. E-mail: averdejo@ugr.es*

T.P. ROSS, E. HANOUSKOVA, K. GIARLA, E. CALHOUN & M. TUCKER. The Reliability and Validity of the Self-Ordered Pointing Task.

Objective: The reliability and validity of the abstract design version of the Self-Ordered Pointing Task (SOPT; Petrides & Milner, 1982) was examined in healthy college students ($N = 170$; M Age = 20.97; SD = 2.76).

Participants and Methods : Ninety-three individuals who did not differ from the initial sample with regard to demographic or cognitive factors participated in retesting to assess the temporal stability of SOPT scores (M interval = 42.7 days). Correlations among SOPT scores purported to reflect working memory and executive functioning (e.g., span score, perseverations, monitoring errors, strategy use) were examined along with measures of intelligence, memory, and executive functioning.

Results : The reliability coefficient for total errors was $r = .81$. In contrast, stability coefficients for other SOPT indices were modest to poor, ranging from .58 for span score to .12 for perseverations. Participants obtained 2 less errors on average when retested [$t(1,92) = 4.15$; $p<.001$], suggesting a practice effect. SOPT scores correlated with measures of memory (e.g., CVLT Trials 1-5; $r = -.26$, $p = .015$), and working memory (WAIS-III LNS; $r = -.34$, $p = .001$), but not with executive measures (e.g., WCST, Tower of Hanoi) or intelligence.

Conclusions : Reliability data better support the use and interpretation of total errors (originally developed by Petrides and Milner, 1982) over more recently developed indices (see Schmitter-Edgecombe & Chaytor, 2003). The SOPT appears to better assess the construct of memory as compared to executive functioning, however, correlations may have been attenuated by low reliability of some SOPT indices. Implications and recommendations for future studies are presented.

Correspondence: *Thomas P. Ross, Ph.D., Psychology, College of Charleston, SC, 66 George Street, Charleston, SC 29424. E-mail: rosstp@cofc.edu*

E. GEENEN, M.E. BEHEN, R. ROTHERMEL & H. CHUGANI. Executive Dysfunction in Children with History of Early Severe Social Deprivation.

Objective: Studies of children with early social deprivation (ESD) have identified a subgroup of children with inattentive-overactive behavior (Krepplner, 2001). However, the incidence of this phenotype within cog-

natively intact samples is not clear, nor is the phenotype well-characterized neurocognitively. The present study evaluated the incidence of a form of executive dysfunction (e.g., inattention, impulsivity; ED) in a sample of globally intact children, and the neurocognitive profile associated with ED.

Participants and Methods : All children had been placed in orphanages at birth (mean duration=30.2 months+16.4). Of the total sample (N=56), 15 children were excluded due to global cognitive impairment. The remaining forty-one globally intact participants had a mean age of 103.3 months+28.2. Twenty-seven children were right-handed and twenty were male. Participants completed a comprehensive neuropsychological evaluation.

Results : Fourteen participants (34% of 41) had executive dysfunction (ED) defined as sustained attention and/or impulsivity scores ≥ 2 SDs below the normative mean. Relative to normative expectation, the overall neurocognitive profile showed average-low average intellectual, motor, and academic functioning, with relative weaknesses in verbal memory and expressive and receptive language. Comparisons between ED and non-ED children revealed significantly lower verbal reasoning, $F(1)=5.329$; $p=.027$; and verbal memory, $F(1)=8.921$; $p=.005$; and trends for reduced expressive ($p=.053$) and receptive ($p=.052$) language in the ED group.

Conclusions : The incidence of ED presented here is consistent with that of previous studies, and provides support for the existence of the ED subgroup in cognitively intact children with early social deprivation. Further, ED was associated with a specific neurocognitive profile that included verbal memory and language difficulties.

Correspondence: *Michael E. Behen, PhD, PET Center, Children's Hospital of Michigan, 3901 Beaubien, Detroit, MI 48126. E-mail: mbehenn@pet.wayne.edu*

A.S. BRUCE, J.M. BRUCE, W.J. RAY & P.A. ARNETT. The Relationship between Executive Functioning and Dissociation.

Objective: The study of normative and pathological dissociation has recently gained importance due to its ability to inform us about cognitive processes. Surprisingly, few studies have used traditional laboratory-based neuropsychological measures to examine dissociative phenomena. Even fewer studies have looked at the relationship between dissociation and executive functioning. In the current study, we compared high and low dissociators on both self-report and neuropsychological measures of executive function.

Participants and Methods : The Dissociative Experiences Scale (DES), a commonly-used measure of self-reported dissociative symptoms, was used to recruit participants. During the experimental procedure, the Dysexecutive Questionnaire (DEX) was administered in addition to the Iowa Gambling Task, the Operation Span task, and the Wisconsin Card Sorting Test-64. The measures were administered to 33 high and 32 low dissociators recruited from an undergraduate sample.

Results : High dissociators reported significantly more executive problems than low dissociators on the DEX [$t(63) = -5.61$, $p < .001$]. Despite this, no between group differences emerged on the objective neuropsychological measures.

Conclusions : Although highly dissociative individuals reported significantly more executive difficulties than low dissociative individuals, these relative difficulties were not related to their performance on neuropsychological measures of executive functioning.

This was consistent across all included neuropsychological measures, which evaluated a variety of different facets of executive functioning. These results suggest that dissociative individuals' perceptions of executive impairments are divorced from their actual experience and may reveal an important process underlying the clinical manifestations of this phenomenon.

Correspondence: *Amanda S. Bruce, MS, Psychology, The Pennsylvania State University, 82 Ninth St., Providence, RI 02906. E-mail: a_schurle@yahoo.com*

A.D. MCGILL, T.W. FRAZIER, R.M. BUSCH & C.S. KUBU. Evaluating Parkinson's Disease: A Comparison of the Frontal Systems Behavior Scale (FrSBe) Family Version and Neuropsychological Measures.

Objective: The Frontal Systems Behavior Scale (FrSBe) is a rating scale designed to measure behavioral syndromes associated with frontal lobe dysfunction through either self or family report. The current study sought to examine the convergent and discriminant validity of the FrSBe subscales. It was anticipated that the FrSBe subscales would show the strongest relationships with neuropsychological measures sensitive to frontal lobe functioning (e.g., executive functioning tasks) and smaller relationships with measures less sensitive to frontal dysfunction (e.g., general intellectual functioning).

Participants and Methods : A neuropsychological battery was administered to 204 patients with idiopathic PD and a close relative completed the FrSBe Family Rating Form. The construct validity of the FrSBe subscales was examined by calculating Pearson correlations between subscale scores (Apathy, Disinhibition, and Executive Dysfunction) and test performance on measures assessing executive function, initiation/perseveration, memory, attention, general intelligence, language, visuoperception/construction and mood/anxiety.

Results : Results indicated that the Apathy subscale had the best convergent validity, as it significantly correlated with all of the predicted neuropsychological measures. The convergent validity of the Executive Dysfunction subscale was only partially demonstrated in that it significantly correlated with only three of the five predicted measures. This study did not demonstrate convergent validity for the Disinhibition subscale. All subscales were found to demonstrate poor discriminant validity.

Conclusions : This study indicates that the FrSBe subscales (current behavior) have questionable convergent validity and poor discriminant validity in our sample of patients with PD. Further research is needed to demonstrate the utility of this instrument in assessing frontal lobe functioning in patients with PD.

Correspondence: *Robyn M. Busch, Ph.D., Psychiatry and Psychology, Cleveland Clinic Foundation, 9500 Euclid Avenue, P57, Cleveland, OH 44111. E-mail: buschr@ccf.org*

K.D. BECK, S. FRANKS & J. COVERT. Differences in Executive Functioning Using the Behavioral Dyscontrol Scale Among Patients with Probable Alzheimer's Disease and Vascular Related Cognitive Decline.

Objective: Deficits in executive functioning have been noted to exist in degenerative diseases such as AD and many vascular-related disorders. This study examined the utility of the Behavioral Dyscontrol Scale (BDS) in determining differences in executive functioning between patients with AD and vascular related cognitive decline. The BDS was developed as a measure of executive functioning and designed to predict and individual's capacity for self-regulation of behavior. Factor analytic studies have confirmed the existence of a 3-factor structure in the BDS items, Motor Programming Factor (F1), Fluid Intelligence Factor (F2), and Environmental Independence Factor (F3).

Participants and Methods : Sixty-seven patients referred for neuropsychological testing were selected for a retrospective study. Patients were coded into the following broad diagnostic categories, probable early Alzheimer's disease (N = 43) and vascular related cognitive decline (N = 24). Independent samples t-tests were performed to compare differences between the AD group and vascular group on the BDS factors and BDS total score.

Results : Significant differences were found between the AD group and the vascular group for F3, $t(64.5) = -2.96$, $p = .004$ (two-tailed) with the AD group (M = 2.58) scoring significantly lower compared to the vascular group (M = 3.38). No other significant differences were found on the BDS factor scores or total score, though total scores for both groups were in the mildly impaired range (AD group M = 12.24, S.D. = 4.9; vascular group M = 13.6, S.D. = 3.7).

Conclusions : The AD group scored lower on all 3 factors and the total BDS score compared to the vascular group, although significant differences were only found for F3. This indicates disinhibition is more likely a problem in AD patients as compared to patients with vascular related cognitive decline, as F3 relates to inhibition of motor responses. More research is needed to confirm the utility of the BDS in distinguishing between these two populations. Correspondence: *Kelley D. Beck, University of North Texas, 1514 Allen Dr., Cedar Hill, TX 75104. E-mail: bkbecks@sbcglobal.net*

C.A. HAJEK, C. CRAVER & L. BIELIAUSKAS. Abnormally High Failure Rates on the Frontal Assessment Battery in a VA Population.

Objective: In a population of inpatients at the Ann Arbor Veterans Hospital (VA), individuals were observed to continually score in the impaired range on the Frontal Assessment Battery (FAB) without exhibiting other signs of frontal lobe damage. The FAB is comprised of six subtests and the goal of this study was to determine if a particular subtest was responsible for patients' poor performance on the FAB overall.

Participants and Methods : Participants were inpatients in the Extended Care Center of the Ann Arbor VA that were administered a standard neuropsychological screening battery. This battery included the FAB and the Mini-Mental State Examination, among other tests, as part of regular clinical care. Included in these analyses were 395 patients with a mean age of 67.27 (SD = 12.41).

Results : Descriptive analyses revealed that 71.6% of patients scored in the impaired range on the FAB based on the criteria set forth by DuBois et al. (2000). Analyses of individual subtest performance failed to find any single test that would characterize participants' poor performance overall. Participants performed equally poorly on the Similarities, Lexical Fluency, Motor Skills, and the Go-No-Go task. On the other hand, participants performed significantly better on the Conflicting Instructions and Prehension Behavior subtests.

Conclusions : This suggests that no single subtest is responsible for the high failure rate on the FAB in this population. Rather, it is likely that other factors are contributing to the elevated number of impaired performances on the FAB in this population, and the implications of these findings are discussed further.

Correspondence: *Christine A. Hajek, University of Michigan, 930 South Forest, Ann Arbor, MI 48104. E-mail: chajek@umich.edu*

V. DRAGO, P.S. FOSTER, G.P. CRUCIAN & K.M. HEILMAN. Cognitive Festination and Impersistence in Parkinson's Disease.

Objective: Patients suffering from PD commonly present with deficits in executive functions. We investigate participants with PD performance on verbal fluency test, to learn if they show cognitive impersistence.

Participants and Methods : Six PD patients without dementia and 5 controls matched by age, participated in this experiment. A letter verbal fluency task was performed. Participants were given 60 seconds to provide as many words as they could that started with a specified letter (F-A-S). The production of words was recorded as a function of time, dividing the minute of performance for each letter into four 15 seconds segments and recording the words produced in each of these sequential segments.

Results : A 2 x 4 (Group x Time) segments repeated measures analysis of variance was used to analyze the data. Significant main effects of group, $F(5,106) = 5.11$, as well as a significant interaction between Group and Time, $F(1,31, 54) = 4.85$, $p = 0.041$ were found. Post-hoc analyses revealed differences between groups for the first ($p=0.039$) and last ($p=0.029$) 15 seconds intervals, but no differences in the second and third 15 seconds intervals.

Conclusions : The observation that in the last 15 seconds, but not in the second and third 15 seconds intervals, PD performed worse than

controls, is consistent with the postulate that cognitive motor impersistence is associated with PD. PD participants reduced production of words in the first 15 seconds was not predicted but might be a cognitive version of the motor festination phenomenon, reflecting a slowness in initiating cognitive activation.

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

K. RANDALL, M. HRABOK & K.A. KERN. An Investigation of Components of Inhibition: Childhood to Adult.

Objective: Theories of developmental psychopathology (e.g. Barkley, Nigg, Casey) conceptualize inhibition as a multidimensional construct and a core deficit in many developmental disorders. Despite the importance assigned to inhibition there have been few studies that have investigated normative development of components of inhibition through adulthood. Casey (2001) described components of inhibition utilizing basal ganglia-thalamocortical circuits. This study investigated stimulus selection (inhibition of a salient, but irrelevant stimulus attribute) and response selection (inhibition of a competing prepotent response) aspects of inhibition as proposed in her model.

Participants and Methods : Computerized tasks used to assess inhibition were administered to 106 adults (17-34 yr olds), 39 school-age children (8-12 yr olds), and 39 preschoolers (4-5 yr olds). Participants were required to press colored buttons in response to target cues of block location or color. The tasks utilized location and color cues to measure stimulus selection and response selection dimensions of inhibition.

Results : Both mean reaction time from correct trials and accuracy on tasks were assessed. School-age children and adults had similar patterns across accuracy and reaction times for both components of inhibition, while the pattern of results for preschoolers differed significantly, with lower accuracy and longer reaction times, significantly more so on inhibition of a prepotent response.

Conclusions : This study attempts to further delineate the development of specific forms of inhibition across development. Results suggest that while inhibitory mechanisms are in place as early as 4 years of age, development continues to occur differentially between components of inhibition. Implications of these findings will be discussed.

Correspondence: *Kate Randall, MA, Department of Psychology, University of Victoria, PO Box 3050, Victoria, BC V8W 3P5, Canada. E-mail: krandall@uvic.ca*

R. FRIED, J. BIEDERMAN, J. FONTANELLA, A. DOYLE, L. SEIDMAN, C. PETTY & S. FARAONE. Impact of Psychometrically-Defined Executive Function Deficits in Adults with ADHD.

Objective: The main aim of this study was to evaluate the impact of EFDs on functional outcomes in a large sample of adults with and without ADHD. We hypothesized 1) that psychometrically-defined EFDs will be identifiable in a subgroup of ADHD adults using a battery of EF tests; and 2) that the presence of psychometrically-defined EFDs in adults with ADHD will be associated with added functional deficits.

Participants and Methods : Subjects were adults with (N=213) and without (N=145) DSM-IV criteria for ADHD. We defined EFD as at least two EF measures 1.5 SDs below matched controls. After applying our EFD algorithm, we defined four groups: controls without EFD (Controls, N=122), controls with EFD (Control EFD, N=23), ADHD without EFD (ADHD, N=147), and ADHD with EFD (ADHD EFD, N=66).

Results : Logistic, linear, and ordinal logistic regression were used depending on the distribution of the outcomes. Exact logistic regression was used in lieu of logistic regression when there were one or more zero frequencies in the two-way table defined by the categorical predictor and the dichotomous outcome. Statistical tests were two-tailed and an alpha level of 0.05 was used.

Conclusions : Our results showed that significantly more adults with ADHD had EFDs than controls. EFDs were associated with lower academic achievement, irrespective of ADHD status. ADHD with EFDs was associated with significantly lower SES and significant functional morbidity beyond the ADHD diagnosis alone. Thus, we concluded that psychometrically defined EFDs may help identify a subgroup of adults with ADHD at high risk for occupational and academic underachievement. Correspondence: *Ronna Fried, Ed.D., Massachusetts General Hospital, Dept. Pediatric Psychopharmacology, 55 Fruit St- Warren 6, Boston, MA 02114. E-mail: rfried@partners.org*

D. HOOFIEN, A. WESHLER & M. KOREM. A Study of the Interactive Relations between Risk-taking, Cognitive-Impulsivity and Valence on the Bechara Gambling Task (BGT).

Objective: The BGT is a commonly used tool in the study of frontal-lobe functions. Our goal was to examine the interactive relations between risk-taking, cognitive-impulsivity and valence in normal subjects' performance on the BGT.

Participants and Methods : Study 1: 32 undergraduate students performed a modified version of the BGT. In the original BGT, disadvantageous (high-value) decks only yield long-term loss (and *rise a versa*), thus confounding high-value with loss. In the modified version both values (high/low) and valence (profit/loss) were counterbalanced. Risk-taking was measured by two self-report questionnaires. Study 2: 21 undergraduate students performed another modified version of the BGT in which a 'Two Choice Delayed Reward' paradigm has been incorporated into the gambling task. At certain points during the task the participant could decide to delay or not to delay his or her choice, thus increasing or decreasing the profit or loss. Risk (profit/loss) and delayed reward (positive/negative) were counterbalanced. Risk-taking and impulsivity were measured by self-report questionnaires.

Results : Study 1: Risk-takers differed from non risk-takers by their preferences on negative-valence decks (loss, high-or-low value) but not on positive-valence decks (profit, high-or-low value). Study 2: Deck preference was found to be associated with risk-taking more than with cognitive-impulsivity. As expected, decision to delay was found to be mainly related to impulsivity.

Conclusions : Our findings indicate to an interactive association between risk-taking and valence but not between risk-taking and cognitive-impulsivity in BGT decision-making.

Correspondence: *Dan Hoofien, Ph.D., Psychology, Hebrew University of Jerusalem, Mount Scopus, Jerusalem 91905, Israel. E-mail: hoofien@inter.net.il*

A. HASEGAWA, A.J. ISOMURA, Y. OHNO, H. KATO & H. UTSUMI. Executive dysfunction among patients with subcortical infarctions.

Objective: It remains unclear if there are differences in executive dysfunction among various types of patients with different subcortical lesions. In order to clarify the extent of dysexecutive function of patients with subcortical lesions, this study attempts to categorize those patients into two groups. They are 1) individuals who had infarctions in basal ganglia and 2) those who had infarctions in white matter.

Participants and Methods : In this study, seven participants had basal ganglia lesions and 14 of them had white matter lesions. Individuals who were suspected having dementia were excluded from the study. All of them had no cerebral cortex lesions. They were administered a comprehensive neuropsychological battery to evaluate their overall cognitive performance. In order to evaluate executive dysfunction, the battery included the Wisconsin Card Sorting Test, the Ruff Figural Fluency Test, the Controlled Oral Word Association Test, the Trail Making Test, and the subtests of Behavioural Assessment of Dysexecutive Syndrome.

Results : Student T-test was utilized to evaluate group differences in executive dysfunction between these two groups. As a result, there were significant differences in number of total errors and perseverative errors on the WCST. Of all, the basal ganglia group scored significantly lower than the white matter group.

Conclusions : In summary, it is found that participants with basal ganglia lesions exhibit significant executive dysfunction when compared to those with white matter lesions. The result suggests that manifestation of executive dysfunction may be rooted in dorsolateral prefrontal cortex. One explanation may be that cerebral infarctions may lead to reduction in cerebral blood flow and cortical atrophy. Subcortical infarctions, especially basal ganglia lesions, interfere frontal-subcortical neuronal circuit and further initiate decreased prefrontal dorsolateral cortical glucose metabolism. Directions of future studies are also discussed.

Correspondence: *Akira Hasegawa, M.D., Neurology, Tokyo Medical University, 6-7-1 Nishi-shinjuku, Shinjuku-ku, Tokyo 160-0023, Japan. E-mail: l-ackeyzone-h@ace.ocn.ne.jp*

K.E. HAYDEN, S.N. MATTSON & E.P. RILEY. Verbal Fluency Clustering and Switching in Children with Heavy Prenatal Alcohol Exposure.

Objective: Children with heavy prenatal exposure to alcohol display deficits in executive functioning, which includes response inhibition, planning, sequencing, set-shifting, and verbal fluency. An explanation for their poor performance on verbal fluency tasks was explored in this study, assessing two underlying strategic components of verbal fluency: clustering (the ability to generate successive words within phonemic or semantic subcategories) and switching (the ability to shift from one cluster or word to another when the previous cluster/word is exhausted).

Participants and Methods : Qualitative aspects of clustering and switching and the frequency of response inhibition errors including intrusions, perseverations, and rule-violations were examined using the Controlled Oral Word Association test (COWA). A sample of 49 children with heavy prenatal alcohol exposure and 50 non-exposed control participants matched on age (6-16 years), sex, handedness, ethnicity, and socioeconomic status (SES) participated in this study.

Results : Data were analyzed using a series of 2 x 2 ANCOVAs with age as a covariate. Results indicated that children with heavy prenatal alcohol exposure produced fewer total words, switched less frequently, produced fewer clusters of similar size, and committed more errors of intrusion compared to controls. Frequency of perseveration and rule-violation errors were not significantly different between groups.

Conclusions : The results of this study lend further evidence of executive dysfunction and suggest that inefficient clustering strategies and increased frequency of intrusion errors may contribute to the poor verbal fluency performance previously identified in children with heavy prenatal alcohol exposure.

Correspondence: *Sarah N. Mattson, Ph.D., Psychology, San Diego State University, 6363 Alvarado Ct, Suite 200, San Diego, CA 92120. E-mail: smattson@sunstroke.sdsu.edu*

M.F. DULAY, M.K. YORK, J. JANKOVIC & R.K. SIMPSON. Neuropsychological Outcome after Bilateral Deep Brain Stimulation Surgery for Advanced Parkinson's disease: Base Rates Adjusted for Practice Effects, Test Unreliability, and Natural Disease Progression.

Objective: Declines on tests of frontal-striatal functioning after bilateral subthalamic nucleus deep brain stimulation surgery (BSTN-DBS) have been reported by some studies but not others. Problematically, studies including matched healthy controls or non-surgical Parkinson's disease (PD) patients are lacking. As a result, the accuracy of post-surgical cognitive morbidity base rates are confounded by the influence of practice effects and cognitive deficits associated with disease progression.

Participants and Methods : We assessed change associated with BSTN-DBS in 25 patients with advanced PD using a battery of 16 neuropsychological tests administered before and 6 months after surgery. The Reliable Change Index method was used, which allowed for the determination of clinically significant changes in performance while taking into account the reliability of the test used. Pre- to post-surgical changes were adjusted for (a) improvements in test scores found in 18 healthy controls and (b) reductions found in 27 medically managed PD patients who did not undergo surgery (all tested at a similar test-retest interval).

Results : The largest change from pre- to post-surgery (adjusting for practice effects and disease progression) was on animal fluency with 79% of BSTN-DBS patients showing a clinically significant reduction. Fifty-eight percent showed a significant decline on Trails B, 48% on letter fluency, and 38% on strategic verbal learning. Practice effects were most apparent on the tests of verbal recall and fluency. Digit span and Trails B were the tests that needed the largest correction for disease progression.

Conclusions : Results demonstrate short-term morbidity in a large percentage of BSTN-DBS patients on measures of frontal-striatal functioning even after controlling for the influences of practice effects, disease progression, and test unreliability. Results provide a helpful guide for counseling surgical candidates on the possible cognitive risks associated with surgery.

Correspondence: *Mario F. Dulay, Ph.D., Baylor College of Medicine, 190 S. Cochrans Green Circle, The Woodlands, TX 77381. E-mail: mariodulay@aol.com*

C. YANG, M. HUA & Y. WU. Temporal Order Memory in Nondemented Patients with Parkinson's Disease.

Objective: Deficits of temporal order memory have often been evident in patients with lesions of frontal lobes. However, the issue regarding whether patients with Parkinson's disease (PD) have such impairments remains equivocal. Methodological drawbacks, such as confounding variables of the disease severity and demented problem might contribute to these inconsistent findings. The present study using nondemented PD patients with varying degree of motor disabilities was thus to make an attempt to examine this issue.

Participants and Methods : Sixty-nine adult subjects, including three groups of nondemented patients with idiopathic PD who were under "on" condition with varying degree of motor disabilities based on Hoehn & Yahr (H&Y) motor staging, and one group of normal control subjects, participated in the study. These subjects were matched for age, education level, MMSE score and/or VIQ of the WAIS-R. Each subject received temporal order memory tasks and a battery of neuropsychological tests.

Results : Our results revealed that our PD patients exhibited difficulties in temporal order discrimination mainly reflected by the score index of temporal context confusion and/or false positive error. Patients with H&Y motor staging III evidenced remarkably higher temporal context confusion and false positive error scores in comparison with their normal counterparts. Furthermore, the index scores of temporal order memory function measures were also significantly associated with executive function tests, but were not related to nonverbal memory task.

Conclusions : Based on the present results, it appeared that our patients with PD had temporal order memory dysfunction, even patients with motor staging I. Accordingly, we suggest that temporal order memory examination might be contributory to the early detection of prefrontal dysfunction in nondemented patients with PD. However, since our results were based on small subject sample, further study of this matter on a large scale 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*

B.P. YOCHIM, A. LEQUERICA, S. MACNEILL & P. LICHTENBERG. Executive Functioning Mediates the Relationship Between Depression and IADL in Geriatric Rehabilitation Patients.

Objective: This study investigated relationships among depression, executive functioning, and independent activities of daily living (IADL) in geriatric rehabilitation patients. Depressed older adults often show executive dysfunction and poor IADL performance. Measures of executive functioning tend to predict IADL more strongly than do measures of other specific cognitive domains such as memory, language, or visuospatial skills. This study investigated whether the relationship between depression and IADL is mediated by executive dysfunction.

Participants and Methods : The sample included 149 medical rehabilitation patients, all at least 60 years of age. Patients were administered the Geriatric Depression Scale, Dementia Rating Scale (DRS), measures of verbal fluency (COWAT letter C and Animal Naming), and the Instrumental Activities of Daily Living Scale. The Initiation/Perseveration subtest of the DRS and the verbal fluency measures were combined into one factor of executive functioning. Structural equation modeling was used to investigate whether the executive functioning factor mediated the relationship between the Geriatric Depression Scale and IADL, while controlling for demographic variables.

Results : The hypothesized model was supported, whereby executive functioning mediated the relationship between depressive symptomatology and IADL. This model accounted for 24% of the variance in IADL. The proposed model fit the data well, according to several fit indexes.

Conclusions : Late-life depression is associated with executive dysfunction. The relationship between depression and IADL can be explained by the executive dysfunction that often accompanies depression. It is possible that improvement in depressive symptoms may lead to improvement in executive function and IADL.

Correspondence: *Brian P. Yochim, Ph.D., Mental Health (116), VA Northern California Health Care System, 150 Muir Rd., Martinez, CA 94553. E-mail: Brian.Yochim@med.va.gov*

R.E. ANDERSON, P.W. KODITUWAKKU, D. MATTHEWS & E. KODITUWAKKU. Reliability and Validity of the Progressive Planning Task.

Objective: The objective is to present a psychometric analysis of the Progressive Planning Task (PPT), a look-ahead puzzle that purports to assess cognitive planning. The PPT consists of 12 problems of graded difficulty that were designed to overcome the limitations of other planning tasks. Like in the Tower of London, the PPT involves moving beads from initial positions to goal positions. However, rules of the PPT are unique in that they constrain the moves so that one incorrect move renders a problem unsolvable, thus encouraging strategic planning.

Participants and Methods : Participants were 104 males and 100 females, ages 18 to 52, referred for counseling through a family court program. Participants were excluded if they had a history of head trauma, significant psychiatric illnesses, and/or substance use disorders. The reliability of the PPT was assessed by a split-half analysis, and construct validity by principal components analysis and structural equation modeling (SEM).

Results : Results indicated that the PPT has good internal reliability (split-half = .86). Principal components analysis revealed that the component most related to the PPT is largely distinct from those related to verbal ability and attention. However, measures of perceptual ability and response inhibition did load moderately on this component. The results of SEM further explicated the relationship between these measures, with 48% of the variance in PPT performance being directly predicted by a latent factor of perceptual ability and by errors on a test of response inhibition.

Conclusions : There is evidence that the PPT is a reliable and valid measure of cognitive planning ability. Although partly explainable by individual differences in perceptual abilities and response inhibition, approximately half of the variation in PPT performance appears to be related to factors that are associated with strategic planning and/or measurement.

Correspondence: *Piyadasa W. Kodituwakku, Ph.D., Pediatrics/ Center for Development and Disability, University of New Mexico School of Medicine, 2300 Menaul NE, Albuquerque, NM 87107. E-mail: pkodituwakku@salud.unm.edu*

T. MCAULEY, J. BICKEL & D.A. WHITE. Developmental Changes in Strategic Learning.

Objective: In this study, we examined developmental changes in the organizational strategies used by children during a word list learning task. We hypothesized that use of a semantic clustering strategy would increase with age and that use of a serial clustering strategy would decrease with age.

Participants and Methods : One hundred forty-six children (6 - 18 years) were presented with a list of 18 words on five consecutive learning trials. Children were instructed to recall as many words as possible in any order. Two organizational strategies were identified: (1) serial recall, in which participants recalled words in the order presented and (2) semantic recall, in which participants recalled words belonging to semantically shared categories. To control for age-related differences in number of words recalled, a clustering efficiency score was calculated by dividing the number of words recalled in clusters by number of words correctly recalled.

Results : Hierarchical regression analyses were used to evaluate the contribution of age, clustering efficiency, and the interaction of these terms to the number of words correctly recalled across trials 1 - 5. In the first analysis, age ($\beta = .496, p < .001$) and semantic efficiency ($\beta = .436, p < .001$) accounted for 60% of the variance in recall. In the second analysis, age ($\beta = .621, p < .001$) and serial efficiency ($\beta = -.235, p < .001$) accounted for 49% of the variance in recall. The interaction terms were not significant in either of these analyses ($p > .05$).

Conclusions : Results indicate that there is an age-related increase in the amount of information that can be recalled across development. Although children may use a semantic clustering strategy in order to facilitate their performance, use of a serial clustering strategy has the opposite effect. Contrary to our hypothesis, use of these strategies was not observed to change as a function of age.

Correspondence: *Tara McAuley, M.A., Psychology, Washington University, Campus Box 1125, 1 Brookings Drive, St. Louis, MO 63130. E-mail: tmcauley@wustl.edu*

T. MCAULEY, J. BICKEL & D.A. WHITE. Strategic Learning in Older Adults.

Objective: In this study, we examined changes in organizational strategies used by older adults. We hypothesized that use of a semantic clustering strategy would decrease with age and that use of a serial clustering strategy would increase with age.

Participants and Methods : 103 participants comprised 3 groups: young (18 - 24), young-old (62 - 74), and old-old adults (75 - 87 years). Participants were presented with a list of 18 words on five consecutive trials and were instructed to recall as many words as possible on each trial. Two strategies were identified: (1) serial recall, in which participants recalled words in the order presented and (2) semantic recall, in which participants recalled words belonging to semantically shared categories. To control for age-related differences in number of words recalled, a clustering efficiency score was calculated by dividing the number of words recalled in clusters by number of words correctly recalled.

Results : Hierarchical regressions were used to evaluate the contribution of age group, clustering efficiency, and their interaction to the number of words correctly recalled across trials 1 - 5. In the first analysis,

group ($\beta = -.372, p < .001$), semantic efficiency ($\beta = .419, p < .001$), and their interaction ($\beta = -.318, p < .001$) accounted for 48% of the variance in recall. Posthoc analyses showed that semantic efficiency was a significant predictor of recall for young and young-old adults but not for old-old adults. In the second analysis, group ($\beta = -.528, p < .001$) and serial efficiency ($\beta = -.329, p < .001$) accounted for 39% of the variance in recall. The interaction term was not significant ($p > .05$).

Conclusions : These results indicate that the observed age-related decrease in recall may be related to a change in the effectiveness of semantic clustering. Although older adults are able to implement a semantic clustering strategy, use of this strategy does not facilitate their performance. Use of a serial clustering strategy resulted in poorer recall for all age groups. Correspondence: *Tara McAuley, M.A., Psychology, Washington University, Campus Box 1125, 1 Brookings Drive, St. Louis, MO 63130. E-mail: tmcauley@wustl.edu*

J. BALDO, D. WILKINS & N. DRONKERS. Working Memory and Language Comprehension in Patients with Inferior Parietal and Inferior Frontal Lesions.

Objective: The current study investigated the relationship between working memory and language comprehension in patients with lesions in left inferior parietal cortex (IP) and left inferior frontal cortex (IF). These regions have been previously associated with phonological storage and rehearsal components of working memory, respectively.

Participants and Methods : Participants included ten IP patients, eight IF patients, as well as young and elderly controls. Comprehension was tested using the Curtiss-Yamada Comprehensive Language Evaluation, which requires patients to point to a picture that best matches a sentence spoken by the examiner.

Results : All patients were near ceiling for comprehending simple declarative sentences. However, when sentences became more complex, both patient groups showed a decrement in performance. Specifically, both patient groups were impaired relative to controls on object relative clauses and negative passive sentences. Inferior parietal patients were additionally impaired on subject relative and object clefting. Importantly, it was found that comprehension performance on complex sentences correlated with digit span, a measure of working memory. In order to better understand the mechanisms underlying impaired comprehension performance, we also tested college undergraduates on the same comprehension tasks under conditions of articulatory suppression (i.e., vocalizing 1 2 3 4 5 5 4 3 2 1...). Like the focal lesion patients, young controls also made more errors on complex sentence comprehension under these conditions, relative to baseline.

Conclusions : Taken together, these data support previous research showing that working memory plays a role in language comprehension. Moreover, the current findings from patients with focal lesions suggest that phonological storage and articulatory rehearsal each play distinct roles in this process.

Correspondence: *Juliana Baldo, Ph.D., VA Northern California, 150 Muir Rd. (126s), Martinez, CA 94553. E-mail: juliana@ebire.org*

J. FLORES LAZARO & F. OSTROSKY-SOLIS. Development of Executive Functions from 6 to 30 years old.

Objective: The neuropsychological development of executive functions is still a very limited explored area. Although diverse authors have investigated the development of different executive functions (EF), in general the actual developmental knowledge covers only a few of these functions in a limited age range. The objective of the present study was to integrate a battery of 14 different EF related to orbital, medial and dorsolateral prefrontal lobes areas and to study their developmental characteristics.

Participants and Methods : A sample of 200 normal spanish-speaking subjects, ranging from 6 to 30 years old was studied. Subjects were divided in 5 groups: 6-8, 9-11, 12-14, 15-17 and 18-30.

Results : Data analysis showed that the majority of the orbital-medial measures including inhibitory control (Stroop effect), motor control (trespassing limits in labyrinths), risk choices detection (card game), and set maintenance (sorting test) as well as dorsolateral-ventral processes (working memory for objects), reached maximum performance in the 9 to 11 age range. Most dorsolateral measures, including planning (labyrinths), sequential planning (Hanoi tower), verbal working memory (ordering), verbal fluency and inverse numeric sequences showed a later developmental range, between 12 to 14 age. Abstract and complex processes like proverbs selections, reached maximum performance in the 18-30 age range.

Conclusions : Discussion emphasizes the need of an integral view for the frontal lobes neuropsychological development.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

A. EASTVOLD, Y. SUCHY, D.S. STRASSBERG & J. WHITTAKER. The detection of subtle executive deficits with the Behavioral Dyscontrol Scale - Electronic Version in a sample of sex offenders.

Objective: The current study had two aims: 1) to examine BDS-EV performance in a clinical population and 2) to assess the BDS-EV's ability to discriminate among populations based on subtle executive deficits.

Participants and Methods : Because criminal offenders are known to exhibit subtle executive deficits, our clinical sample was comprised of two types of offenders (pedophiles, n=24; non-pedophilic child molesters, n=24). Their performance on the BDS-EV, the original BDS, and three traditional executive measures was compared to a control sample (n=24) matched on age and education.

Results : One-way ANCOVAs (using age and education as covariates) revealed that the three groups differed on the motor-programming factor (MPF) of the BDS-EV, $F(2,67) = 4.41, p < .05$, and on the Stroop Color-Word (SCW), $F(2,67) = 4.83, p < .05$. Post-hoc analyses revealed that SCW significantly differentiated offenders from controls, whereas MPF differentiated the two offender groups. Stepwise Discriminant Functional analysis confirmed that each variable contributed uniquely to the variance among the three groups, Wilks Lambda (λ) = .734, $p < .001$. Participants in all three groups were classified significantly above chance, with the total hit rate of 60%.

Conclusions : These results contribute to the validation of the BDS-EV, showing that it surpasses the original BDS, as well as compliments traditional measures in capturing subtle executive deficits. As such, the BDS-EV shows promise as a future clinical measure.

Correspondence: *Angela Eastvold, MA, Psychology, University of Utah, 380 S 1530 E, Salt Lake City, UT 84102. E-mail: angela.eastvold@psych.utah.edu*

P.W. KODITUWAKKU, R.E. ANDERSON, D. MATTHEWS & E. KODITUWAKKU. Learning and Shifting of Strategies during Cognitive Planning: Evidence for Intense and Relaxed Engagement of the Executive System.

Objective: Cognitive planning is generally considered to be an ability involving executive functioning. Little is known, however, about executive control processes underlying this ability. The objective of the current research was, therefore, to investigate the operation of two executive mechanisms - strategy learning and strategy shifts - during the performance on a test of cognitive planning.

Participants and Methods : Participants were 278 adults, ages 18 to 52, who were enrolled in a study of domestic conflict resolution. The sample was comprised of 143 females and 135 males, predominantly Hispanic. Those with a history of head trauma, major psychiatric illnesses, and/or substance use disorders were excluded. The Progressive Planning Test (PPT), which is a look-ahead puzzle, was administered as part of a larger test battery. Like the Tower of London Task, the PPT involves moving beads from initial positions to goal positions following

specific rules. The test consists of 12 problems of 3 complexity levels, with 4 problems at each level. Given that solutions to problems at each level require the employment of specific strategies, this test allows assessing strategy shifts (between levels) and strategy learning (within each level).

Results : The main effect of strategy shifts was significant. Performance on the two problems where these shifts occurred was significantly lower than that on immediately preceding ones. On average, the participants immediately recovered from these sudden 'dips' in performance. However, the degree of strategy learning was dependent on the level of problem complexity.

Conclusions : Diminished performance followed by rapid recovery indicates relaxed and intense engagement of the executive system during cognitive planning.

Correspondence: *Piyadasa W. Kodituwakku, Ph.D., Pediatrics/ Center for Development and Disability, University of New Mexico School of Medicine, 2300 Menaul NE, Albuquerque, NM 87107. E-mail: pkodituwakku@salud.unm.edu*

K. KETELSEN, M. WELSH, B. HOLTER & R. HU. Working Memory and Mental Arithmetic: A Case for Dual Central Executive Resources.

Objective: Baddeley and Hitch (1974) conceptualized a working memory model comprised of verbal and spatial slave systems, the functions of which are mediated by a single central executive for complex working memory tasks. The current study was designed to examine the existence of two limited-capacity pools of central executive resources: one each for verbal and spatial processing.

Participants and Methods : Ninety-one college students (M age = 19.0, SD = 2.2) were administered the Modified Mental Counters (MMC), a verbal working memory test which involves updating numbers (adding and subtracting) in 2-, 3-, and 4-load conditions. The MMC was administered in a dual-task format to three groups: no interference, verbal interference, and spatial interference. The dual central executive hypothesis would be supported by a two-way interaction of Load and Interference, with errors increasing more dramatically across load in the verbal interference condition.

Results : The findings indicated main effects of both Load and Interference, as well as the Load X Interference interaction. There were no interference effects at the relatively simple 2-load condition; however, verbal interference caused a steep increase in errors with increasing load.

Conclusions : Taken together, the effect of verbal interference and the lack of a spatial interference effect, suggests that the processing of verbal and spatial stimuli in a dual-task paradigm requires separate central executive resources.

Correspondence: *Kirk Ketelsen, BS, Psychology, University of Northern Colorado, Box 94, Greeley, CO 80639. E-mail: kirkketelsen@gmail.com*

K. PYTLAK, C. PILARSKI, J. NEUDECKER, J. BROCK & R. SKEEL. The Role of Performance-Based and Personality Measures in the Prediction of Alcohol Consumption.

Objective: Individuals who engage in risky behaviors, including substance use, perform similarly to individuals with prefrontal cortex damage on performance-based risk-taking tasks (Bechara, 2003). Personality measures, such as the TPQ (Cloninger, 1987), have also been associated with substance use patterns. The current study compared the utility performance-based measures and personality measures in the prediction of alcohol use. It was hypothesized both domains would contribute uniquely to the prediction of drinking.

Participants and Methods : The sample was 114 college-aged individuals with 70.2% reporting alcohol use over a two-week period (M = 1.94 drinking episodes, M = 5.9 drinks per episode). The Bechara Gambling Task (BGT; Bechara et al., 1994) and the Balloon Analogue Risk Task (BART; Lejuez et al., 2002) were used as the behavioral risk-taking measures. The TPQ was the personality measure used.

Results : Drinks consumed per episode (DCE) correlated with BGT disadvantageous selection ($r = .272$, $p = .027$), BART pumps adjusted total ($r = .25$, $p = .043$), and BART total money won ($r = .25$, $p = .043$). Harm Avoidance and Total Novelty Seeking correlated with total units per day (TUD). Regression models indicated the TPQ explained a significant variance (15.9%, $p = .001$) for TUD, but not DCE. In contrast, risk-taking measures added 9.8% ($p = .035$) to the explanation of DCE, but failed to explain significant variance beyond the TPQ for TUD. The total models for DCE and TUD were significant.

Conclusions : Both behavioral and personality measures uniquely contributed to prediction of differing drinking patterns, suggesting utility for both.

Correspondence: *Reid Skeel, Ph.D., Central Michigan University, 136 Sloan Hall, Mt. Pleasant, MI 48859. E-mail: reid.skeel@cmich.edu*

W.D. KILLGORE, T.J. BALKIN & N.J. WESENSTEN. Decision-Making is Impaired Following 2-Days of Sleep Deprivation.

Objective: Sleep loss reduces metabolic activity within the prefrontal cortex, but the degree to which sleep deprivation affects decision-making has not been adequately explored. We studied the effect of 49 hours of sleep loss on decision-making during the Iowa Gambling Task (IGT), which presents subjects with choices that differ in immediate versus long term reward payoffs.

Participants and Methods : Thirty-four healthy volunteers (24 males) participated. Following a full night of sleep in the laboratory, participants were awakened at 0700 on Wednesday, and completed a baseline administration of the IGT. They remained awake and were tested again on an alternate version of the IGT on Friday (following 49.5 hours awake). Net Scores were calculated for baseline and sleep-deprived conditions, indicating the ratio of risky versus advantageous deck selections for each 1/5 of the game.

Results : Repeated measures ANOVA indicated that sleep deprivation significantly affected decision-making on the IGT, $p = .001$. Volunteers performed normally at baseline, learning to avoid risky decks as the game progressed, $p < .001$. In contrast, following 49 hours of continuous wakefulness, volunteers gradually shifted their choices away from advantageous decks as the game progressed, $p = .019$. Furthermore, when sleep deprived, older subjects made more risky decisions than younger ones, $r = -.40$, $p = .019$, an effect that was not observed at baseline, $r = .07$, ns.

Conclusions : Though less severe in magnitude, the pattern observed during sleep deprivation is similar to that reported in studies of patients with ventromedial prefrontal cortex lesions. Executive functions mediated by the ventromedial prefrontal cortex appear to be particularly vulnerable to sleep loss, especially with increasing age.

Correspondence: *William D. Killgore, Ph.D., Behavioral Biology, Walter Reed Army Institute of Research, Division of Psychiatry and Neuroscience, 503 Robert Grant Avenue, Silver Spring, MD 20910. E-mail: william.killgore@na.amedd.army.mil*

R.M. ROTH, P.K. ISQUITH & G.A. GIOIA. The Duality of Action Monitoring in Healthy Adults.

Objective: Monitoring ones own behavior is an important subdomain of executive function. In a previous study employing the Behavior Rating Inventory of Executive Function (BRIEF) in a large sample of healthy children, we identified a Task Monitor subscale reflecting ability to recognize task performance errors and remain on intended goal-directed paths, and a Self Monitor subscale reflecting ability to recognize relationships between ones behaviors and the responses they provoke in others. In the present investigation, we evaluated whether distinct Task and Self Monitor subscales also emerge on an adult version of the BRIEF (BRIEF-A).

Participants and Methods : Participants were 1050 healthy adults aged 18-90 who completed the Self-Report form of the BRIEF-A and 1200 adults who rated a healthy individual using the Informant Report form.

Results : Overall internal consistency reliabilities were appropriate for the two 6-item monitor scales on the Self Report form (Self = 0.78, Task = 0.74) and the Informant Report form (Self = 0.86, Task = 0.84). While the two monitor scales were moderately correlated for both the Self Report form, $r = .58$, and the Informant Report Form, $r = .68$, principal factor analysis of all nine BRIEF-A scales revealed unique loadings for each monitor scale. Self-Monitor loaded strongly on a Behavioral Regulation factor and Task Monitor loaded strongly on a Metacognition factor.

Conclusions : Findings replicate those seen using the BRIEF in children and indicate that action monitoring is a heterogeneous construct. Possible differential neurobiological correlates of the two types of monitoring are being investigated.

Correspondence: *Robert M. Roth, Ph.D., Psychiatry, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001. E-mail: robert.m.roth@dartmouth.edu*

E. BRANDLING-BENNETT & D. WHITE. Strategic Processing in Typically Developing Children.

Objective: Executive abilities are widely considered to comprise working memory, inhibitory control, and strategic processing. Of these abilities, strategic processing is neither well defined nor well understood, particularly from a developmental perspective. In our study, we examined frontally-mediated strategic processing in typically developing children by administering semantic fluency and list learning tasks.

Participants and Methods : Participants comprised 111 typically developing children. Age ranged from 6 to 14 years. For semantic fluency, total number of words produced was examined. For list learning, total number of words recalled on trial 5 was examined. To evaluate strategic processing on both tasks, number of clusters and number of clustered words was calculated.

Results : Hierarchical regression analyses demonstrated significant changes in overall task performance and strategic processing abilities as a function of age. Additionally, measures of strategic processing were found to significantly contribute to overall task performance above the contribution of age. Strategic processing, however, did not significantly contribute to overall task performance between the two tasks.

Conclusions : These findings demonstrate that strategic processing begins to emerge prior to 6 years of age and continues to develop after 14 years of age. The relationship between strategic processing and overall task performance between tasks, however, has yet to be established. Correspondence: *Erica Brandling-Bennett, M.A., Psychology, Washington University in St. Louis, One Brookings Drive, Campus Box 1125, Room 225A, St. Louis, MO 63130. E-mail: embrandl@artsci.wustl.edu*

S. DERIA, W. THORNTON, R. SHAPIRO & A. HILL. Executive Functioning Impairments in Elderly Patients with Chronic Kidney Disease: Evidence from the Dementia Rating Scale-2.

Objective: The Dementia Rating Scale-2 (DRS-2) is a cognitive screening measure widely used in the elderly. Chronic Kidney Disease (CKD) is an increasingly common illness in older adults, and is associated with vascular risk factors linked to cognitive impairment and dementia. The purpose of this cross-sectional study was to examine the extent and pattern of cognitive impairment in older CKD patients using the DRS-2.

Participants and Methods : We administered the DRS-2 to 49 consecutive pre-dialysis CKD outpatients (age: 71.92 yrs) and 40 age and education matched community-dwelling volunteers (age: 69.53 yrs).

Given their higher prevalence of hypertension and diabetes, we predicted that CKD patients would show greater cognitive impairment on the DRS-2, particularly on measures of executive functioning. Independent sample t-tests were used to compare performance on the DRS-2 Total and subscales scores.

Results : CKD patients obtained significantly lower scores on the DRS-2 Total score than controls. Using the recommended cutpoint of < 135 (van Gorp et al., 1999), 22.4 % of CKD and 5.0 % of controls met criteria for significant cognitive impairment. Across DRS-2 domains, CKD patients performed significantly worse than controls on the Initiation/Perseveration and Conceptualization subscales, while no group differences emerged for the Attention, Memory, and Construction subscales. **Conclusions :** These findings suggest that, compared to matched controls, older patients with CKD exhibit higher rates of impairment on screening measures sensitive to executive functions. This pattern of deficits is consistent with a vascular cognitive impairment (VCI) presentation in CKD.

Correspondence: *Sirad Deria, Psychology, Simon Fraser University, #201-1245 West 10th Avenue, Vancouver, BC V6H 1J5, Canada. E-mail: sderia@sfu.ca*

C.R. PILARSKI, J. NEUDECKER, K. PYTLAK & R. SKEEL. A Comparison of College Drinkers and Non-Drinkers on a Behavioral Measure of Decision-Making.

Objective: The current study compared performance of drinkers and non-drinkers on a behavioral measure of risky decision-making known as the Bechara Gambling Task (BGT; Bechara et al., 1994). Bechara (2003) demonstrated that a significant amount of substance dependent individuals performed disadvantageously on the BGT, similarly to individuals with damage to the ventromedial prefrontal cortex. It was hypothesized that college-age drinkers would perform disadvantageously on the BGT as compared with non-drinkers.

Participants and Methods : Seventy college students (48 drinkers and 22 non-drinkers) participated in the study. A profile analysis was employed to determine whether the groups demonstrated different patterns of decision-making across five blocks of trials on the BGT. Difference scores (advantageous selections minus disadvantageous selections) for each block of twenty card selections were used as the dependent measure. Next, the overall performance of the two groups was compared. Finally, the two groups were combined to assess whether individuals demonstrated changes in decision-making across the BGT trials.

Results : No significant differences were found between the groups in either total performance or the patterns of performance across trials. Significant changes in decision-making across BGT trials was demonstrated in the combined group (Wilks $\Lambda = .496$, $F(4, 65) = 16.51$, $p < .001$). The differences found across the performance of the combined group indicated that individuals improved rapidly following the initial trial, and then demonstrated minor fluctuations in performance on remaining trials.

Conclusions : The primary research hypothesis was not supported suggesting that the BGT may not be sensitive to differences in drinking status among college students.

Correspondence: *Carrie R. Pilarski, Psychology, Central Michigan University, 10346 E. Remus Rd., Mt. Pleasant, MI 48855. E-mail: crrtaratuta@hotmail.com*

L.E. NYBERG, K. BROCKI, C. TILLMAN & G. BOHLIN. The Proposed Interaction of Working Memory and Inhibition.

Objective: The objective of this study was to investigate, in two experiments, the determinants of inhibitory performance on a go/no-go task by studying the interplay between two executive function components, working memory (WM) and inhibition. It has been proposed that these

two core executive functions tap into a common limited-capacity resource, so performing tasks that involve both of these functions will be significantly more difficult than those involving either function alone. Performance should furthermore be a function of individual differences in WM capacity as well as inhibitory capacity.

Participants and Methods : A total of 202 university students participated in one of two experiments in which WM and inhibition task demands were systematically varied, resulting in four experimental groups. Within-task experimental manipulations of task demands were combined with individual difference measures of WM and inhibition. WM and inhibition task demands were used in the analysis of inhibitory performance together with individual capacity measures of both functions, thereby investigating an interactive view of WM and inhibition.

Results : The results showed additive effects of the two task demand variables in Exp 1 but interactive effects in Exp 2. This interactive effect points to the use of a common mechanism in handling the combined task demands. Furthermore, there was new empirical evidence for interactive effects of the task demand variables in concert with individual WM capacity, suggesting WM to be the above mentioned common mechanism. Students with lower WM capacity showed poorer inhibitory performance under combined high task load as compared to students with high WM capacity. No such effect was found for individual differences in inhibitory capacity.

Conclusions : The present study is among the first to present empirical evidence supporting an interactive view of WM and inhibition. These findings set the stage for a better understanding of the interplay of core EF processes in cognitive performance in general.

Correspondence: *Lilianne E. Nyberg, PhD in psychology, Department of Psychology, Uppsala University, P.O. Box 1225, Uppsala S-751 42, Sweden. E-mail: lilianne.nyberg@psyk.uu.se*

J.R. TUNSTALL, D. SHUM & J. O'GORMAN. A New Task to Assess Everyday Planning Ability After Acquired Brain Injury (ABI).

Objective: The aim was to develop a task of planning ability that would 1) be suitable to assess clients after ABI, 2) provide objective measures of the prior-to-action components of a basic information-processing model, 3) be ecologically valid, and 4) be designed so that the participant would need to invoke executive processes in order to succeed on the task.

Participants and Methods : The test was initially developed with 73 undergraduates (aged 17 - 46 years, 35 males) and 31 'planning experts' (aged 24 - 65 years, 11 males). The planning experts were identified as such and recruited by academics in the School of Psychology. The experts were asked to rate various alternative plans to achieve a scoring system for the measure of 'evaluating alternative plans'. The undergraduates completed the entire planning task in return for course credit.

Results : The measures of detecting problems, generating plans, and choosing a plan required slight modification. However, the measure of defining goals required major revision. The final version (the Planning Abilities Task; PAT) was piloted with 15 undergraduates and ABI clients to ensure that the revised measure was useful. Reliability and validity of the PAT with non-ABI participants are currently being assessed.

Conclusions : The task shows promise as a valid measure of planning ability. Data for ABI participants will follow.

Correspondence: *Jennifer R. Tunstall, MPhil, School of Psychology, Griffith University, Mt Gravatt Campus, Griffith University, Brisbane, QLD 4111, Australia. E-mail: j.tunstall@griffith.edu.au*

A. DAVIS & B.A. HUDSON. Exploratory Factor Analysis of the Delis-Kaplan Executive Function System Trail Making Test.

Objective: The Delis-Kaplan Executive Function System (D-KEFS) expands upon traditional trail making tests by offering 5 separate conditions. Although the D-KEFS Trail Making Test still assesses the traditional skills of visual scanning and cognitive set shifting, the four other tests provide insight into the underlying mechanism of completing the task.

Participants and Methods : This study examined the D-KEFS Trail Making Test scores of 64 individuals (mean age=19.89 years) who completed the D-KEFS as part of a comprehensive validity study.

Results : Exploratory Principal Components Analysis (PCA) with Varimax Rotation revealed that a 1 factor solution was the best fit for the data when an Eigenvalue limit of 1 was used, although a second PCA with Varimax rotation with factors set a priori to 2 was a better fit for the data. The first factor had an Eigenvalue of 2.642 and explained 58.23% of the variance. A second factor emerged with an Eigenvalue of .964, and explained an additional 19.29% of the variance. The first factor was dominated by Number Sequencing, Letter Sequencing, and Number-Letter Sequencing. The second Factor had a high loading (.937) for the Motor Speed Condition. Visual Scanning loaded somewhat equitably on both factors.

Conclusions : It appears that the Motor Speed condition contributed enough unique variance that a two factor solution was the best fit for the data. The implication is that motor speed can have a profound impact on Trail Making Test performance. Nonetheless, traditional trail making tests fail to consider the influence of motor speed on performance.

Correspondence: *Andrew Davis, Ph.D., Ball State University, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

J.L. MABRY. Ecological Validity of Executive Function in Children: The Relationship Between the D-KEFS and the BRIEF

Objective: To examine ecological validity of executive function (EF) in children by investigating the relationship between the Delis-Kaplan Executive Function System (D-KEFS) and the Behavior Rating Inventory of Executive Function-Parent Form (BRIEF). It was hypothesized that D-KEFS test conditions and BRIEF scales/indices that purport to tap the same EF construct would be associated.

Participants and Methods : Participants were 32 children (ages 8-18) receiving outpatient neuropsychological evaluations that included conjoint administration of the D-KEFS and BRIEF, representing a mixed clinical sample diagnosed with acquired brain injury, neurodevelopmental disorders, and/or psychiatric disorders. Pearson-product moment correlation analyses were conducted to test the hypothesis.

Results : The D-KEFS demonstrated modest associations with the BRIEF, supporting the notion of ecological validity. However, only one (Color-Word Interference) out of four D-KEFS tests revealed this relationship. The strength of correlation coefficients between the D-KEFS and BRIEF variables varied from .00 to .56, accounting for 0% to 31% of the variance. Unexpectedly, none of the Trails, Verbal Fluency, and Tower test conditions were statistically significantly associated with any the BRIEF scales/indices, suggesting these three D-KEFS tests and the BRIEF may be tapping separable EF subroutines or constructs.

Conclusions : This study's primary contribution is to document the relationship between these two newer EF instruments in mixed clinical group, ultimately contributing critical literature regarding measurement, diagnosis, and treatment of executive dysfunction in children. These preliminary results should not be considered conclusive and may reflect the differences and inherent limitations in both types of sampling and methodology in quantifying a complex construct such as EF.

Correspondence: *Jennifer L. Mabry, EdD, Pediatric Psychology, University of Virginia Children's Hospital, 2270 Ivy Road, Charlottesville, VA 22903-4972. E-mail: jlm2hk@virginia.edu*

A. DAVIS, T. NEAL, S. PEABODY & B. HUDSON. The Internal Consistency of the D-KEFS Color Word Interference Test.

Objective: The use of printed words with differential colors has been a hallmark of neuropsychological assessment since the early version of the Stroop Test. The Delis-Kaplan Executive Function System (D-KEFS) is a battery of nine stand-alone measures of executive function, including the Color Word Interference Test, a version of the classic Stroop

test. The D-KEFS version is a standardized, well-normed adaptation that offers four separate measures to assess cognitive set shifting, inhibition, and other executive functions. Despite the promising nature of this new measure, little independent validation of this measure has been conducted.

Participants and Methods : The participants were 64 adults (mean age= 19.89 years, SD= 3.63 years) who were administered the D-KEFS as part of a validation study. The participants were college students who participated in the project for extra credit in their undergraduate classes.

Results : Pearson Correlation Coefficients were significant at the .01 level for each combination of the four conditions of the Color Word Interference Test. The correlation coefficients ranged from .428 to .655.

Conclusions : The results from this study support the construct validity of the D-KEFS Color Word Interference Test. Additionally, it is likely that the four conditions are measuring a similar construct, although they may be measuring unique underlying elements of that construct. This presentation will discuss the results of this study in regards to implications for practitioners and researchers.

Correspondence: *Andrew Davis, Ph.D., Ball State University, Teachers College Room 515, Ball State University, Muncie, IN 47306. E-mail: davis@bsu.edu*

K. MANNING & J. BRANDT. The Completions and Corrections Test: A New Measure of Executive Control.

Objective: The Completions and Corrections Test (CCT) is a novel measure of executive control that requires the patient to inhibit well-learned verbalizations. Participants are read twelve anomalous phrases and asked to repeat each one verbatim. Five of the phrases are meant to induce errors that are either completions or extensions of the original (e.g., "On your marks. Get set . . ."), while the remaining seven are meant to induce either corrections or alterations (e.g., "The tooth, the whole tooth, and nothing but the tooth."). Scores for the test are number of errors of each type (completions-extensions or corrections-alterations) and a total error score.

Participants and Methods : The CCT was administered to 10 older adults with mild cognitive impairment (MCI) and 10 normal older adults.

Results : The MCI patients made more correction-alteration errors (MCI Mean=1.50, Control Mean=.30, U=16.00, p=.006) and had a higher total

error score (MCI Mean=2.00, Control Mean=.50, U=15.50, p=.007) than the normal subjects. The correction-alteration errors were correlated ($\rho=.677$, $p=.016$) with scores on the IQCODE (Jorm & Jacomb, 1989). CCT scores correlated with several other measures of executive functioning including the Trail Making Test, part A ($\rho=.626$, $p=.003$) and part B ($\rho=.574$, $p=.008$), Brixton Spatial Anticipation Test ($\rho=.716$, $p=.0003$), Alternate Uses Test ($\rho=-.602$, $p=.005$), Porteus Maze Test ($\rho=-.679$), and the Brief Test of Attention ($\rho=-.720$, $p=.001$).

Conclusions : This brief and easy-to-administer test may prove useful in the study of executive dysfunction in older adults.

Correspondence: *Kevin Manning, B.A., Psychiatry, Johns Hopkins University, 600 North Wolfe Street / Meyer 218, Baltimore, MD 21287. E-mail: kmanning4@jhem.jhmi.edu*

L. QUITANIA, C. HALABI, J.H. KRAMER, D. DEAN, B. BENAVIDES, V. BECKMAN, D. DELIS & B.L. MILLER. Neuroanatomical Correlates of Two Different Set-Shifting Paradigms.

Objective: Set-shifting requires mental flexibility in order to alternate between cognitive sets or stimuli, however, the underlying anatomy is not well understood. Our goal was to identify the MRI predictors of set shifting.

Participants and Methods : We studied a clinical sample of 79 patients (age mean=61.75, MMSE mean=25.61) with a wide range of diagnoses including normals (n=22), AD (n=11), FTD (n=24), semantic

dementia (n=13), progressive aphasia (n=3), PSP (n=4), and corticobasal degeneration (n=1), from the UCSF Memory and Aging Center. MRI brain image analyses were conducted with the BRAINS2 software package. Subjects were administered DKEFS Design Fluency and Stroop subtests, both of which have separate conditions for measuring the component tasks plus a set shifting condition. To control for age based performance, we used the standardized test scores for our analyses. Separate hierarchical multiple regressions were conducted for each task, with MMSE and the component tasks entered into the model before MRI regional volumes.

Results : Left and right frontal ($p < .01$) and right temporal ($p < .05$) volumes significantly contribute to the variance on DF set-shifting scores, above and beyond those accounted for by MMSE and component tasks (R^2 change = .117, $F = 11.165$, $p < .05$). Further analyses of these three regions indicate that left frontal volume was the best predictor ($\beta = .349$, $p < .05$). With regards to the Stroop subtest, after controlling for MMSE scores and component tasks, only the right frontal region ($\beta = .373$, $p < .05$) was found to be significant for predicting set-shifting (R^2 change = .045, $F = 20.639$, $p < .05$).

Conclusions : Our results illustrate that even after controlling for MMSE scores and the component cognitive abilities in hierarchical multiple regressions, frontal lobe volumes successfully predict scores on set-shifting. These findings highlight the importance of adequately controlling for component cognitive skills provide further evidence of a link between frontal regions and executive functioning.

Correspondence: *Lovingly Quitania, BA, Neurology, UCSF Memory and Aging Center, 350 Parnassus Ave. Suite 706, San Francisco, CA 94143-1207. E-mail: lquitania@memory.ucsf.edu*

C.E. BARBER, L. GRANDE, M. AHLQUIST, J. RUDOLPH, R. MCGLINCHEY & W. MILBERG. The Relationship of CVLT Clustering Scores to Memory and Executive Functions in Elderly African-Americans at Cardiovascular Risk.

Objective: Cardiovascular risk factors such as hypertension and diabetes are highly prevalent in African-Americans and contribute to the development of heart disease and stroke in this population. These risk factors have been previously related to poorer performance on executive function measures. However, executive functioning may impact memory by influencing encoding, organization and retrieval. The link between executive functioning and memory performance was examined by the use of encoding strategies on the California Verbal Learning Test II (CVLT-II).

Participants and Methods : 148 healthy, elderly African-Americans completed a standardized battery of neuropsychological tests of memory and executive function. We specifically examined the four CVLT clustering types (semantic, subjective, serial forward/bidirectional).

Results : A significant interaction using a repeated measures ANOVA revealed that participants who employed semantic and subjective clustering strategies performed better on immediate and delayed recall and recognition. Stepwise regressions indicated that subjective clustering was the best predictor, followed by semantic clustering, of these same memory measures. Performance on several executive function tasks, and a non-verbal memory test, was also best predicted by subjective clustering. Participants with higher systolic blood pressure were less likely to use subjective clustering and tended to perform worse on certain executive function tasks (e.g., Stroop).

Conclusions : These results highlight the effectiveness of elaborate encoding for retention over time, as well as the potential negative impact of cardiovascular risk on executive functions that may influence memory. The relationship between cardiovascular risk and performance in this group gains even more significance given our participants' relatively low risk. Higher risk would likely produce greater impairment. 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.J. GRANDE, W. MILBERG, C. BARBER, M. AHLQUIST, J. RUDOLPH, D. SCHNYER & R. MCGLINCHEY. Executive Function and White Matter Changes in Elderly African-Americans with Cardiovascular Disease.

Objective: Stroke is highly prevalent in the African-American community and is mediated by a high prevalence of cardiovascular risk factors such as hypertension and diabetes that may contribute to the development of cerebrovascular disease. Our primary objective was to evaluate the hypothesis that brain regions affected by cardiovascular disease, known to disrupt frontal-subcortical circuits, would produce a unique cognitive profile associated with changes in neural connectivity.

Participants and Methods : 140 community dwelling African-American participants completed a battery of standardized neuropsychological measures assessing memory and executive functions as well as a brief medical evaluation. Thirty-two participants also underwent diffusion tensor imaging (DTI).

Results : Neuropsychological data was subjected to a factor analysis resulting in four factors accounting for 71% of the variance. The factors were best characterized as representing the cognitive domains of (1) executive functions, (2) verbal memory, (3) non-verbal memory, and the specific executive function of (4) selective attention. Correlations relating factor scores and medical measures revealed a significant relationship between Factor 1 and systolic blood pressure ($r = -.199$), as well as Factor 4 and body mass index ($r = -.314$). Additionally, DTI measures revealed a significant relationship between systolic blood pressure and transverse pathways connecting frontal and posterior brain areas.

Conclusions : These findings confirm that community dwelling African-American individuals are experiencing brain changes related to cardiovascular risk that are producing behavioral impairments that might lead to difficulties in daily function. These data underscore the need for community outreach to assist in the identification of individuals at risk and to assist in maintaining medical compliance for those who are at risk.

Correspondence: *Laura J. Grande, Ph.D., Psychiatry, Harvard Medical School & Boston VA Medical Center, 150 S. Huntington Ave-GRECC(1S2JP), GRECC-1P1S2, Boston, MA 02130. E-mail: lgrande@heartbrain.com*

K. MANNING, L.R. KINGERY, C.H. KUZU, S.M. MEYER & D.J. SCHRETLEN. Construct Validity of a Recency Discrimination Task in Healthy Adults.

Objective: Recency discrimination (RD) has been conceptualized as an executive function. Patients with frontal lesions or impaired executive functioning have been found to demonstrate poor RD. However, few studies have examined the construct validity of RD in relation to other cognitive functions in healthy adults. We tested the hypothesis that performance on an RD task would correlate more highly with executive functioning than with explicit memory and intelligence.

Participants and Methods : Altogether, 261 healthy adult participants in the Johns Hopkins Aging, Brain Imaging, and Cognition study of normal aging completed a comprehensive battery of neuropsychological tests. These included a 15-item recency discrimination task that was developed for this study. Mean non-age-corrected z-scores for selected measures were used to construct indices of executive functioning, explicit memory, and intellectual ability for correlation with performance on the RD task.

Results : Contrary to our hypothesis, RD performance did not correlate more strongly with executive functioning ($r = 0.22$, $p < .001$) than with either explicit memory ($r = 0.32$, $p < .001$) or intelligence ($r = 0.20$, $p < .002$). In fact, RD task performance correlated most highly with explicit memory. While this correlation was not significantly stronger than the correlation between RD and executive functioning ($t = 1.91$; $p = .056$), it was significantly stronger than the correlation between RD and intellectual functioning ($t = 2.38$; $p = .017$).

Conclusions : These findings suggest that, in a broadly representative community sample, recency discrimination is more closely related to explicit memory than to either executive or general intellectual functioning.

Correspondence: *Kevin Manning, B.A., Psychiatry, Johns Hopkins University, 600 North Wolfe Street / Meyer 21S, Baltimore, MD 21287. E-mail: kmannin4@jhmi.edu*

C.P. JOHNSON, G.A. GIOIA, R.M. ROTH & P.K. ISQUITH. A Novel Performance Test of Working Memory and Inhibitory Control in Children.

Objective: Inhibitory control (IC) and working memory (WM) are fundamental domains of executive control that have been difficult to parse on performance tasks. We examined whether traditional cognitive psychology tasks often employed in functional neuroimaging studies of WM and IC, namely n-back and go/nogo paradigms, could be parametrically varied to separate these functions in a performance task.

Participants and Methods : 24 boys and 32 girls aged 8 to 18 years completed a computerized test of executive control with 3 levels of WM demand (0, 1, 2-back) fully crossed with absence versus presence of an inhibitory signal. Participants pressed a non-target or target button, or no button with an inhibitory cue, for 13 simple visual objects presented for 400 milliseconds each with a mean interstimulus interval of 1600 over 100 trials per condition. Significance level was $p < .01$ for all analyses.

Results : A 3 (WM load) x 2 (IC demand) within subjects MANOVA revealed that response accuracy declined steadily and substantially with increased WM load, $\eta^2 = .558$, and that this was exacerbated by the addition of IC demand, $\eta^2 = .096$. Response times increased primarily as a function of IC, $\eta^2 = .387$, while response time variability increased both as a function of WM, $\eta^2 = .236$, and IC, $\eta^2 = .116$. Children had increasing difficulty inhibiting responses as WM demand increased, $\eta^2 = .173$.

Conclusions : Preliminary data suggest that parametrically varying WM and IC in a performance task may allow integrated, yet separable, examination of children's executive control.

Correspondence: *Chad P. Johnson, BA, Neuropsychology, Children's National Medical Center, 14801 Physicians Lane, Suite 173, Rockville, MD 20850. E-mail: cpjohnso@cnmc.org*

T.P. SCHWARTZ, J. KAUFMAN, S. HEATON, L. HAHN & M. BENJAMIN. Gender Differences in the Relationship Between Executive Functioning and Intellectual Ability in Healthy Children.

Objective: Existing research is sparse regarding the relationship between executive functions and intellectual abilities of healthy children. The literature is further limited in exploration of potential gender differences. The current study evaluated the role of executive functions (inhibition, working memory, and cognitive flexibility) in intellectual functioning (global, verbal and concept formation intelligence) in a sample of 50 healthy children between the ages of 8 and 12. Equal distribution of boys and girls allowed for examination of any gender differences.

Participants and Methods : Executive functions were evaluated in terms of Inhibition (D-KEFS Color-Word Interference), Working Memory (Woodcock-Johnson Numbers Reversed and Auditory Working Memory), and Cognitive Flexibility (D-KEFS Trail Making Test). Intellectual Ability was evaluated using the Woodcock-Johnson Brief Intellectual Ability Scale, which yielded composite scores for global intellectual ability (BIA), verbal ability (Verbal Comprehension), and non-verbal concept formation (Concept Formation).

Results : For the total sample, Working Memory and Cognitive Flexibility predicted global intellectual ability, but Inhibition did not. When analyses were repeated within gender groups, the model remained similar for males (Working Memory 43%, Cognitive Flexibility 29%), while only Cognitive Flexibility predicted global intellectual ability for females.

When intellectual ability was examined at the composite score level, results suggest that Working Memory predicted non-verbal concept formation intelligence for males but not females. No relationship was found between the executive functions and verbal intellectual ability for either males or females.

Conclusions : Broadly, executive functions predict intellectual ability more so for males than for females, with Working Memory being most influential for males and Cognitive Flexibility for females.

Correspondence: *Thomas P. Schwartz, University of Florida, 1505 Fort Clarke Blvd, Apt. 6-207, Gainesville, FL 32606. E-mail: tps90@hotmail.com*

J.G. BLANKNER, S. FOTEDAR, S.L. RIMRODT, M.B. DENCKLA, J.J. PEKAR & S.H. MOSTOFISKY. Effect of Short-term Memory Load on Activation Associated with Motor Response Inhibition.

Objective: To differentiate the neural correlates of motor response inhibition under conditions in which the level of short-term memory required to guide the response is varied.

Participants and Methods : Eleven adults (8F), mean age 27.2 years, completed two event-related fMRI tasks that tested response inhibition: 1) a "simple" go/no-go task in which demand on short-term memory was minimized by using only two stimuli incorporating a well-ingrained stimulus response association (green=go; red=no-go), and 2) a "multicolor" go/no-go task in which 13 different colored stimuli (excluding shades of green and red) were used (3 different colors for no-go; 10 for go).

Results : For both tasks go activation was seen in left primary sensorimotor cortex, right cerebellum and bilateral occipital cortex. For the simple task, no-go activation was localized to a single right prefrontal region (middle frontal gyrus; BA10), bilateral occipital cortex and left cerebellum. For the multicolor task, no-go activation was observed in a widespread frontal network, bilateral occipital cortex and bilateral cerebellum. A paired t-test between the two tasks revealed greater no-go activation for the multicolor task in bilateral inferior frontal gyrus (BA47), right lingual gyrus (BA17) and the right anterior temporal lobe.

Conclusions : At the cortical level, right prefrontal cortex appears to be involved in simple motor response inhibition. Recruitment of temporal lobe regions important for object recognition and inferior frontal regions important for recalling stimulus-response associations occurs under conditions in which increased short-term memory is necessary to guide response inhibition.

Correspondence: *Joanna G. Blankner, MA, Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N Broadway, Suite 232, Baltimore, MD 21205. E-mail: schaffer@kennedykrieger.org*

G.A. GIOIA, R.M. ROTH & P.K. ISQUITH. Evidence of Validity based on Exploratory Factor Analysis of the BRIEF-Adult Version.

Objective: We examined the validity of a recently developed adult version of the Behavior Rating Inventory of Executive Function (BRIEF-A) via exploratory factor analyses of the nine scales in normative and mixed clinical samples for the Self- and Informant Report forms.

Participants and Methods : Principal factor analysis was used as the exploratory method with an oblique rotational procedure (Promax). Criterion for inclusion of a scale on a factor was set at a loading greater than .40. Separate analyses were conducted for the normative samples (Self-Report $n = 1050$; Informant Report $n = 1200$) and mixed clinical/healthy adult samples (Self $n = 233$; Informant $n = 196$).

Results : Based upon theoretical, statistical, and historical considerations, a two-factor model was retained as the best-fitting model in all of the analyses. The two-factor solution accounted for between 73% and

81% in each of the four analyses with five scales- Initiate, Working Memory, Plan/Organize, Task Monitor and Organization of Materials loading on the first factor, corresponding to Metacognition, and four scales- Inhibit, Shift, Emotional Control and Self-Monitor- defining the second factor, corresponding to Behavioral Regulation. The two factors were strongly correlated with one another in each analysis.

Conclusions : A two-factor structure remains consistent across the various samples for each form of the BRIEF-A, in keeping with previous versions of the BRIEF, providing evidence of validity for the instrument based on internal structure.

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*

C. NIKI, T. KUMADA, T. MARUYAMA & Y. MURAGAKI. Decision-Making Impairments in Patients with Left Insula Damage.

Objective: It has been reported that patients with ventromedial frontal orbitofrontal cortex, or amygdala damage showed risky decision making. In this study, we investigated three patients with left insula damage on performance of a risk-taking decision task.

Participants and Methods : Participants: Three patients who were damaged in the left insula were participated.

Methods: Each patient performed a Risky-Gains task (Paulus, et al., 2003). In the task, three numbers, 20, 40, and 80 were presented on the computer screen in ascending order. The patients was asked to press a button for one of three numbers, and informed that the number of points were given, but for both 40 and 80 points, there is a chance for losing the number of points when a red-colored 40 or 80 appeared session . The task was performed in two sessions. In the first session, their start score was zero. In the second, they ought to start being in debt.

Results : All patients did not select the "safe" 20 response in the next trial of which they lose points (punishment). Two patients selected more 80 response after punishment than after non punishment. The other one patient showed the same pattern only in the second session.

Conclusions : These patients with left insula damage showed tendency of risky decision making. The risky decision making behaviour in the patients may be due to disconnection between limbic structures such as the orbitofrontal cortex, amygdala and medialfrontal cortex caused by insula lesion.

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*

M. KRAYBILL & Y. SUCHY. Motor Task Performance Among Individuals With Varying Levels of Executive Abilities: Novelty and Complexity as Important Moderator Variables.

Objective: Motor tasks that involve learning novel sequences are known to correlate with frontal lobe integrity and executive abilities. Such tasks involve motor programming (MP), motor learning (ML), and motor control (MC). It is not clear how these components are affected by executive impairment or by increases in executive demands, such as varying levels of novelty or complexity. This study examined the impact of novelty and complexity on MP, ML, and MC among individuals at different levels of executive ability (EA).

Participants and Methods : 55 participants (ages 18-68) were divided into three EA groups based on their performance on traditional executive measures. Additionally, they were administered the Push-Turn-Tap-tap (PTT) task from the electronic version of the Behavioral Dyscontrol Scale (BDS-ev). The PTT task utilizes novel hand movements that increase in complexity, and allows fractionation of performance into MP, ML, and MC.

Results : Data were analyzed using multivariate analysis of variance using MP, ML, and MC as the dependent variables, Level of novelty/com-

plexity as a within-subjects factor, and EA Group as a between-subject factor. The results showed an interaction between Level and Group for MP, ML, and MC, $F(3,51)=4.86, p=0.005$; $F(3,51)=4.13, p=0.011$; $F(3, 51)=4.41, p=0.008$, respectively. For MP, both novelty and complexity interacted with EA. For ML and MC, there was no effect of novelty, but increased complexity led to a progressive degradation of performance for people in the lowest EA group.

Conclusions : These results provide support for the utility of assessing motor task performance in conjunction with evaluating executive abilities. Because novelty and complexity seem to have differential effects on discrete performance components, it may be important to consider these variables when clinically assessing individuals with executive impairment.

Correspondence: *Matt Kraybill, BA, Psychology; University of Utah, 380 S. 1530 E., Room 502, Salt Lake City, UT 84112. E-mail: mkraybill@gmail.com*

A.B. BROWN, P. MCNAMARA & R. DURSO. Awareness of Executive Cognitive Deficits in Patients with Parkinson's Disease (PD).

Objective: To test the hypothesis that patients with PD are unaware of their poor executive cognitive functioning (ECF).

Participants and Methods : We administered a battery of neuropsychologic and mood tests to 20 mid-stage PD patients and 18 healthy controls. Participants also filled out the 20 item Dysexecutive Questionnaire (DEX) which requires subjects to estimate the level of their own functioning across a range of domains of executive cognitive functioning (ECF). We also asked the wives of patients to estimate patient's ECF for each DEX item/domain. We compared patient's self-ratings and wives ratings of their husband's ECFs with patient's actual performance on executive function tests.

Results : Patients were impaired on tests of executive function as compared to controls, and rated themselves more impaired than controls on the DEX. Patient's self-ratings were similar to wives ratings on all subscales of the DEX (all p 's >1.8). Patients total score on the DEX and on the inhibition and intentionality subscales were significantly related to impairment on tests of executive function as well as to mood disturbance. Scores on the DEX executive memory subscale were significantly related to mood. DEX scores were not related to any other cognitive measures. The patients whose wives judged them as more impaired on the DEX were more impaired on a set shifting measure ($r=.636, p=.019$), and scored higher on a measure of anxiety ($r=.61, p=.024$).

Conclusions : We conclude that mid-stage PD patients are just as aware of their executive dysfunction as their wives and that this awareness may be related to depression and anxiety.

Correspondence: *Ariel B. Brown, Boston University School of Medicine, 260 Aspinnwall Ave. #1, Brookline, MA 02445. E-mail: abbrown@bu.edu*

M.B. MITCHELL, M.E. MCFARLAND, J.L. HARRIS & L. MILLER. The Ecological Validity of Delis-Kaplan Executive Function System (D-KEFS) Tests: Prediction of Functional Status in Older Adults.

Objective: The purpose of this study was to investigate the predictive abilities of neuropsychological measures of executive functioning on daily functioning in older adults. It was hypothesized that two measures of planning and sequencing would be more predictive of functional status than two measures of cognitive fluency.

Participants and Methods : Participants were 42 Caucasian community-dwelling older adults from retirement centers in Northeast Georgia (mean age = 81, s.d. = 5.97). To measure planning and sequencing abilities, participants were administered the D-KEFS Tower and Trail Making Test 4. To measure cognitive fluency, participants were administered the D-KEFS Design Fluency and Verbal Fluency Tests. To obtain a measure of daily functioning, participants were administered the Direct Assessment of Functional Status, Revised edition (DAFS-R).

Results : A hierarchical linear regression was performed to determine if measures of planning and sequencing were predictive of functional status above and beyond the variance accounted for by age, education, income, and the measures of cognitive fluency. Planning and sequencing ability was the only significant predictor of functional status, $t(5, 35) = 2.327, p < .05$. Age, education, income, and cognitive fluency were nonsignificant ($p > .05$).

Conclusions : Results of this study suggest that the D-KEFS Tower Test and the D-KEFS Trail Making Test are useful clinical tools in predicting daily functioning in older adults. Results also suggest that neuropsychological measures of executive functioning that examine planning and sequencing abilities are more useful in detecting functional decline than measures of cognitive fluency.

Correspondence: *Meghan B. Mitchell, B.A., Psychology, University of Georgia, 281 Westchester Circle, Athens, GA 30606. E-mail: mbmitch@uga.edu*

P.K. ISQUITH, R.M. ROTH & G.A. GIOIA. Mood States as Mediators in Self-Awareness of Executive Functioning.

Objective: Mood states may influence executive functioning, but may also mediate individuals awareness of their own self-regulation. We examined the influence of depression and anxiety on agreement between self- and informant reports of executive function.

Participants and Methods : Nineteen men and 14 women aged 19 to 67 years ($M = 46.15, SD = 11.43$) seen for neuropsychological evaluation completed the BRIEF-Adult Version (BRIEF-A) Self-Report form, the Beck Depression Inventory-II (BDI-II), and the State scale of the State Trait Anxiety Inventory (STAI). Informants completed the BRIEF-A Informant Report form. Moderating effects of mood on executive function awareness were examined via mediation modeling regression analyses with the BRIEF-A self-report Global Executive Composite (GEC) as the dependent variable and significance set at $p < .01$.

Results : The direct model was significant, with informant reports strongly predicting self-reports on the GEC, $R^2_{adj} = .52, \beta = .73$. BDI-II and STAI state anxiety scores taken together also accounted for a significant proportion of variance in the Self Report GEC, $R^2_{adj} = .26$. In the mediated model, the standardized beta weight for the informant report GEC score remained significant when controlling for mood state, $\beta = .62 (p < .001), R^2_{adj} = .51$.

Conclusions : While depression and anxiety may affect executive function, the present data suggest that such symptoms do not substantially modify individuals awareness of their own executive functioning relative to observations of knowledgeable informants.

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*

E.J. MOES & M. KRISHAN. The Relationship Between Activation Level (Tonic and Phasic Arousal) and Executive Functioning in School Children from India Ages 9 to 11 years.

Objective: To explore the impact of activation level on performance on specific tasks of executive functioning

Participants and Methods : Sixty English-speaking fourth and fifth grade school children from India (30 males and 30 females), ages 9 to 11, were administered a continuous performance test (Vigil) and two subtests from the Delis-Kaplan Executive Functions System (D-KEFS). IQ, parental education and SES were also assessed. Variables from the CPT task included response time (RT) and number of omissions and commissions for both a cued and uncued condition, and the difference in mean response time between the two conditions to assess the benefit of cuing on performance.

Results : Results indicated that RT on the cued and uncued condition were positively correlated ($r = .326, p < .01$), but children who were slower to respond (lower tonic arousal) benefited the most from cuing

(phasic arousal), and made more omission and commission errors on the uncued condition (i.e., were more careless and impulsive). They also demonstrated the most interference on the CWIT (a Stroop task), despite making fewer errors on the more automatic Color Naming and Word Reading conditions. Children with lower tonic arousal generated fewer correct sorts on the CST, were able to describe fewer categories verbally, and identified fewer sorting principles when the cards were laid out before them.

Conclusions : These results emphasize the importance of subtle differences in cortical activation for problem-solving. More consistent assessment of activation using a simple computerized test provides an opportunity to explore means of enhancing activation and thereby cognitive performance.

Correspondence: *Elisabeth J. Moes, Ph.D., ABPP, Suffolk University, 280 Chestnut Ave, Boston, MA 02130. E-mail: elisabethmoes@yahoo.com*

A. BOEKA, L. ALEXANDER & K. LOKKEN. The Iowa Gambling Task as a Measure of Decision Making in Bulimia Nervosa.

Objective: Although little is known about decision making in bulimia nervosa (BN), behaviors characteristic of the disorder suggest that these individuals have difficulties inhibiting the binge/purge cycle, even with a conscious attempt to abstain. Making a decision, or choosing between immediate reward and future consequences, has previously been investigated in populations with which BN shares commonalities, such as substance abuse and addictions. However, little research currently exists as to how this process works in BN. Recently, the Gambling Task (GT) has been introduced into the neuropsychological (NP) literature as a measure of real-life decision making. Populations that have been found to perform poorly on this task include substance dependent individuals, pathological gamblers, and frontal lobe patients. Certain characteristics in BN parallel those that are common to these disorders, such as continued engagement in a behavior (bingeing and purging) despite future negative consequences. Thus, there exists rationale for investigating decision making in BN via the GT.

Participants and Methods : Twenty undergraduate females with no eating disorder symptoms (Group 1) and 20 with BN (Group 2) were administered the GT as part of a NP test battery.

Results : Results indicated that Group 2 performed significantly worse on the GT as compared to Group 1. In addition, GT performance negatively correlated with bulimic symptomatology. A standard regression analysis revealed that bulimic symptoms were able to predict GT score beyond demographic variables and depression.

Conclusions : Results are discussed in terms of using NP test batteries in BN and development of interventions and treatments that address decision making in this disorder.

Correspondence: *Abbe Boeka, University of Alabama, 120 East 15th #8305, Tuscaloosa, AL 35401. E-mail: boeka001@bama.ua.edu*

Poster Symposium 2

12:30–2:00 p.m.

Collaborative Research in Pediatric Settings: Experiences from General Clinical Research Centers

J. RADCLIFFE, M. MAHONE, G. GIOIA, N. HATTIANGADI, D. RIS & T. FLYNN. Collaborative Research in Pediatric Settings: Experiences from General Clinical Research Centers.

Symposium Description : Neuropsychology plays an increasingly important role in collaborative pediatric research in helping to understand disease progression and treatment effects among children and families. To facilitate more collaborative research efforts within pediatric

centers, general clinical research centers have been established, with the purpose of bringing together specialists from laboratories, nursing, informatics, biostatistics, and other necessary research operations. Six pediatric general clinical research centers around the U.S. include cores devoted to neuropsychological and behavioral outcomes of research.

This symposium brings together directors from Neuropsychology and Behavioral Cores from pediatric general clinical research centers. The presentations will highlight types of research questions examined, issues raised through the collaborations, including experiences of effective research coordination with other disciplines. The presentations will also address the unique opportunities for neuropsychologists in multi-site and multidisciplinary studies, as well as challenges encountered and lessons learned.

Human subjects issues raise a particular challenge for pediatric neuropsychologists. How test batteries are designed, and how evaluation results are shared with parents, physicians, and the investigative team vary from site to site. The implications of these practices will be shared and discussed from research, practical and ethical perspectives.

Finally, future directions for neuropsychological research within general clinical research centers will be discussed, including guidance for developing similar core programs in other sites.

Correspondence: *Jerilynn Radcliffe, PhD, Psychology, The Children's Hospital of Philadelphia, 3400 Civic Center Blvd., CHOP North, 14th floor, Philadelphia, PA 19104. E-mail: radcliffe@email.chop.edu*

N. HATTIANGADI. Human Subjects Issues in Collaborative Pediatric Research.

When medical procedures are conducted in a research context, human subjects issues are critical. Invasive or unproven medical tests or treatments would not be attempted without a thorough examination of consent procedures, risks and benefits to participants, and appropriate evaluation of outcome. However, when neuropsychological measures are administered as part of a research battery, human subjects issues inherent to such testing are frequently overlooked or dismissed. For this reason, professionals functioning within a GCRC Neuropsychology Core must remain alert to potential human subjects issues. Dilemmas may arise from the different relationship and responsibilities a neuropsychologist assumes with a research participant in comparison to a clinical patient, as well as the differences between a research battery and a clinical battery. Additionally, consent procedures can be influenced by a desire to present testing as quick, easy, and fun, or to use provision of test results as an incentive to participation. Issues of appropriate feedback are particularly central to neuropsychological testing in a research context. Neuropsychologists functioning within a GCRC often struggle with varying standards and requirements related to how much feedback is appropriate, when such feedback should be provided, and who is qualified to provide feedback to families. Strategies for addressing human subjects issues will be discussed, including methods for involving a neuropsychologist in protocol planning, designing a battery to minimize participant frustration and effects of extraneous factors on test performance, managing expectations of other investigators and parents, and developing appropriate practices for provision of feedback.

Correspondence: *Jerilynn Radcliffe, PhD, Psychology, The Children's Hospital of Philadelphia, 3400 Civic Center Blvd., CHOP North, 14th floor, Philadelphia, PA 19104. E-mail: radcliffe@email.chop.edu*

D. RIS. Initiating A Behavioral/Neuropsychology Research Core: Recommendations and Lessons Learned.

This presentation will focus on the various steps involved in developing a Behavioral/Neuropsychology core program through a General Clinical Research Center, using the Cincinnati program as an example. Establishing such a core program is facilitated by an organized effort to: (a) raise the level of awareness in the institution of the importance and funding potential of behavioral research, (b) highlight the practicality

of behavioral endpoints for biomedical research, particularly in this era of outcomes-oriented clinical research, (c) determine the current level of institutional support for behavioral research with particular attention to NIH funded studies, and (d) survey GCRC-supported researchers as to their interest in having such resources available to them in the future. Obtaining start-up support from the GCRC and/or institution prior to inclusion in the next GCRC grant application would be important in demonstrating the feasibility of the program. In this presentation, there will also be discussion as to why Behavioral/Neuropsychology Cores are an important but underutilized mechanism for advancing behavioral research, protecting human subjects, and promoting a biobehavioral model of health/healthcare in academic medical centers.

Correspondence: *Jerilynn Radcliffe, PhD, Psychology, The Children's Hospital of Philadelphia, 3400 Civic Center Blvd., CHOP North, 14th floor, Philadelphia, PA 19104. E-mail: radcliffe@email.chop.edu*

M. MAHONE. Marketing Pediatric Neuropsychology: The Johns Hopkins GCRC Experience.

The General Clinical Research Center (GCRC) at the Johns Hopkins Medical Institutions supports patient-oriented research by faculty at all stages (pilot studies to multi-center trials), via adult inpatient, outpatient, and pediatric medical units, as well as a neurobehavioral research unit (NBRU). The NBRU, located at the Kennedy Krieger Institute, operates under a sub-contractual agreement with the Johns Hopkins GCRC, and is a clinical research unit devoted to neurobehavioral analysis with a special emphasis on brain disorders in children. The NBRU provides protocol development, neuropsychological assessment, neuroimaging, behavioral training, movement analysis, and auditory function assessments. Investigators with research questions involving brain-behavior relationships are required to consult with a faculty neuropsychologist to determine whether neuropsychological services are required for the study. In particular, the neuropsychologist and investigator decide whether the study requires ongoing participation from a neuropsychologist as a co-investigator, or whether contractual or more peripheral consultative services are more appropriate. Neuropsychological services supported through the NBRU service centers include administration of tests, scoring, and preparation of data for the investigator (in accordance with state law), but not clinical interpretation, report writing, parent meetings, or faculty support for manuscript preparation. Faculty neuropsychological consultation for protocol development is provided through a separate center grant (Mental Retardation Research Center). The challenge for the consulting neuropsychologist is to ensure that all protocols involving neuropsychological analysis have appropriate NBRU and other faculty support to protect patient care standards, while achieving study goals. The steps in this consultation process will be highlighted.

Correspondence: *Jerilynn Radcliffe, PhD, Psychology, The Children's Hospital of Philadelphia, 3400 Civic Center Blvd., CHOP North, 14th floor, Philadelphia, PA 19104. E-mail: radcliffe@email.chop.edu*

G. GIOIA. Strategies for Effective Implementation of Services across Multiple Protocols: The GCRC Experience at Children's National Medical Center.

The Neurobehavioral and Psychosocial Evaluation Core (NPEC) laboratory of the General Clinical Research Center (GCRC) at Children's National Medical Center (CNMC) is described. The NPEC supports funded clinical research conducted by faculty and postdoctoral fellows. The NPEC is the largest core laboratory in the CNMC GCRC supporting 3 part-time faculty, 2 part-time postdoctoral fellows, and 2 research psychometricians. Currently, 14 studies receive active service from the NPEC. The NPEC provides a variety of services including: consultation regarding research design related to neuropsychological and psychosocial issues, protocol development including test selection, neuropsychological test administration and scoring, data preparation, training of study research assistants or investigators on test administration and scor-

ing, and consultation regarding findings. Strategies for coordinating and actively managing the multiple NPEC services across multiple diverse studies will be discussed. The NPEC services are typically delivered as an extension of a study and not the sole source of support. Investigators are required to consult with and receive approval by an NPEC faculty member before the GCRC Advisory Committee reviews the overall study. Decisions are made regarding the level and amount of NPEC service. Organized rationing and coordination of services across the multiple protocols is essential. The level of complexity of testing service may necessitate different levels of expertise from the research psychometrician to a postdoctoral fellow. Examples of service coordination will be provided to illustrate the efforts to provide effective and efficient service delivery to the maximal number of protocols within the GCRC.

Correspondence: *Jerlynn Radcliffe, PhD, Psychology, The Children's Hospital of Philadelphia, 3400 Civic Center Blvd., CHOP North, 14th floor, Philadelphia, PA 19104. E-mail: radcliffe@email.chop.edu*

Symposium 13

1:15–2:45 p.m.

The NIH MRI Study of Normal Brain Development

J.M. RUMSEY. The NIH MRI Study of Normal Brain Development.

Symposium Description : The NIH MRI Study of Normal Brain Development is a multisite, longitudinal imaging study of approximately 500 healthy, typically developing children, from newborns through age 18 at time 1 (oldest age 24 at completion). To enable the identification of deviations in brain maturation associated with developmental, neurological and neuropsychiatric disorders, four NIH institutes (NICHD, NIDA, NIMH, NINDS) are cosponsoring this study of healthy structural and metabolic brain development. Participating sites include Children's Hospitals at Boston, Philadelphia, Cincinnati; UCLA; University of Texas at Houston; Washington University; Montreal Neurological Institute; and intramural NICHD. The primary measures are derived from anatomic MRI and are supplemented by diffusion tensor imaging (DTI) and magnetic resonance spectroscopy and spectroscopic imaging (MRS, MRSI). The project is comprehensive in scope, including multispectral, multimodality imaging, the inclusion of infants, toddlers and preschoolers, an epidemiological sampling strategy, and clinical/behavioral measures for use in brain-behavior correlations. The resulting database will serve as a public resource for researchers and the clinical medicine community both for use in studies of disorders, as well as for further analysis of healthy development and tool development. This symposium describes the protocols and preliminary results on a subsample of children ages 4:6 and older at time 1: sampling protocol and clinical/behavioral results (Dr. Waber), imaging protocols and preliminary imaging results (Dr. Rivkin), and brain-behavior relationships (executive functions - Dr. Paus; memory functions - Dr. Asarnow).

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsey@mail.nih.gov*

M.J. RIVKIN, N. LANGE & C. BRAIN DEVELOPMENT. The NIH MRI Study of Normal Brain Development: Magnetic Resonance Imaging (MRI) Procedures and Findings.

The MRI Study of Normal Brain Development comprises the largest neuroimaging database to characterize typical development from new-

borns to young adults. Participants attend three or more sessions during the study and receive standardized neurologic, neurobehavioral and brain MRI evaluation at each visit. The MRI protocol includes 3D-volumetric T1-weighted and dual-echo T2-weighted acquisitions for neuroanatomic data. Single-voxel proton magnetic resonance spectroscopy is obtained at frontal and parietal white matter, thalamus and occipital gray matter. Echo-planar diffusion tensor images obtained in six directions at a b-value=1000 sec/mm² (plus b=0) characterize white matter microstructure. Recruitment of 511 children to date will produce MRI data with both cross-sectional and longitudinal features.

Preliminary cross-sectional data yielded growth curves for several brain volumes between ages 4.5 and 18 years of age. Lobar volumes were larger for males than for females at age 4.5 and remained larger. A sexually monomorphic growth pattern was common. An age-related quadratic growth pattern characterized total brain volume, all lobes, frontal lobe white matter and putamen. Rates of early childhood increase, adolescent decline, and curve apogee varied by structure and sex, confirming regionally-specific changes over time. Caudate and putaminal volumes increased in linear and quadratic fashion, respectively. Sexually dimorphic quadratic growth was seen in frontal and occipital gray matter; faster post-pubertal decline in these tissue volumes among males resulted in similar gray matter volumes for both sexes by late adolescence. Occipital white matter and caudate volumes increased linearly throughout childhood. However, occipital white matter volume increased faster for males than females.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsey@mail.nih.gov*

D.P. WABER & C. BRAIN DEVELOPMENT. The NIH MRI Study of Normal Brain Development: Sampling Procedures and Behavioral Findings.

The NIH MRI Study of Normal Brain Development employed an epidemiologic approach to recruit participants between 4.5 and 18 years to identify a population whose joint socioeconomic and racial/ethnic distribution was proportional to that of the U.S. population based on the 2000 census. Potential participants were screened for medical, neurological, psychiatric and genetic morbidity (child and first degree relatives) that could impact normal brain development. A total of 35,429 families were approached by mail with telephone follow-up; 453 met all inclusion and exclusion criteria, provided consent, and participated in Visit 1. High income families were more likely to decline participation, and children from low-income families were more likely excluded by morbidity.

The data characterize the neurobehavioral status of a demographically representative sample of U.S. children in whom morbidity that could affect functional and structural brain development has been minimized. Neuropsychological test performance and behavioral ratings for this well screened sample were consistently above average relative to published norms. Mean Full Scale IQ was 110.6 (s.d. 12.5). Although males and females performed comparably on most tests, marked sex differences emerged for Coding (females superior) and Block Design (males superior) ($p < .0001$). Performance differences related to socioeconomic status were prominent for measures of IQ and academic achievement ($p < .0001$); scores for the lower income group were well within the Average range, but those of the high income group were above average. No such differences emerged for other neuropsychological measures (verbal memory, word fluency, motor dexterity, spatial working memory).

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsey@mail.nih.gov*

R.F. ASARNOW, T. BABIKIAN, N. LANGE & C. BRAIN DEVELOPMENT. The NIH MRI Study of Normal Brain Development: The Relationship Between Developmental Changes in Brain Volume and Verbal Learning and Memory Abilities.

There are dynamic structural brain changes and increases in verbal learning and memory in children between 8-16 years of age. We focused on gray and white matter volumes of the frontal and temporal lobes because they support encoding and retrieval processes. Data for boys and girls were analyzed separately. Three sets of predictors were entered into a hierarchical multiple regression: 1) white matter volumes; 2) gray matter volumes and; 3) age. The outcomes were indices of short-term memory and retention from the CVLT-C.

The white and gray matter volumes included in the model accounted, on the average, for approximately 20% of the variance in boys and 12% in girls on CVLT-C variables. White matter volume and age accounted for more variance in CVLT-C performance in boys than girls. In contrast, gray matter volume accounted for comparable amounts of variance in CVLT-C indices across genders. For both boys and girls there was an inverse relationship between gray matter volumes in the temporal lobes and CVLT-C performance. In contrast, the correlation between white matter volumes in the temporal lobes and CVLT-C performance were positive. Boys, but not girls, show a higher correlation between gray and white matter volumes in the left, relative to right, frontal and temporal lobes and indices of short-term memory. There are no differences in the magnitude of correlations between the left and right hemispheres in girls. A substantial part of the variance shared by CVLT-C indices and brain volume is moderated by age. Verbal learning may be more lateralized in boys than girls.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsy@mail.nih.gov*

T. PAUS. The NIH MRI Study of Normal Brain Development: Brain Behaviour Relationships in the Executive Domain.

To identify neural substrates underlying the development of executive functions, the Study employs three subtests of the Cambridge Neuropsychological Test Automated Battery: (1) Spatial Span Task (Span); (2) Spatial Working Memory Task (WorkingM); and (3) Intradimensional/Extradimensional Set-shifting Task (Shift). These tasks complement standard neuropsychological measures of intelligence, memory, fluency and motor dexterity. The core MRI protocol includes 3D-volumetric T1-weighted and dual-echo T2-weighted acquisitions; these are processed by a fully automated image-analysis system yielding estimates of grey matter (GM) and white matter (WM) volumes of the cerebral lobes, as well as GM and WM density maps.

Performance in the three tasks is strongly age-dependent (Span [length]: $r=0.74$, $n=423$; WorkingM [errors]: $r=-0.76$, $n=376$; Shift [stages completed]: $r=0.49$, $n=418$). At the same time, age affects GM&WM densities in a region-specific manner. In order to assess age-independent relationships between brain and behaviour, we used multiple regressions and revealed the following structural predictors of performance: (1) the maximum length of spatial span was predicted by WM density in a sub-region of the medial frontal lobe (local max $X=0$, $Y=22$, $Z=45$; $t=11.6$); (2) the number of errors in the WorkingM task was predicted by WM density in another subregion of the medial frontal lobe ($X=8$, $Y=-3$, $Z=64$; $t=-9.4$); and (3) the number of stages completed in the Shift Task was predicted by the GM density in a subregion of the left prefrontal cortex ($X=-46$, $Y=40$, $Z=41$; $t=-6.2$). These results suggest that cognitive performance varies as a function of structural GM&WM properties in specific brain regions.

Correspondence: *Judith M. Rumsey, Ph.D., Pediatric Division, NIMH, 6001 Executive Boulevard, Room 6180, Rockville, MD 20852. E-mail: jrumsy@mail.nih.gov*

Symposium 14

1:15-2:45 p.m.

Cognitive Reserve, Schooling, Autonomy and Lifespan

G. DELLATOLAS, C. BULTEAU, C. SORIA, S.E. SABBAGH & J. GRILL. Autonomy, Quality Of Life and Schooling in Relation to Cognitive Deficits in Children with Epilepsy and/or Acquired or Congenital Brain Lesions.

Institut National de la Sante et de la Recherche Medicale, Villejuif, France; Institut Gustave Roussy, Villejuif, France

Background: Few studies have focused on the relationships between cognitive deficits on one hand, and autonomy, quality of life and school placement/academic difficulties on the other, in children with epilepsy and/or congenital or acquired brain damage.

Material and Methods: Neuropsychological assessments were performed, and information on school placement, academic difficulties, autonomy and quality of life were collected, in large populations of children (3-16 years) with epilepsy or brain tumors.

Results and commentaries: IQ measures and characteristics of the disease only partially explained school placement (main stream vs special school). IQ measures and performances at neuropsychological tasks were only moderately correlated with academic difficulties as reported by the teachers. Autonomy measures (e.g. Vineland scales) were useful in children with severe cognitive deficits. Quality of life as reported by the parents was poorly related to severity of disease or degree of cognitive deficits. The role of cognitive assessments on schooling and the role of schooling on cognitive performances, in young children with epilepsy or brain lesions, are discussed.

Correspondence: *Orlando F. Bueno, Ph.D., Psychobiology, Universidade Federal de Sao Paulo, Rua Napoleao de Barros 925, Vila Clementino, Sao Paulo 04024002, Brazil. E-mail: flaviahs@psicobio.epm.br*

F.D. SANTOS, S.M. GROTH & M.G. MACHADO. Autonomy, Aging and Intellectual Disabilities.

Universidade Estadual Paulista, UNESP, Assis, Brazil (1), and Instituto APAE, Sao Paulo, Brazil (2);

Background: Memory dysfunction is allied to Intellectual Disabilities (ID), aging, and dementia. It might be present since childhood. But the impact usually is more associated with learning difficulties than to aging prognosis. Moreover, memory decline may occur early in people with ID. However, dementia-screening tests such as the Mini Mental State Examination are not suitable for people with ID. Autonomy markers may be alternative instruments. Material and Methods: Adults with non-specific etiology ID, both gender, aged from 30 to 58 years, non-workers, and only 9 non-literates. Participants performed Choice-Making and Community Integration Scales (Heller et al, 2000) and were assessed twice (basal and actual) by Stanford-Binet Intelligence Scale form LM. Results and commentaries: Quantitative decline on IQ score from basal to actual measures was found to all subjects. But qualitatively, i.e., in terms of IQ classification, some participants were stable and other declined. Higher scores in the scales (more autonomy) were found in participants with stable IQ. Findings were discussed in terms of literacy, prospective memory, and autonomy influences on neuropsychological rehabilitation. Financial Support: AFIP.

Correspondence: *Orlando F. Bueno, Ph.D., Psychobiology, Universidade Federal de Sao Paulo, Rua Napoleao de Barros 925, Vila Clementino, Sao Paulo 04024002, Brazil. E-mail: flaviahs@psicobio.epm.br*

V.M. ANDRADE, L.G. OLIVEIRA, L. VAZ, B. BALDIVIA, M.G. ROCHA & O.A. BUENO. Cognitive Reserve, Health Aging and Brain Damage.

Universidade Federal de Sergipe, UFS (1), Universidade Federal de Sao Paulo, UNIFESP (2); Brazil

Background: The lifestyle influences the functioning of the cognitive skills across life span. It might influence the aging according to the hypothetical concept of cognitive reserve (CR). Evidences of the CR development across life span are taken from comparative studies of degree dementia and cognitive impairment in people with different school levels, in that higher educational levels are associated to better cognitive performance in the neuropsychological assessment. Could the CR to protect all kind of cognitive skills? **Objective:** to compare the neuropsychological profile younger and older adults, and adults with Multiple Sclerosis (MS) in order to predict which cognitive functions are more CR-related. **Material and Methods:** Three groups: older adults, control younger adults and young adults with MS, all of them with high academic level were assessed by a large battery for neuropsychological assessment with emphasis in processing of information, capacity to solve problems and occupational status. **Results and commentaries:** In most tasks older adults performed similarly to the young adults and better than MS (e.g. vocabulary, similarities, comprehension) but in tasks that evolves processing speed and perceptual organization (such as FAS, Stroop test, Block Design) they performed less well than the other groups. The finding suggests that CR is not an all-or-none process in cognitive functions; it seems to be dependent of hemispheric asymmetry and modular systems, which seems to develop before aging. **Financial Support:** CNPq/AFIP

Correspondence: Orlando F. Bueno, Ph.D., Psychobiology, Universidade Federal de Sao Paulo, Rua Napoleao de Barros 925, Vila Clementino, Sao Paulo 04024002, Brazil. E-mail: flaviahs@psicobio.epm.br

A. CASTRO-CALDAS, V. NUNES & M. GONCALVES. Learning to read in adulthood.

Instituto de Ciencias da Saude; Universidade Catolica Portuguesa, Portugal

Background: There are several sources of evidence that school attendance may modulate cerebral function; illiterate subjects have a handicap that can be demonstrated both at the behavioural and at the biologic level, however it is possible to learn in adulthood, the question that can be raised concerns the neural mechanisms involved in this late learning. **Material and Methods:** Adult subjects that learned to read and to write in the proper age were compared to those that learned in adulthood in several situations; some were scanned

with Magnetoencephalography other with fMRI in different experiences. **Results and commentaries:** Right temporo-parietal regions play a more important role in reading of subjects that learned in adulthood; the access to left frontal structures is attained more quickly following reading by subjects that learned in childhood; the area of the corpus callosum were parietal fibres cross plays an important role in writing.

Correspondence: Orlando F. Bueno, Ph.D., Psychobiology, Universidade Federal de Sao Paulo, Rua Napoleao de Barros 925, Vila Clementino, Sao Paulo 04024002, Brazil. E-mail: flaviahs@psicobio.epm.br

O.F. BUENO. Cognitive reserve, Schooling, Autonomy and Lifespan. Symposium Description : Cognitive reserve, Schooling, Autonomy and Lifespan

Universidade Federal de Sao Paulo, UNIFESP; Brazil

The idea that people might, across their lives, build a cognitive reserve (CR) has been evidenced in many researches, ranging from epidemiological to imaging studies. Studies have demonstrated that higher levels of educational and occupational attainment, or of intelligence, and cultural environment are good predictors of which individuals can sustain greater brain damage before demonstrating functional deficit. There-

fore, cognitive changes age-related taps on a lifespan perspective. However, in certain conditions, such as in intellectual disabilities (ID), the cognitive deficits found in the childhood rarely are considered in terms of ageing prognosis, nevertheless the early cognitive decline may be observed in some people with ID. Older adults, with or without ID, generally present diminished autonomy for lifetime activities due to physical condition and for cognitive losses. The lack of autonomy prevents people to carry out activities related to psychosocial adaptation and the responsibilities for their own acts. The present studies discuss how Schooling, Autonomy, and Lifespan influence the cerebral architecture and play a role as factor of protection on aging and after a brain damage. They focus on neural mechanisms by neuroimaging studies and in neuropsychological assessment as tools to investigate the impact of CR under diseases by the comparison of different age groups, educational levels, and diagnosis (epilepsy, multiple sclerosis, congenital or acquired brain damage and ID) and the interaction between quality of life, occupational activities, literacy, and severity of impairment. These parameters seem to enrich the investigation and raises fundamentals for neuropsychological rehabilitation of the central nervous system disorders.

Correspondence: Orlando F. Bueno, Ph.D., Psychobiology, Universidade Federal de Sao Paulo, Rua Napoleao de Barros 925, Vila Clementino, Sao Paulo 04024002, Brazil. E-mail: flaviahs@psicobio.epm.br

Poster Session 10 /2:15–3:45 p.m.

Aging

R. ZEC, S.J. MARKWELL, N.R. BURKETT & D.L. LARSEN. A Longitudinal Study of Confrontation Naming in the “Normal” Elderly.

Objective: The study’s objective was to examine the longitudinal effects of age on confrontation naming using the Boston Naming Test in the “normal” elderly.

Participants and Methods : Subjects were 541 “normal” elderly (age 50-99). For subjects with at least four annual assessments (n=238), 150 were followed for at least 6 years, 81 for at least 8 years, and 43 for at least 10 years. The 60-item BNT without cueing was administered as part of a comprehensive neuropsychological battery in a study of cognitive aging.

Results : A small practice effect (0.21 words, p=0.06) and moderately high test-retest reliability was found when comparing the first two assessments which were 9-15 months apart (r=0.76, n=353). Reliable change index scores indicated that an annual decline of at least 4 points on the BNT is needed for a statistically reliable decline in an individual. A gradient in the mean annual rate of change was found with improvement in the 50s age group, no change in the 60s age group, and decline in the 70s and 80s age groups. When projected over 10 years, the magnitudes of the mean changes were relatively small, i.e., a 1-word improvement for subjects in their 50s and a 1.3 word decline for subjects in their 70s.

Conclusions : Despite increasing health problems and “normal” age changes in brain structure/function, lexical retrieval as measured by a visual object confrontation naming task is generally well preserved with age in that there is only a subtle decline in the 7th and 8th decades of life. **Correspondence:** Ronald F. Zec, Ph.D., Neurology, SIU School of Medicine, 751 North Rutledge, P.O. Box 19643, Springfield, IL 62794-9643. E-mail: rzec@siumed.edu

L. ASHENDORF & R.J. MCCAFFREY. Age-related decline on the Wisconsin Card Sorting Test.

Objective: Performance on the Wisconsin Card Sorting Test (WCST) has been shown to decline with age, but the reason for this decline is

thus far unclear. Various research efforts have postulated processing speed, working memory, or a fundamental set-shifting deficit as the mediating factor. The present study incorporates a qualitative approach featuring verbalization of sorting strategies to provide a clearer analysis of this process.

Participants and Methods : The two samples used in this study included a younger sample of 25 college students, ages 18-22 ($M = 19.79$, $SD = 1.37$), and a community-dwelling sample of 19 older adults, ages 63-89 ($M = 77.44$, $SD = 8.14$). Each participant was administered the computer version of the WCST. In addition to the standard instructions, participants were asked to verbalize their sorting strategy for each card, and eight new qualitative variables were created on the basis of these responses.

Results : To compare the two groups, t-tests were conducted on each set of variables. As expected, the older individuals performed more poorly on the traditional WCST variables than younger individuals. With respect to the newly-created variables, younger individuals make more sorts that are correct and more sorts that are non-perseverative in nature. The older adults commit a greater number of perseverative sorts that are contrary to previous negative feedback as well as more frequent set shifts despite positive feedback.

Conclusions : The results point to a fundamental reduction in feedback utilization efficiency, rather than working memory or processing speed deficits, as the cause for decreased WCST performance in older adults.

Correspondence: *Lee Ashendorf, Ph.D., Psychology, Edith Nourse Rogers Memorial Veterans Hospital, 200 Springs Road, 116B, Bedford, MA 01730. E-mail: la2297@albany.edu*

S. VANDERHILL, D. BUNCE, D.F. HULTSCH, M.A. HUNTER & E. STRAUSS. Noncognitive Correlates of Mild Cognitive Impairment Subgroups.

Objective: A recent consensus statement on Mild Cognitive Impairment (MCI) outlined revised guidelines for sub-grouping individuals with MCI according to the nature of observed cognitive impairment (Winblad et al., 2004). These subgroups are hypothesized to be associated with differing etiologies and long term outcomes. As the cognitive symptoms, and therefore the subgroup distinctions, of MCI are subtle, a better understanding of the noncognitive correlates of MCI subgroups is needed.

Participants and Methods : 304 nondemented community volunteers aged 64 to 92 were classified into the following groups according to the presence of memory impairment and the number of cognitive domains in which impairment was evident: Controls, Amnesic MCI-Single Domain (aMCI-), Amnesic MCI-Multiple Domain (aMCI+), Nonamnesic MCI-Single Domain (nMCI-), and Nonamnesic MCI-Multiple Domain (nMCI+). Exploratory analyses were conducted to compare functioning across groups on a range of demographic, metacognitive, functional, health, and affective measures.

Results : The MCI+ groups differed from controls on a number of measures: the aMCI+ group had lower self-rated memory, self-rated health, fine motor functioning, and higher negative affect while the nMCI+ group had lower self-rated functional status, fine and gross motor functioning, and more chronic health conditions and perceived pain. The MCI- groups did not tend to differ from controls or MCI+ groups.

Conclusions : MCI is associated with lower levels of functioning across a range of noncognitive measures for those showing impairment in multiple cognitive domains. Differing profiles of noncognitive functioning for the aMCI+ and nMCI+ groups offer some support for the hypothesized existence of differing etiologies and long term outcomes for MCI subgroups.

Correspondence: *Susan Vanderhill, M.A., Psychology, University of Victoria, University of Victoria Dept Psychology, PO Box 3050 STN CSC, Victoria, BC V8W 3P5, Canada. E-mail: sv@uwic.ca*

S.E. COOK, F.W. UNVERZAGT, K.A. LANE, S. GAO, B. MUSICK, V. SMITH-GAMBLE, J. DICKENS, R.M. EVANS, J.R. MURRELL, O. BAIYEWU, O. GUREJE, A. OGUNNIYI, H.C. HENDRIE & K.S. HALL. Longitudinal Outcomes of Cognitive Impairment in Elderly African Americans: Patterns and Predictors.

Objective: Longitudinal studies of Cognitive Impairment No Dementia (CIND) outcomes have reported substantial rates (13-45%) of individuals originally classified as CIND but classified as normal on follow-up examination. The determinants of longitudinal functional outcome of CIND was examined in a community-based sample of African Americans including demographic factors, health factors, and cognition.

Participants and Methods : Participants were from the Indianapolis site of Indianapolis-Ibadan Dementia Project, a longitudinal, population-based study of dementia. Participants for current study had at least 2 clinical assessments, one assessment with diagnostic classification of CIND (Occasion 1) and the subsequent assessment (Occasion 2) in which they were classified as normal (Improvers, $N = 48$), CIND (Stable, $N = 79$), or dementia (Decliners, $N = 51$).

Results : Compared to Stable, the Improvers were more likely to have myocardial infarction and kidney disease in their medical history and Decliners were more likely to have at least one APOE $\epsilon 4$ allele than the Stable group. Within-person change in neuropsychological scores was clinically meaningful, while depression did not contribute to longitudinal outcome.

Conclusions : Findings suggest that health factors and functional status contribute to the longitudinal course of CIND in African Americans. Correspondence: *Sarah E. Cook, MS, Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610-0165. E-mail: scook@phhp.ufl.edu*

P. CORNEY & M. CROSSLEY. The Impact of Task Difficulty on Age-Associated Differences in Three Domains of Attention.

Objective: The purpose of the present study was to investigate the impact of task difficulty on age differences in three domains of attention (selective attention, focal attention, and divided attention). It was predicted that young and older adults would perform similarly when the attentional tasks were relatively easy and automatized, but that older adults would be disproportionately disadvantaged as tasks became more difficult and effortful.

Participants and Methods : Twenty-four young adults (age 22-39 years, $M = 28.13$) and 24 older adults (age 69-88 years, $M = 78.50$) participated in this study. In addition to completing a demographic questionnaire and a battery of standardized neuropsychological tests, each participant completed experimental tasks of selective attention, focal attention, and two tasks of divided attention. For each of the three attentional domains, task difficulty was manipulated by having participants complete easy and difficult versions.

Results : Expected age differences and similarities were found on the standardized neuropsychological tests. For each of the experimental attentional tasks administered, main effects of age group and task difficulty were detected. In addition, Age Group x Task Difficulty interaction effects were detected for tasks of selective attention, $F(1, 46) = 8.71$, $p = .005$, focal attention, $F(1, 46) = 32.66$, $p < .005$, and one of the two divided attention tasks, $F(1, 46) = 20.80$, $p < .005$.

Conclusions : Results of this study highlight the importance of considering task difficulty when assessing age-associated differences in attentional tasks. Specifically, age differences in selective, focal, and divided attention were clearly evident when tasks were sufficiently difficult, but age effects were significantly smaller for tasks that were easy and automatized. A related study, currently in progress, is assessing the effects of task difficulty on attentional functions in older adults with Alzheimer's Disease.

Correspondence: *Patrick Corney, BA (Honours), Psychology, University of Saskatchewan, 273A Sussex Drive, Ottawa, ON K1N 6Z1, Canada. E-mail: patrick.corney@usask.ca*

A.J. DONNELL, J. HOLDNACK, N.H. PLISKIN, B.N. AXELROD, L. DROZDICK & C. RANDOLPH. Validity of the WAIS-III Short-Form for Elderly Clinical Samples.

Objective: Although the Wechsler Adult Intelligence Scale-Third Edition (WAIS-III), extends the upper normative age range to include the elderly, there are issues that could influence clinical utility of the full administration of the WAIS-III in a geriatric population such as patient endurance and time constraints. Kaufman (1990) developed a short-form of the WAIS-Revised that Randolph, Mohr, & Chase (1993) later modified for more reliable use of the WAIS-R with older adults. The goal of the present study was to examine the utility of the revised scaling of the Kaufman short form for the WAIS-III in elderly samples.

Participants and Methods : Participants included three clinical groups from the WAIS-III standardization sample: Mild Alzheimer's disease (n=35), Huntington's (n=15), and Parkinson's (n=10), and a second sample of heterogeneous clinical cases from a veteran's medical center (n=72). Means, standard deviations, and reliabilities were obtained from the actual and the short-form estimated FSIQ.

Results : The revised scaling of the Kaufman tetrad correlated highly with the WAIS-III FSIQ for each clinical sample: Mild Alzheimer's (r=.97), Huntington's (r=.90), Parkinson's (r=.86), and mixed sample (r=.91). Eighty-two percent of the Alzheimer's, 73% of the Huntington's, 80% of the Parkinson's and 80% of the mixed clinical sample was within 5 points of the actual IQ.

Conclusions : The revised scaling of the Kaufman tetrad provides an accurate estimate of WAIS-III FSIQ for elderly clinical samples.

Correspondence: *Alison J. Donnell, Ph.D., University of Illinois at Chicago, 5209 S. Blackstone #1, Chicago, IL 60615. E-mail: ajdonnell@earthlink.net*

S.E. COOK, M. MARSISKE & K. MCCOY. The Use of the Telephone Interview for Cognitive Status in the Detection of Mild Cognitive Impairment.

Objective: Many screening tools for detecting cognitive decline require in-person assessment, which is often not cost effective. The Telephone Interview for Cognitive Status (TICS) has been used for screening dementia (cutoff: 30/50), but little is known about its usefulness in detecting amnesic Mild Cognitive Impairment (aMCI).

Participants and Methods : Community-dwelling participants (mean age = 74.9 years, mean education = 16.1 years) were administered the TICS during initial screening and subsequently were given a multi-domain neuropsychological battery to determine eligibility for a study. Participants were classified by consensus panel as normal older adult (noMCI, N = 54) or aMCI (N = 17) based on neuropsychological performance and informant interview, but independent of TICS score.

Results : There was a significant difference between groups in TICS score ($t = 8.04$, $p < 0.01$, noMCI range 32 - 43, mean [SD] = 37.4 [2.5], MCI range 25 - 37, mean [SD] = 31.2 [3.5]). Discriminant function analysis revealed that TICS alone correctly classified 85.9% of participants into their respective diagnostic classification (sensitivity = 82.4%, specificity = 87.0%). Further analyses investigated classification using TICS and performance on a modified word list learning test (total score and percent retention) and a processing speed measure assessed independently of diagnostic testing. Results revealed a somewhat improved overall model (90.1% correctly classified, 82.4% sensitivity, 92.6% specificity). Additional analyses examined subscores of the TICS, including orientation, list recall, and list retention, to examine which aspects are most predictive of MCI.

Conclusions : The TICS is a brief, cost-effective screening measure for identifying those with and without aMCI.

Correspondence: *Sarah E. Cook, MS, Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610-0165. E-mail: scook@phhp.ufl.edu*

R. READY, M.D. ROBINSON & M.I. WEINBERGER. Age Differences in the Structure of Emotion Knowledge: Priming Effects for Valence and Time Frame.

Objective: There is compelling evidence that the emotional lives of older and younger adults are different. The objective of the present study was to build on this work by investigating age-related differences in the schematic organization of emotion knowledge. A secondary objective was to investigate differential organization of episodic and semantic emotion knowledge in older and younger adults.

Participants and Methods : In an affective priming task, 41 younger (M age = 24 years) and 42 older adults (M age = 71 years) reported on their experiences of positive and negative emotion, both 'today' and 'in general.' Of primary interest was judgment speed as a function of matches (e.g., positive-positive) or mismatches (e.g., negative-positive) in valence and time frame across consecutive trials.

Results : Older adults had stronger valence-related priming effects than younger adults, indicating greater differentiation in storage of positive and negative affective information. In contrast, older adults exhibited weaker time frame-related priming effects relative to younger adults. Thus, older adults differentiated less between episodic and semantic emotional experiences, consistent with age-related declines in episodic memory. Results remained significant after controlling for individual differences in speed and variability.

Conclusions : Findings point to robust age-related differences in the organization of emotional self-knowledge, which adds to current understanding of age-related differences in the self-concept, affective processing, and emotional experience.

Correspondence: *Rebecca Ready, Ph.D., Psychology, University of Massachusetts, Tobin Hall, 135 Hicks Way, Amherst, MA 01003. E-mail: ready@psych.umass.edu*

R. HOLTZER & R. FRIEDMAN. Using Neuropsychological Tests to Predict Falls in Normal Aging.

Objective: Falls are common in old age and constitute a significant public health concern. This study examined the relationship between empirically derived cognitive factors and the risk of falls in a large group of elders residing in the community.

Participants and Methods : Participants (n=162; 54% female) were cognitively normal old individuals (mean age in years = 78) who were enrolled in the Einstein Aging Study.

Dependent measures: Comprehensive neuropsychological battery covered pre morbid and current verbal abilities, attention, memory and executive function. Information about falls was obtained during the clinical interview.

Statistical Analysis: Neuropsychological tests were submitted to Factor Analysis for the purpose of data reduction. Varimax rotation was used to derive orthogonal factor scores. Logistic regression analysis examined whether the neuropsychological factors predicted the risk of falls. The dichotomous dependent measure was falls within the last year. Analyses controlled for age, sex, education, and disease comorbidity status.

Results : Twenty four percent of the sample experienced a fall incident within the last year. Factor Analysis yielded three orthogonal factors: Verbal IQ, Timed Attention/ Executive, and Memory. Logistic regression Analyses revealed that the Timed Attention/ Executive factor was a significant predictor of falls ($B = -.520$, $p = .014$, 95%CI = .394-.899) even when adjusted for other risk factors.

Conclusions : This study revealed that timed attention executive function, but not verbal IQ and memory, predicted the risk of falls in normal aging. This information is relevant to risk assessment of falls and to possible shared neural networks of cognitive and motor function.

Correspondence: *Roe Holtzer, Ph.D., Ferkoff Graduate School of Psychology and the department of Neurology, Yeshiva University, Albert Einstein College of Medicine, rousso Building, 1300 Morris Park Avenue, Bronx, New York, NY 10461. E-mail: rholtzer@aecom.yu.edu*

P.J. GAGER, B. GIORDANI, J. BENO & C. PERSAD. Elderly Less Able to Learn from Feedback on an Unfamiliar Memory-Based Mobility Task.

Objective: This study examined the relationship between mobility and cognitive functioning in aging by specifically examining: 1) age-associated effects of disrupting normal gait patterns during a memory-based target localization task (TL), and 2) subjects' ability to adapt to the disrupted gait by using feedback about extent of TL errors during subsequent trials. Subjects walked blindfolded to a previously viewed target under 3 conditions (5 trials each): 1) Baseline Walk with normal gait, 2) Shuffle Walk, and 3) Shuffle Walk with immediate visual feedback. TL accuracy was measured as cm off and angle displacement from target. Subjects also were administered a brief neuropsychological test battery.

Participants and Methods : Subjects were 12 older (M=72 y.o) and 12 younger (M=24 y.o) adults. Results analyzed with repeated measures ANOVA and linear regression.

Results : Younger and older subjects were equally accurate in TL with normal gait and shuffling without feedback ($p < .01$). However, when immediate visual feedback was provided in the shuffling condition, younger subjects immediately reduced their error after the first feedback and were more accurate than older subject across trials ($p < .001$). Older subjects actually increased their error following the first trial with feedback, and their performance over subsequent trials with feedback was highly variable compared to younger, in distance off target ($p < .03$) and angle displacement ($p < .03$).

Conclusions : Neuropsychological correlates of ability to learn from feedback in the elderly group included measures of executive functioning, immediate memory, and visual-spatial learning. Many medical and physical changes with aging can contribute to daily variability in gait patterns, which may contribute, along with attention changes, to increased falls risk.

Correspondence: *Peter J. Gager, PhD, Psychiatry - Neuropsych, UMichigan, Ann Arbor, C-450 Med Inn, 1500 E Med Center Dr, Ann Arbor, MI 48109. E-mail: pgager@umich.edu*

R. HOLTZER, Y. GOLDIN & P.J. DONOVICK. Extending the Administration Time of the Letter Fluency Test Results in Increased Sensitivity to Cognitive Status in Aging.

Objective: The letter fluency test is limited to one minute. This study examined whether extending the administration time to two minutes increased the sensitivity of this test to cognitive status in aging.

Participants and Methods : Participants (mean age in years = 84.6; 63% female) were old individuals who scored below ($n=20$) and above ($n=40$) the Dementia Rating Scale (DRS) cutoff (123).

Dependent Measures: Letter fluency tests (B and F) were assessed in 1- and 2-minute conditions.

Statistical Analysis: Analysis of Variance (ANOVA), performed on the difference ratio of the 1 and 2-minute conditions, examined whether increasing the administration time differentially affected word generation performance in the two groups. Two separate Discriminant Function Analyses (DFA), using performance in the 1 and 2-minute letter fluency conditions as predictors and group status as the dependent measure, examined whether extending the administration time increased classification accuracy.

Results : The number of words generated in the second minute of the letter fluency task was higher in the group scoring above the DRS cutoff (mean = 5.35) compared to the group scoring below the cutoff (mean = 2.35). ANOVA showed that these group differences were statistically significant $F(2,57) = 7.5, p = 0.001$. DFA showed that the percentage of cases correctly classified increased from 68.0% in the 1-minute condition to 77% in the 2-minute letter fluency condition.

Conclusions : Extending the administration time increased the sensitivity of the letter fluency test to cognitive status in aging. These results should be replicated and extended to other patient populations as well.

Correspondence: *Roe Holtzer, Ph.D., Ferkauf Graduate school of Psychology and the department of Neurology, Yeshiva University, Albert Einstein College of Medicine, rousso Building, 1300 Morris Park Avenue, Bronx, New York, NY 10461. E-mail: rholtzer@acem.yu.edu*

J.I. BREIER, L. MAHER, E.M. CASTILLO, B. NOVAK & A.C. PANICOLAOU. Neurophysiological Changes in Receptive Language Cortex with Age Using Magnetoencephalography.

Objective: To determine if there are changes in the neurophysiological status of receptive language cortex associated with aging, and whether such changes are accompanied by change in function.

Participants and Methods : Twenty-six participants with no history of medical difficulty were given a recognition task for abstract words while magnetoencephalography (MEG) data was collected using a 248 channel whole-head Magnes 3600 scanner. MEG images were co-registered with structural MRI scans and timing and strength (RMS) of activity sources in primary auditory cortex and posterior superior temporal gyrus (STG) that met standard criteria were recorded for each subject. Subjects over the age of 50 ($n = 13$) were given controlled oral word association (COWA) and Boston Naming (BNT) tests.

Results : There was no relation between age and either strength or amount of activation in primary auditory cortex in either hemisphere ($p > .4$). However, degree ($r = -.50, p < .008$) and strength ($r = -.62, p < .0006$) of late (> 200 ms post stimulus onset), language-specific activation in left STG were both inversely related to age. In addition, both degree ($r = .68, p < .007$) and strength ($r = .53, p < .05$) of activation were correlated with performance on COWA, but not BNT. Activation within primary auditory cortex was not associated with either behavioral measure ($p > .7$).

Conclusions : Results indicate a decrease in the strength and degree of activation within receptive language cortex with age that is associated with increasing difficulty in lexical retrieval using phonological cues. The specificity of this association is consistent with a role for left STG in phonemic analysis. These findings do not appear to be related to peripheral hearing loss as there were no significant findings for parameters of activation within primary auditory cortex.

Correspondence: *Joshua I. Breier, PhD, Neurosurgery, University of Texas Health Science Center at Houston, 1333 Moursund St., Suite H114, Houston, TX 77098. E-mail: joshua.i.breier@uth.tmc.edu*

A. ECONOMOU. Intraindividual Variability in Memory Test Performance in Middle Aged and Elderly Persons from the Community.

Objective: Findings of significant and frequent interindividual variability in test performance, demonstrated in recent studies using non-clinical samples, indicate that large discrepancies between test scores are part of normal intraindividual variability. The present study specifically examined discrepancies between secondary and primary memory measures in normal adults. The study aimed to (1) describe the magnitude of the discrepancies; and (2) investigate whether discrepancies between secondary and primary memory scores were affected by age and education.

Participants and Methods : Memory tests were administered to 126 community-dwelling middle aged and elderly persons. Scores from a list learning task and from subtests of the Wechsler Memory Scale-III (Letter-Number Sequencing and Digit Span) were z-transformed and secondary-primary difference scores were computed by subtracting primary memory scores from long delay free recall scores.

Results : Over 40% of the sample produced discrepancies greater than 1 SD but only about 7% produced discrepancies greater than 2 SDs. Correlations of primary and secondary memory scores with age and education showed the expected age- and education- related decline, but secondary-primary difference scores did not correlate with age. When the sample was divided by age (50-63, $N=65$; 64-98, $N=61$), difference scores significantly correlated with education in the older group, only.

Conclusions : The results indicate that large discrepancies between secondary and primary memory scores are uncommon in normal aging; that secondary memory is not selectively impaired with age in the age range examined; and that higher education is associated with a greater discrepancy in favor of primary memory in the older participants.

Correspondence: *Alexandra Economou, Psychology, University of Athens, Panepistimiopolis, Ilissia, Athens 15784, Greece. E-mail: aoikono@psych.uoa.gr*

E. WOO, M. SCHMITTER-EDGEcombe, E. HOLLENBACK, J. BENEGAS & A. CURREN. Cognitive Support for Verbal Episodic Memory in Older Adults.

Objective: The effect of semantic cues provided at encoding and during the retention interval on older adults' memory for a word list was examined.

Participants and Methods : In a completely crossed design, participants received semantic or nonsemantic cues at encoding and during the retention interval. Each of four groups of older adults was comprised of 23 participants, and each group was matched for age and education levels. The semantic cue consisted of the names of the categories that the words comprised. The nonsemantic cue consisted of instructions to intentionally remember the words.

Results : In comparison to the nonsemantic cue, provision of the semantic cue at encoding led to greater semantic clustering at learning, but not better recall performance. In contrast, providing the semantic cue during the retention interval led to better delayed free recall and greater semantic clustering than providing the nonsemantic cue.

Conclusions : Overall, semantic cues that were administered during the retention interval were beneficial for older adults' memory for unstructured information. In addition, older adults were able to reorganize the word list during the retention interval. At learning, greater semantic organization did not lead to better memory performance.

Correspondence: *Ellen Woo, M.A., Washington State University, 148 S. Sepulveda Blvd. #3, Los Angeles, CA 90049. E-mail: ewoo@wsu.edu*

M.K. JONSDOTTIR, E.M. INGTHORSdOTTIR, T. ASPELUND, P.V. JONSSON, L.J. LAUNER & V. GUDNASON. Retrospective Time Estimation in an Elderly Cohort: Relationship to Cognitive Functioning.

Objective: Time estimation relates to numerous cognitive processes and demographic factors. Studies of psychological time have largely neglected retrospective time estimation and have generally emphasized prospective estimation of short durations (seconds or few minutes). The goal of this study was to investigate retrospective estimation of a long event duration (> 20 minutes) and its relationship to general cognitive functioning, which is largely unknown.

Participants and Methods : Subjects were 769 males and 1009 females (Mean age = 75.9 and 75.5, $p=.15$) who participated in an epidemiological study of aging. The following tests were administered: MMSE, DSST, Digit Span, Spatial Working Memory, Stroop, CVLT, Figure Comparison (perceptual speed) and the Geriatric Depression Scale. Time Estimation was subsequently tested by asking participants to estimate, in minutes, the amount of time spent with the psychometrician. The estimation score was the proportional deviation from the actual testing time.

Results : The average testing time was 44 minutes (SD = 9.4). Consistent with Vierordt's Law time was underestimated by 76% of the participants. Men underestimated time more than women. The relationship between time estimation and neuropsychological tests depended on whether participants under- or overestimated time. Underestimation cor-

related with memory and overestimation correlated with timed tests (i.e. slower individuals overestimated more). Although significant, correlations were weak, explaining from .3 to 2.2% of the variance. Overall cognitive status (dementia, no dementia), education, age and GDS score were not related to time estimation.

Conclusions : The relationship between time estimation and neuropsychological tests is complex and retrospective time estimation for long duration may have limited clinical value.

Correspondence: *Maria K. Jonsdottir, Ph.D., Icelandic Heart Association, Holtasmari 2, Kopavogur 201, Iceland. E-mail: marijon@landspitali.is*

S. WIEDERKEHR, M. SIMARD, D. LAURIN & R. VERREAULT. Impact of Vascular Risk Factors on Cognition in the Elderly: A Cross-Sectional Analysis of the Data from the Canadian Study of Health and Aging.

Objective: Vascular risk factors (VRF) increase the likelihood of developing cognitive impairment in the elderly (Skooog, 1998). However, the cognitive deficits described in previous studies were detected only by brief cognitive screening (DiCarlo et al., 2000), and most studies used the MCI-Amnesic criteria of Petersen as the main outcome measure (DeCarli et al., 2001 ; Kivipelto et al., 2001). Thus, the impact of VRF on various cognitive functions remains to be clarified as well as their additive effects on cognition. We hypothesized that individuals aged 65 years or above with more than 3 VRF would have more cognitive impairment than those with 0 and 1-2 VRF.

Participants and Methods : This is a retrospective, cross-sectional neuropsychological analysis of the Canadian Study of Health and Aging - 1 (1991) involving a selected sample of 674 relatively healthy individuals aged 65 years or above. The VRF considered were: history of stroke and/or alcoholism; focal neurological and/or cardiac symptoms; hypertension; antihypertensive medication; diabetes; Hachinski score above 7; smoking; absence of physical activity; obesity. The groups with 1-2 VRF (n=311), 3 or more VRF (n=280), and the control group (0 VRF; n=83) were compared on measures of memory, processing speed, executive and visuospatial abilities.

Results : The 3 groups were similar in terms of age, gender and educational level. ANOVAs performed between the 3 groups revealed significant differences on tests of semantic memory, judgment, visuospatial abilities and processing speed ($\alpha = p < 0.05$). Tukey post hoc comparisons showed that the group with 3 or more VRF performed worse than the control group on measures of semantic memory ($p=.035$), judgment ($p=.029$), visuospatial abilities ($p=.042$) and processing speed ($p=.009$), and more poorly than the group with 1-2 VRF on the processing speed task ($p=.032$).

Conclusions : These results suggest that the number of VRF affects cognitive functioning, especially processing speed, in elderly individuals otherwise in good health.

Correspondence: *Sandra Wiederkehr, Ph.D Candidate, Université Laval, 93 rue Saint-Paul, app 4, Québec, QC G1K 3V8, Canada. E-mail: sandra.wiederkehr.1@ulaval.ca*

M.E. ZIMMERMAN, A.M. BRICKMAN, R.H. PAUL, S.M. GRIEVE, D.F. TATE, G. JOHN, R.A. COHEN, M.A. ALOIA, L.M. WILLIAMS, C. CLARK & E. GORDON. Region and Age-Specific Relationships between Frontal Lobe Gray Matter Volume and Cognitive Function across the Healthy Adult Lifespan.

Objective: Age-associated decline in both gray matter brain volume and cognitive function in healthy adults is well-supported in the literature. The goal of the current study was to examine the relationship between age-related changes in regional brain volumes and cognitive function in a large, cross-sectional sample of healthy adults across the lifespan.

Participants and Methods : Neuropsychological assessment and magnetic resonance imaging (MRI) imaging were administered to 148 adults aged 21 to 77 years. Analyses were performed on regional cortical and subcortical gray matter brain volumes and cognitive test scores measuring attention, executive function and language. Participants were categorized into three groups based on age (younger adults aged 21-30, n=54; middle adults aged 31-50, n=51; older adults aged 51-77, n=43).

Results : MANOVA revealed significant age group differences in gray matter volumes ($\Lambda=0.63$, $F(16,274)=4.45$, $p<0.01$) and cognitive performance ($\Lambda=0.47$, $F(18,274)=7.05$, $p<0.01$). Multivariate regression analyses revealed significant age group interaction effects for lateral ($p<0.01$) and orbital ($p<0.01$) frontal volumes in the prediction of a cognitive factor score. Pearson product correlation coefficients identified significant associations between cognitive performance and lateral ($r=0.39$, $p<0.01$) and medial ($r=0.35$, $p<0.02$) frontal gray matter volumes in the older adult group.

Conclusions : The findings from the current study confirm age-associated declines in cognitive function and gray matter volumes, particularly in anterior cortical brain regions. Results also reveal age-specific associations between lateral and orbital frontal gray matter volumes and cognitive function in older adults that were not observed in either middle or younger adults.

Correspondence: *Molly E. Zimmerman, PhD, Psychiatry and Human Behavior, Brown University, Brown University, Box G-BH Duncan Building, Providence, RI 02912. E-mail: Molly_Zimmerman@Brown.edu*

L. MITCHELL, G. BUCKWALTER, A.S. YI & V. CROOKS. Cognitive Aging and the Role of Processing Speed.

Objective: As humans age a decline in overall cognitive functioning occurs. The processing resource theory asserts that a few key processes underlie much of cognitive aging. One such cognitive process is speed, which is well documented to decline with age. This study explores the relationship between speed and cognitive aging, hypothesizing that processing speed is an integral factor of cognition affecting multiple domains.

Participants and Methods : The study was a secondary analysis of data that was collected from a NIH study of participants who were actively recruited from the Kaiser Permanente database in Southern California. They included 211 patients aged 65 through 95. Participants were given the Cognitive Assessment of Later Life Status (CALLS), a new telephone administered cognitive screening test. This test measures speed auditorily using simple and choice reaction time. Participants were also given a battery of neuropsychological tests. These tests were factor analyzed. The impact of speed on neuropsychological performance was evaluated by calculating the correlations between the speed measures and the neuropsychological factors. Speed was then controlled for using hierarchical regression to determine if speed accounted for associations between age and all neuropsychological factors.

Results : There was a significant negative correlation between age and choice reaction time. No correlation was observed with age and simple reaction time. Partial correlations suggested an association with age and memory after controlling for both speed variables. Also, an association between age and mental control was suggested after controlling for simple reaction time, yet not after controlling for choice reaction time.

Conclusions : Support was not found for a strong version of the processing resource theory, as speed was associated with only one of six domains. That one domain was mental control and its relationship with age appeared to be mediated by choice reaction time.

Correspondence: *Lisa Mitchell, M.A., School of Psychology, Fuller Seminary, 44 N. Oak Ave, #3, Pasadena, CA 91107. E-mail: lisamitch@sbglobal.net*

L.S. MILLER, J. WOODARD & L. POON. The Georgia Centenarian Study: Functional capacity in the Oldest Old.

Objective: The overall purpose of this study is to measure, evaluate, and predict patterns of functional capacity in the oldest old. This study presents initial descriptive data and preliminary analyses of the performance of the centenarians in comparison with an older adult comparison group.

Participants and Methods : 217 Centenarians and 78 80 year olds were evaluated on a series of neurocognitive and functional performance tasks. Neurocognitive tasks included the Mini-Mental State Exam, the Behavioral Dyscontrol Scale, and the Severe Impairment Battery, among others. Functional performance was measured with the Direct Assessment of Functional Skills.

Results : As would be expected, highly significant differences were found between groups on all neurocognitive measures (T-scores from 3.394-7.869, all with p 's $< .001$), as well as performance of tasks of functional skill ($t=8.52$, $df 289$). Similarly, all neurocognitive measures significantly correlated with functional performance for each group. Centenarians showed significantly greater variation and dispersion of scores in their neurocognitive performance and in their ability to perform functional tasks.

Conclusions : Centenarians as a group show significantly greater cognitive difficulties than do 80 year olds. Similarly, they have greater difficulty with performing functional tasks. However, Centenarians show greater variability in these abilities. The ongoing Georgia Centenarian Study aims to predict the variables most important in identifying "successful" agers.

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*

E. WEHLING, T. ESPESETH, I. REINVANG & A.J. LUNDERVOLD. Subjective memory complaints and neuropsychological test performance in middle aged and older adults at genetic risk for Alzheimer's disease.

Objective: Subjective complaints about memory problems are common in aging people. They can be both an indicator of depression and an early sign of dementia. We examined the factor structure of the Everyday Memory Questionnaire (EMQ), the occurrence of depressive symptoms (Beck's Depression Inventory), and memory performance (California Verbal Learning Test-II).

Participants and Methods : A community dwelling sample ($n=167$) of middle aged and older subjects participated in the study. Presence or absence of the Apolipoprotein $\epsilon 4$ allele, a risk factor for Alzheimer's disease, was included in our analyses.

Results : A principle component analysis revealed five factors for the EMQ, denoted retrieval, memory for daily activities, conversation monitoring, working memory/task monitoring, and self-biography/recognition. The two genotype groups ($\epsilon 4$ carriers and non carriers) were neither found to be significantly different on the five EMQ scores nor the EMQ sum-score. This was also true on the measures of memory function and depressive symptoms.

The EMQ factors were significantly correlated with depressive symptoms, even when age and gender were controlled for ($p<.000$). Neither the factors nor the sum score were significantly correlated with the memory measure, but an interaction between the memory performance, genetic status and depressive symptoms was indicated by an ANOVA analysis ($F[5, 153] = 5.743$, $p < 0.000$, Adjusted $R^2 = 0.16$).

Conclusions : Results do not suggest an association between subjective memory complaints and ApoE allele in this sample of cognitively intact elderly. Results rather suggest a major role of mood disturbances in older adults with subjective memory complaints.

Correspondence: *Astri J. Lundervold, PhD, Dep. of Biological and Medical Psychology, University of Bergen, Jonas Lies vei 91, Bergen 5009, Norway. E-mail: astri.lundervold@psych.uib.no*

S. WOOD, J. BUSEMEYER, A. KOLING & H. DAVIS. Older Adults are Adaptive Decision Makers: Evidence from the Iowa Gambling Task.

Objective: Decision-making strategies were examined in older versus younger adults by applying the Busemeyer-Stout (2002) expectancy valence model to the Iowa Gambling Task.

Participants and Methods: Eighty-eight young adults (18 to 34 years) and 67 older adults (65 to 88 years) completed the Iowa Gambling task. A traditional analysis of ratio of bad decks to good decks chosen was completed followed by an application of the Busemeyer model that allowed for a trial by trial analysis of decision strategy. Three additional outcome measures were derived: memory, attention to wins, attention to losses.

Results: Using a traditional measure, there was no significant difference in performance between younger and older adults. However, using a theoretical decomposition of the task designed by Busemeyer and Stout (2002). Younger adults demonstrated significantly better memory ($p < .05$) and a significant negativity bias ($P < >05$) in comparison to older adults. Older adults demonstrated an accurate representation of wins and losses (valence), but demonstrated a significant recency bias ($p < .05$).

Conclusions: Older and younger adults successfully completed the Iowa gambling task. A theoretical decomposition allowed us to ascertain strategy. Younger adults demonstrated superior memory but a strong negativity bias. Older adults did not demonstrate a negativity bias.

Correspondence: *Stacey Wood, PhD, Scripps College, 1250 N College, Claremont, CA 91711. E-mail: swood@uccs.edu*

M. BUTTARO & R. KAPLAN. Using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) to Identify Mild Cognitive Impairment.

Objective: The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) has become a popular dementia screening tool, in part because it provides co-normed data across several cognitive domains, including attention, language, visuospatial skills, and memory. Since many mental status screening tests are relatively insensitive to mild dementia, the RBANS might be particularly useful for detecting the subtle deficits associated with mild cognitive impairment (MCI), a condition characterized by subjective memory complaints, abnormal memory for age, essentially preserved general cognitive function, and largely intact activities of daily living (Petersen et al., 1999). In this study, we examined the utility of the RBANS for discriminating MCI, early Alzheimer's disease (AD), and depression.

Participants and Methods: Patients referred to the Neuropsychology Service at the University of Connecticut Health Center were administered a diagnostic interview and the RBANS. Those who fit clinical criteria for MCI ($N=57$), probable early Alzheimer's disease ($N=32$), and depression ($N=20$) were compared on each of their RBANS scores.

Results: MANOVA results indicated that the RBANS was useful for discriminating the three diagnostic groups (Wilks' $\lambda = 7.13$ $F(12, 202) = 3.096$, $p < .01$). Post hoc analyses showed that the AD group had significantly different ($p < .05$) performance than MCI and depressed patients on all RBANS scores. However, the RBANS did not successfully discriminate between the MCI and depressed groups.

Conclusions: The RBANS is a useful tool for discriminating MCI from early Alzheimer's disease, but additional measures are needed to distinguish between MCI and depression.

Correspondence: *Melissa Buttarro, B.A., Psychology, University of Connecticut, 95 Varga Rd #24S, Ashford, CT 0627S. E-mail: melissa.buttaro@uconn.edu*

A.R. KAUP, N. DENBURG, H.J. FRIEDRICHSEN, T. YAMADA & A. BECHARA. Poor Decision-Making Among Older Adults is Related to Elevated Levels of Neuroticism.

Objective: A well-studied index of reasoning and decision-making is the Iowa Gambling Task (IGT), and a decline in performance with age has been demonstrated. However, there exists a great deal of individual variability on the IGT, and the present study examines the role of personality in IGT performance.

Participants and Methods: In the present study, 40 younger (aged 26-40) and 40 older adults (aged 60-85) were administered the IGT and the NEO-Five Factor Inventory (NEO-FFI). The NEO-FFI is a 60-item self-report measure that taps the five domains of personality (Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness).

Results: Utilizing overall performance on the IGT (number of total picks from advantageous decks minus number of total picks from disadvantageous decks) as the decision-making variable of interest, we found a negative relationship between IGT and Neuroticism ($r = -0.28$, $p = .025$) among the older adults. No relationship obtained for the younger adults.

Conclusions: Neuroticism is thought to involve aversive feelings, such as fear, sadness, embarrassment, anger, guilt, and disgust, as well as a general susceptibility to psychological distress. We propose that poor performance on the IGT among older adults reflects an over reliance on negative affect, specifically, impulsivity and disinhibition, thereby leading to disadvantageous decision-making. We interpret our findings in the context of several theories of personality, and discuss implications of the present findings for decision-making in older adults.

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Correspondence: *Natalie Denburg, Neurology, University of Iowa College of Medicine, #2155 RCP, UHC, 200 Hawkins Drive, Iowa City, IA 52242-1053. E-mail: natalie-denburg@uiowa.edu*

V. DOTSON, J. BUGOS & W.M. PERLSTEIN. Aging and Cognitive Control Dysfunction: An ERP Study.

Objective: A large body of research has demonstrated that aging is associated with impairments in cognitive control, the ability to align thought and action in accord with internal intentions. We used event-related potentials (ERPs) and a novel Stroop task to evaluate the effect of aging on ERP signatures of cognitive control functions, including context encoding and maintenance, and conflict detection.

Participants and Methods: We acquired high-density ERPs while 20 younger (ages 18-35) and 19 older (ages 62-84) adults performed a cued, single-trial Stroop task. Each trial of the task comprised an instructional cue, followed by the Stroop stimulus to which participants provided a manual response. ERPs were used to dissociate regulative processes (i.e., representing and maintaining attentional demands of the task) from evaluative processes (i.e., conflict processing).

Results: Behaviorally, older adults showed impairments in cognitive control, reflected in selective and disproportionate increases in error rates to the incongruent condition of the color naming task, $F(1, 37) = 4.48$, $p < .05$. ERP analyses revealed that context encoding was impaired in older adults, reflected in a lack of differentiated frontal P3a activity during mixed compared to single-trial blocks, $F(1, 14) = 2.87$, $p > .10$. Younger, but not older adults showed an increase in the negative slow wave over left frontal sites for incongruent compared to congruent color-naming conditions, $F(1, 31) = 6.07$, $p < .05$. In addition, older adults showed global, $F(1, 14) = 9.83$, $p < .01$, but not local, $F(1, 14) = 1.08$, $p > .30$, task switching effects on the parietal cue-related slow wave, suggesting that older adults inefficiently allocate neural resources to successfully complete cognitive tasks.

Conclusions: Findings indicate that aging is associated with deficits in cognitive control, and that impairments in conflict detection, conflict resolution, and detection of response conflict contribute to cognitive control dysfunction in aging.

Correspondence: *Vonetta Dotson, M.S., Clinical & Health Psychology, University of Florida, P.O. Box 142732, Gainesville, FL 32614. E-mail: vonetta@ufl.edu*

S.D. GALE, L. BAXTER, J. MORRONE-STRUPINSKY & S. JOHN-SON. White Matter Volume in the Elderly with a Remote History of Traumatic Brain Injury: A Voxel-Based Morphometry Study.

Objective: Traumatic brain injury (TBI), even when mild, has been shown to be a risk factor for Alzheimer's disease (AD). However, little

is known about how a remote history of TBI might affect the structure of the aging brain decades following an injury. TBI can decrease temporal lobe white matter without decreasing gray matter (Bigler 2002) and modification of age-related myelin breakdown may be a factor in AD (Bartzokis 2004). We hypothesized elderly with remote mild TBI would have reduced temporal lobe white matter volume (WMV) compared to peers.

Participants and Methods : We utilized voxel-based morphometry (VBM) to compare whole brain and regional differences. Nine subjects with remote TBI were compared to 14 controls. All subjects completed MRI and cognitive examination. No subject had MCI/AD. MRI scans were read as normal. The subjects with remote TBI were 76.6 (SD=17.6) years old and 44.6 years post-injury (range=11-77, median=36). Controls were 77.0 (SD =18.0) years old. Groups were matched on age and education. VBM was carried out with 3D T1-weighted images obtained on a 3.0T scanner and processed with SPM2 (Good 2001). AnCova was used with total intracranial volume as a nuisance variable.

Results : Decreased WMV ($p < 0.005$, uncorrected) in the TBI group was mainly seen in left posterior temporal/parietal and right frontal regions and subtly in the posterior cingulate.

Conclusions : In this preliminary study, cognitively intact elderly with remote mild TBI had regional decreases in WMV compared to age-matched peers. These mild changes may represent a mechanism underlying mild TBI as a risk factor for AD.

Correspondence: *Shawn D. Gale, Ph.D., Barrow Neurological Institute, 222 West Thomas Rd. Ste. 315, Phoenix, AZ 85013. E-mail: s2gale@chw.edu*

C.G. LOWE, S.A. ROGERS, K.J. MILLER, T. CROWE-LEAR & G.W. SMAILL. The Relationship Between Subclinical Hypothyroidism, Mood and Cognitive Functioning.

Objective: Clinical hypothyroidism (CH) has been associated with mood and neurocognitive functioning, including deficits in depression, language, and verbal and visual memory. However, the cognitive and emotional effects of subclinical hypothyroidism (SCH) have been less studied, largely because SCH has been considered a benign condition. This project examined the effect of TSH and T4 levels on depressive symptomatology, memory, and language.

Participants and Methods : A total of 208 participants (M age = 66 years; M education = 16 years) completed a full neuropsychological battery and tested for thyroid blood levels. SCH was defined as high TSH (> 4.7 mIU/L) and normal T4 (4.5-11.0 mcg/dL).

Results : Individuals with clinically elevated levels of TSH had significantly higher levels of depression than those with normal TSH levels, $t(130) = -2.06$, $p < .05$. Similarly, those with clinically elevated levels of T4 had significantly greater depression, $t(179) = -2.33$, $p < .05$. Neither correlational nor t-test analyses using clinical cutoffs revealed a significant effect of TSH or T4 levels on neuropsychological functioning, even controlling for depression and demographic differences.

Conclusions : The results suggest that older adults with SCH are at a greater risk for depression. However, contrary to previous research, levels of TSH and T4 were not related to neuropsychological functioning. These findings may further inform the treatment of individuals with various thyroid disorders while considering SCH as a possible risk factor for depression. These findings, in conjunction with the literature on CH, warrant further study in understanding the relationship between SCH, mood, and cognitive functioning.

Correspondence: *Charmaine G. Lowe, M.A., Memory and Aging Research Center, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, Room 88201, Los Angeles, CA 90024. E-mail: clowe@mednet.ucla.edu*

J.K. PANNU, A.W. KASZNIAK, S.Z. RAPCSAK, L. RYAN & E. GLISKY. Tip-of-the-Tongue States in Aging: An Event-Related fMRI Study.

Objective: The tip-of-the-tongue phenomenon refers to a strong feeling that a target word, though presently not recalled, is known and on the verge of being produced. Older adults experience tip-of-the-tongue more frequently than younger adults. In this fMRI study with older adults, we examined the neural correlates of successful retrieval, tip-of-the-tongue experiences, and unsuccessful retrieval.

Participants and Methods : Based upon performance on a battery of neuropsychological tests, 20 older adults were characterized as High or Low Frontal and High or Low Medial Temporal functioning (see Glisky et al., 1995). In an event-related fMRI design, participants viewed famous and novel faces and were asked to respond as to whether they had remembered the name, did not know the name, or had a tip-of-the-tongue experience.

Results : Results show that, as a group, these older adults had greater activation in the medial prefrontal cortex during tip-of-the-tongue states, consistent with similar studies in young adults (Maril et al., 2001; Pannu et al., 2005). Additionally, activations in lateral prefrontal cortex and medial temporal areas during the task varied systematically with frontal and temporal lobe factor scores.

Conclusions : These results provide evidence for differences in neural activation between groups of healthy older adults characterized on the basis of neuropsychological performance, and shed light on the neural underpinnings of the tip-of-the-tongue states in aging.

Correspondence: *Jasmeet Pannu, Psychology, University of Arizona, 1503 E. University Blvd, Tucson, AZ 85716. E-mail: jasmeet@u.arizona.edu*

G.M. THORNTON, P.J. MASSMAN, J.F. BENGE, R.A. JENKINS & R.S. DOODY. Category-Letter Fluency Discrepancies in Healthy Older Adults: Normative Data and Reliability.

Objective: Normative data for the discrepancy between category (animals) and letter (FAS) fluency performance was calculated.

Participants and Methods : One hundred twenty-two healthy older adults (60-89 years) with a mean age of 72.2 years and education of 15.63 years were evaluated at the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center, and also completed a health screening, physical, and neurological exam. The average score on FAS (FAS/3) was subtracted from the animals score. Fluency difference score was correlated (-0.27) with age ($p < .01$), indicating normative data should be stratified by age group, but associations with education and gender were not significant. Normative data for the animal-letter fluency discrepancy were calculated for 5 age groups. We examined reliability by comparing the fluency difference scores from 84 participants' initial evaluation and return visit, 9-15 months later.

Results : Most participants (100/122=82.0%) demonstrated the expected pattern of better category than letter fluency performance. The fluency difference score did not correlate significantly with Boston Naming Test or AMNART scores. The mean difference in the discrepancy score for the two visits was -0.25 (SD=6.69), which was not significant, paired $t(83) = -0.34$, $p > .70$. The correlation between the discrepancy scores was small but significant, $r = 0.37$, $p = .01$.

Conclusions : This data may be useful in evaluating patients with neurological disorders, including Alzheimer's disease. Other linguistic measures may not associate with the fluency difference score due to ceiling effects in well-educated samples. The modest correlation between visits may have been influenced by the relatively long time interval between sessions and the inherent compounding of measurement error in difference scores.

Correspondence: *Garett M. Thornton, MS, Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: gmthornton@uh.edu*

D.J. HARVEY, J. FOLEY, Z. PROCTOR-WEBER & C. GOLDEN. Gender Discrepancies in Processing Speed Across the Lifespan.

Objective: Previous research demonstrated effects of gender on processing speed, with superior female performance on WAIS-III Digit-Symbol/Coding (DS). Other studies indicated age-related declines in both genders. The present study investigated gender discrepancies on DS across the lifespan.

Participants and Methods : Participants were 170 neuropsychologically normal adults. Age groups were *young* (18-25 years; $M=21.91$; $SD=1.99$), *mid* (25-65 years; $M=45.71$; $SD=12.90$), and *older* (65+ years; $M=75.23$; $SD=8.56$). Mean education was 15.35 years ($SD=1.41$) for *young*, 15.10 years ($SD=12.90$) for *mid*, and 13.51 years for *older* ($SD=2.76$). 75% were Caucasian, 15% Hispanic, and 5% African-American. 89.4% were right-handed. All were administered the WAIS-III.

Results : A 2X3 ANOVA (gender*age) was run to examine differences between age group means on DS. A significant interaction was found for group*gender ($F[2, 164]=3.36$, $p=.04$). Post hoc independent samples *t*-tests were conducted to examine simple effects of gender on age, with adjusted alpha of .0167 (.05/3) to maintain the .05 familywise error rate. A significant effect was found for gender in the *young* group ($t[32]=-2.68$, $p=0.01$) with females higher ($M=88.32$, $SD=13.49$; $M=72.67$, $SD=20.61$). No gender effects were found in *mid* ($t[54]=-1.410$, $p=0.16$) or *older* groups ($t[78]=.57$, $p=0.57$).

Conclusions : Mean gender differences declined with age, with no difference in the older group. Findings suggest female processing speed advantage disappears with age.

Correspondence: *Daniel J. Harvey, M.S., Neuropsychology Assessment Center, Nova Southeastern University, 701 SW 148th Ave #107, Sunrise, FL 33325. E-mail: bdharvey@comcast.net*

J. DAMON, N. BELFOR, J. JOHNSON, B. MILLER & J. KRAMER. Predictors of Cognitive Decline in MCI Patients.

Objective: Prediction of decline in older adults who present with cognitive concerns may enable clinicians to target them for interventions. The purpose of this study was to identify significant predictors of decline in a well-characterized cohort of amnesic MCI patients followed longitudinally.

Participants and Methods : Subjects were 102 older adult subjects (mean age= 72; MMSE= 28) diagnosed with MCI at the UCSF Memory and Aging Center. Neuropsychological assessment was carried out at baseline, and all subjects were followed for 1-2 years. Subjects were grouped according to those whose MMSE dropped by 3-points or more ($n=15$) vs. those who remained stable at follow-up ($n=89$).

Results : Subjects who showed a decline in MMSE were older ($p<0.03$) and performed less well on modified Trailmaking Test ($p<0.03$) and semantic fluency ($p<0.001$). List learning data (CVLT-SF) also yielded a significant Trial X Group interaction ($p<0.001$), with the declining group showing a more rapid rate of forgetting over the 10-minute delay interval. A multiple regression analysis indicated that these variables explained 21.6% of the variance in group status ($p<0.01$), with rate of forgetting and animal fluency remaining in the model as predictors.

Conclusions : Subjects whose MMSE score declined over a two-year period were older, had more rapid forgetting, and performed worse on modified Trailmaking Test and category fluency at baseline than subjects who remained stable. Results indicate that baseline measures can assist with predicting who might be most vulnerable to decline, and suggest that measures with known sensitivity to AD might be the best predictors.

Correspondence: *jill damon, M.A., UCSF Memory & Aging Center, 350 Parnassus Avenue, Suite 706, San Francisco, CA 94117. E-mail: jdamon@memory.ucsf.edu*

S. JITTLER & B. SHERWIN. Perceived Stress, Cognition and Steroid Hormones in Elderly Men.

Objective: Previous literature provides evidence that stress may negatively influence aspects of cognitive functioning. The Perceived Stress Scale (PSS) is a measure commonly used to assess self-reported chronic stress, yet little research discusses its association with cognition. This study explored the relationships between perceived stress and cognition in elderly men.

Participants and Methods : Twenty-six healthy elderly men were recruited from the general community through newspaper advertisements. Stressed and non-stressed groups were formed using a median split on Perceived Stress Scale (PSS) scores. All stressed ($n=14$; mean age = 68; $SD = 4.4$) and non-stressed men ($n=12$; mean age = 68; $SD = 4.4$) were euthymic and matched in age, education, general intelligence, and socioeconomic status. Participants completed a comprehensive neuropsychological battery including measures of verbal and nonverbal learning and recall, short-term memory, working memory and attention. A blood sample and salivary samples were obtained in order to establish levels of cortisol, testosterone, and estradiol.

Results : Between group analyses of variance revealed that stressed men had significantly lower scores than non-stressed men on a measure of the recall and recognition of word lists (CVLT-II). Stressed men also performed more poorly on a measure of visuoconstruction (Block Design; WAIS-III), and spatial working memory (Spatial Span Backwards; WMS-III). Neuroendocrine profiles did not differ between groups.

Conclusions : Our findings suggest that, in healthy elderly men, moderate levels of perceived chronic stress may negatively influence aspects of both verbal and nonverbal cognition.

Correspondence: *Sandra Jittler, B.A., Ph.D Candidate, Psychology, McGill University, Stewart Biological Sciences Building WS/1, 1205 Dr. Penfield Avenue, Montreal, QC H3T 1H7, Canada. E-mail: sjittler@ego.psych.mcgill.ca*

A. GUTCHES & C. YOON. Aging and the Self-Reference Effect in Long-term Memory.

Objective: Memory is enhanced when information is encoded in relationship to the self (the self-reference effect). However, this effect has been primarily investigated in younger, but not older, adults. Despite widespread memory impairments with age, memory for social and emotional information may be relatively intact for older adults. This preservation could reflect the finding that the medial prefrontal cortex, the cortical region that supports social information processing, undergoes little shrinkage with age. The present studies explore whether the self-reference effect extends to elderly adults.

Participants and Methods : Across two studies, 60 young and 60 elderly incidentally encoded adjectives by judging whether they described themselves, another person, or were in upper case. After a retention interval, participants received a surprise recognition test for each adjective, as well as distractors.

Results : A prime scores, based on hit and false alarm rates, were analyzed in a 2 x 3 mixed ANOVA with Age (young/elderly) as a between-subjects variable and condition (Self/Other/Case) as a within subject variable. Although elderly performed worse than young adults across all conditions, the self-reference effect was preserved for elderly adults. Age did not interact with encoding condition even when a close, intimate other, as opposed to a semantically familiar other, was compared to the self.

Conclusions : The self-reference effect is preserved with age, although does not disproportionately benefit elderly compared to young. Self-referencing suggests a possible strategy to improve long-term memory performance for older adults.

Correspondence: *Angela Gutches, PhD, Harvard University and Massachusetts General Hospital, 33 Kirkland Street, William James Hall 86S, Cambridge, MA 02139. E-mail: agutches@wjh.harvard.edu*

A.A. PELOQUIN, H.R. FRANKLIN, L.T. WILLIAMS, M.E. MCFARLAND, J. HARRIS & L. MILLER. Cognitive Predictors for Independent Functional Abilities in High-Risk Older Adults.

Objective: The purpose of the study was to investigate the predictive abilities of multiple cognitive domains on functional independence in frail elders. It was hypothesized that immediate memory measures would be more predictive of functional status than the other screening measures.

Participants and Methods: The elders assessed were participants with Community Care Services Program, a Medicaid funded program. Participants were 40 community-dwelling older adults from private homes throughout Northeast Georgia (mean age = 77.47, SD = 9.52). To measure immediate memory, language, visuospatial-constructional abilities, attention, and delayed memory, the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), was used. Trail Making Test, and the Frontal Assessment Battery (FAB) were administered to measure sequencing abilities and executive functioning. To obtain a measure of daily functioning and functional status, participant's instrumental activities of daily living were assessed and rated by registered nurses employed by CCSP.

Results: A hierarchical linear regression was performed to determine if the immediate memory index score was more predictive of functional status than the other measures above and beyond the variance accounted for by age, education, ethnicity and frailty. Immediate memory was the only significant predictor of functional status, $t(5, 35) = 2.467, p < .05$.

Conclusions: Results of this study suggest that the immediate memory index score of the RBANS is a clinically useful tool in predicting daily functioning in frail older adults. Results also suggest that neuropsychological measures of immediate memory may be more clinically useful in predicting functional decline than other global screening measures.

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

Learning Disabilities/ADHD

J.G. FINE, M. SEMRUD-CLIKEMAN, T.Z. KEITH, L. STAPLETON & G. HYND. Smaller Corpus Callosum Midbody in Poorer Readers within Families.

Objective: Existing studies on the corpus callosum in dyslexics have yielded inconsistent results. Some found larger corpus callosa in those with RD, others have found a smaller cc, and some have found no differences in the cc of persons with and without RD. Problems with past studies include failure to control for whole brain size, IQ, gender, and comorbid syndromes such as ADHD.

Participants and Methods: 68 readers nested in 24 families; no family history of ADHD.

1.5T struc. scans.

Corpus callosum area controlled for whole-brain volume, gender, IQ.

Data centered around the family mean to remove family bias and the influence of between-family variance in genetics and environment.

GORT-3 standard scores as dependant variables.

Corpus callosum area digitally segmented into five equal regions.

Regressions were used to test the influence of total corpus callosum area and each segment of the corpus callosum on GORT scores. Path analysis used to test equivalence of effects on Rate and Accuracy scores.

Results: Area of the corpus callosum controlled for brain volume, gender and IQ accounted for 27% of the variance in GORT Passage scores ($R^2 = .267, F(3, 40) = 7.57, p < .001$). A moderate contribution of CC area was found ($b = .243, p = .039$). The midbody segment of the corpus callosum was the only statistically significant contributor to GORT Passage ($b = .361, p = .002$) in separate regressions, one for each segment. With all five segments in a regression ($VIF < 4.5$), the unique contribution of the midbody segment was significant ($b = .596, p = .009$).

Conclusions: Better readers within families have larger CC areas at the midbody of the midsagittal slice. The midbody is presumed involved in the integration of primary/secondary auditory functioning, and oral-motor functions needed for word formation (Aboitiz et al., 1992). A hypothesis is that early anemic myelination or unusual termination of axons at the CC midbody contribute to deficits in timing and perception of temporal cues in speech in dyslexics, as suggested by the work of Lappanen (2002).

Correspondence: *Jodene G. Fine, M.S., University of Texas at Austin, 613 Rocky River Road, Austin, TX 78746. E-mail: jodene.fine@mail.utexas.edu*

A.C. NEWMAN & R.L. MAPOU. The Role of a Nonverbal Learning Disability in Understanding Psychiatric Illness: A Case Study.

Objective: A case is described of an individual with a significant psychiatric history whose neuropsychological profile provided important clues for understanding and treating his psychiatric symptoms.

Participants and Methods: The case is of a 40 year old man on psychiatric disability for 5 years who was referred for an evaluation of ADHD. He had a history of academic failures and had been unable to work due to depression, anxiety and paranoia, but was benefiting from medications and psychotherapy and was eager to return to school with specific goals for employment. He also had difficulties with dating and wished to be in a long-term relationship.

Results: ADHD was confirmed by history and was further supported by evidence on testing of problems with attention, speed and executive dysfunction. Neuropsychological data also revealed a distinct nonverbal learning disability (NLD) characterized by a significant VIQ>PIQ discrepancy, constructional problems, and problem solving difficulties in the context of average verbal intelligence and memory.

Conclusions: NLD provided a useful explanation for understanding his discomfort in work and social situations because of the implications for his ability to accurately interpret nonverbal cues. Furthermore, the discovery of NLD provided a "nonjudgmental" way of understanding his interpersonal difficulties. Specific recommendations to enhance his school, work and psychosocial functioning given the presence of NLD and ADHD are described.

Correspondence: *Anne C. Newman, Ph.D., Anne C. Newman, Ph.D., 4701 Willard Ave., Suite 233, Chevy Chase, MD 20815. E-mail: acn2@erols.com*

E. DIRKS, L. DE SONNEVILLE, G. SPYER & E. VAN LIESHOUT. Cognitive and neuropsychological characteristics of children with combined reading and arithmetic disabilities.

Objective: The purpose of this study was to compare the performance of children with combined reading and arithmetic disabilities to that of children with only one of these disabilities on different cognitive and neuropsychological tasks, in order to determine a discriminating pattern of skills and deficits characteristics of children with combined reading and arithmetic disabilities.

Participants and Methods: We selected 200 9-11 year olds based on their reading (word decoding) and arithmetic (computational ability) performance on standard achievement tests. The first group, consists of children with reading disabilities (RD), who had reading achievement scores below the 25th percentile and arithmetic scores above the 50th percentile. The second group with arithmetic disabilities (AD), had arithmetic achievement scores below the 25th percentile and reading scores above the 50th percentile. The third group with combined reading and arithmetic disabilities (RAD), had achievement scores below the 25th percentile in both reading and arithmetic. The fourth, normal achievement group (NA), had achievement scores above the 50th percentile in both reading and arithmetic.

Results : The main findings were as follows: The performance of the RAD group on most of the verbal tasks is comparable to that of the RD group, with both groups performing more poorly on these tasks than the AD and NA groups. On visual spatial, and attention tasks the performance of the RAD group is most comparable to that of the AD group, with both groups showing poorer performance than the RD and NA groups.

Conclusions : The RAD group seems to have generalized verbal and non-verbal problems.

Correspondence: *Evelien Dirks, Special Education, Vrije Universiteit Amsterdam, Van der Boerhorststraat 1, Amsterdam 1081 BT, Netherlands. E-mail: e.dirks@psy.ru.nl*

Z.E. PROCTOR-WEBER & C. GOLDEN. Neuropsychological Approach for Classifying Adults Seeking Post Secondary Accommodations.

Objective: The purpose of the present investigation was to compare the diagnostic efficiency of traditional FSIQ-Academic Achievement discrepancy scores to neuropsychological test measures in learning disabled (LD) college students seeking post secondary accommodations.

Participants and Methods : Participants included 132 adults ranging in age from 18 to 60 (M=31.12; SD=10.92). Educational levels were consistent with college (M=14.97; SD=1.88). The sample was presorted into 3 groups (55 LD seeking accommodation, 32 COG NOS with history of MTBI and 45 Normal controls). Discriminant function analyses were used to investigate the classification hit rates for individual and domain test performance.

Results : Results indicated that each of the 5 domains (FSIQ-AA Discrepancy, Processing Speed, Language, Attention and Executive Functioning) identified specific groups at a rate better than chance ($\alpha = .01$). As expected, the Discrepancy score domain performed worse than any of the neuropsychological measures in terms of overall classification (hit rate 47%; 20% improvement over chance). The Attention domain was most successful (hit rate of 64%; 47% improvement over chance). Processing speed and Language measures performed comparably (hit rate 57%; 36% improvement over chance) and Executive Functioning measures classified 50% of the subjects accurately, representing a 25% improvement over chance.

Conclusions : Results support the use of a brain-behavior model in the assessment of adult disabilities. Overall, domain specific neuropsychological measures appear to be more useful than global discrepancy scores in overall classification. For LD students seeking post secondary accommodations, neuropsychological measures are more appropriate for identifying underlying cognitive deficits, which can then be used to design tailor fit accommodation packages.

Correspondence: *Zoe E. Proctor-Weber, PsyD, PhD, Mental Health and Behavioral Science, James A. Haley VAMC, 13000 Bruce B Downs Blvd, Psychology 5N, Tampa, FL 33612. E-mail: xcane2@aol.com*

L. HARDER, M. SEMRUD-CLIKEMAN, J. MAEDGEN & N. NUSSBAUM. The Relation Between Executive Functions and Written Expression in College Students with Attention Deficit Hyperactivity Disorder.

Objective: Attention-deficit hyperactivity disorder (ADHD) is the second most common disability affecting college students today. Given that written expression involves many of the neurocognitive systems compromised for individuals with ADHD, specifically executive functions, it is hypothesized that college students with ADHD would experience more difficulty with written expression as compared to non-disabled peers.

Participants and Methods : Two groups of undergraduate students, ages 19 to 28 years, were recruited with group one consisting of 31 students diagnosed with ADHD and group two consisting of 27 controls. Four measures of executive function and a measure of written expression were administered. SAT Verbal scores were used to control for verbal aptitude. The number and frequency of ADHD symptoms for each participant was measured.

Results : Linear regression models were used to test the relation between executive function measures and a written expression measure. Higher scores on a measure of inhibition was associated with a higher Writing Quotient on the Scholastic Abilities Test for Adults (SATA). The addition of the remaining executive function measures was not useful for predicting the SATA Writing Quotient. Results also show that scores from a self-report ADHD measure, indicating the number and frequency of symptoms, were strongly associated with the ADHD group, suggesting that this measure discriminates well based on ADHD classification.

Conclusions : Findings from this study provide important information about the link between executive functions and written expression in college students with ADHD and provide a window for providing appropriate interventions.

Correspondence: *Lana Harder, M.A., Educational Psychology, University of Texas at Austin, 634 S Montford Ave, Baltimore, MD 21224. E-mail: lanaharder@mail.utexas.edu*

D.M. STROTHER, C. MORELAND, L. BATSON & K.R. KRULL. AD/HD and Dyslexia: A Case Study of Monozygotic/Dizygotic Triplets.

Objective: This case report reviews patterns of attention and learning differences in dizygotic/monozygotic triplets as related to stimulant medication response and hemispheric dominance.

Participants and Methods : One set of male, monozygotic/dizygotic triplets completed neuropsychological testing on six occasions over a period of 19 months. Age at initial evaluation was 7 years, 4 months. Monozygotic siblings presented with symptoms of AD/HD and reading difficulties, while their dizygotic brother was reportedly functioning within normal limits for age. One of the monozygotic pairs was left-handed, while the other was right-handed. Evaluations included direct neuropsychological assessment, as well as parent and teacher behavior rating forms.

Results : Confidence intervals were used to assess change across time. Monozygotic siblings evidenced improvement in behavioral regulation and processing speed after medication was initiated. Improvements in sustained attention were evident with low doses of stimulant medication (Concerta 27mg), while impulsivity declined only at moderate doses (36mg). Additional increases in medication beyond the moderate dosage yielded increased variability in test performance. Reading improved in the right-handed monozygotic sibling with medication, though this was not the case for the left-handed monozygotic sibling. Reading performance and performance on a visual focused attention task appeared to be related to hemispheric dominance rather than symptoms of AD/HD.

Conclusions : Cognitive symptoms of AD/HD (processing speed and sustained attention) responded best to low doses of medication, while behavioral inhibition improved with moderate doses. Hemispheric dominance appeared to have a larger impact on visual scanning, focused attention, and reading skills than medication.

Correspondence: *Darren M. Strother, Ph.D., Learning Support Center, Texas Children's Hospital, Clinical Care Center, Suite 1630, 6621 Fannin St., CC1630.00, Houston, TX 77030-2399. E-mail: dmstroth@texaschildrenshospital.org*

L. WEYANDT & G. DUPAUL. Neuropsychological Functioning of College Students with ADHD.

Objective: The purpose of this proposed presentation is to critically review the literature concerning neuropsychological performance of college students with Attention Deficit Hyperactivity Disorder (ADHD).

Participants and Methods : Research indicates that approximately 2 to 8% of college students in the U.S. report clinically significant levels of ADHD symptoms, and approximately 25% of students receiving disability support services receive such services for ADHD. The prevalence of ADHD symptoms in college students varies across genders and countries (DuPaul, et al. 2001).

Results : Cross sectional studies have found that college students with ADHD are more likely to obtain lower grade point averages and are less likely to graduate than their non-ADHD peers. With respect to neuropsychological functioning, studies have found that college students with ADHD tend to perform similar to control participants on intelligence tests (Full Scale IQ) as well as on the freedom from distractibility factor (e.g., Gregg, Coleman, Stennett & Davis, 2002; Weyandt, Mitzlaff, & Thomas 2002). The findings are mixed with respect to performance on specific neuropsychological tests. For example, some studies have reported that college students with ADHD commit higher rates of errors of omission on computerized performance tasks than control participants, higher rates of internal restlessness and intrusive thoughts while other studies have reported no performance differences between college students with and without ADHD (or ADHD symptomatology) on the WCST, Stroop, errors of commission, mean correct response time, and variability measures on continuous performance tasks (e.g., Weyandt, Rice, Linterman, Mitzlaff, & Emert 1998; Weyandt, Mitzlaff, & Thomas, 2002; Lyonfields, 2001).

Conclusions : The proposed presentation will critically examine the neuropsychological findings and offer suggestions for future research. Correspondence: *Lisa Weyandt, Ph.D., Psychology, CWU, 400 University Way, Ellensburg, WA 98926. E-mail: weyandt@cwu.edu*

H.D. BARNARD, M.A. SHANAHAN, E.G. WILLCUTT & B.F. PENNINGTON. Is "Pure" ADD Etiologically Distinct from ADHD-Combined Type? A Behavioral Genetic Analysis.

Objective: It has been suggested that "pure" ADD (ADHD without hyperactivity) is neurobiologically and etiologically distinct from ADHD (with hyperactivity). The objective of the present study is to test whether the genetic etiology of ADHD symptom dimensions (inattentive (IA) and hyperactive-impulsive (HI)) differ as a function of subtype.

Participants and Methods : Symptom data from 87 identical twin and 71 same-gender fraternal twin pairs in which at least one member had a diagnosis of ADHD were subjected to familiarity and heritability analyses. Proband were divided into three subtypes: a "pure" ADD subtype comprised of ADHD-IA probands exhibiting 2 or fewer HI symptoms, an "intermediate" subtype of ADHD-IA probands presenting with 3 to 5 HI symptoms, and an ADHD-Combined Type subtype.

Results : Proband placed co-twins at preferential risk for their own subtype ($\chi^2 = 23.638, p = 0.003$). However, there were many cases of co-familiarity (e.g., a pure ADD proband with a combined type co-twin). Moreover, a 3-subtype by 2-ADHD dimension ANOVA examining co-twin symptoms found a main effect of subtype but no subtype by dimension interaction ($p = .525$). Univariate heritability analyses of inattention yielded h^2_g estimates ranging from 0.536 to 0.617 ($p < .05$), and these estimates did not differ across subtypes ($p = .968$). Bivariate h^2_g estimates ranged from 0.207 to .492 across subtypes; however, extended multiple regression analyses revealed these differences to be non-significant ($p = .217$).

Conclusions : These data do not support a genetically-distinct etiology for "pure" ADD. Rather they are suggestive of a partially overlapping genetic etiology of inattentive and hyperactive symptomatology.

Correspondence: *Holly Barnard, BA, University of Denver, 2674 S. Roslyn St., Apt. #208, Denver, CO 80231. E-mail: hbarnard@du.edu*

M.Y. KIBBY, J.B. FANCHER, R. MARKANEN & G.W. HYND. A Morphological Test of the Cerebellar Deficit Hypothesis: Possible Subtypes?

Objective: The goal of this study was to test the cerebellar deficit hypothesis of dyslexia by focusing on cerebellar morphology in those with and without dyslexia.

Participants and Methods : 20 children with dyslexia and 20 children without dyslexia ages 8-12 years participated in a neuropsychological evaluation and a structural MRI scan. Cerebellar hemisphere and vermis size were then measured using NIH Image blind to group membership.

Results : Overall, groups differed in cerebellar hemisphere asymmetry only, with those with dyslexia displaying symmetry and reversed asymmetry more frequently. Moreover, when reversed asymmetry occurred, it was always in the dyslexia group. When just focusing on the dyslexia group, those with symmetry/reversed asymmetry differed from those with typical asymmetry in phonological processing ability. In a different approach, when motor functioning was analyzed in the total sample, 5 children had poor motor functioning, all with dyslexia. These children differed from the rest of the sample in posterior inferior vermis size, and 4/5 had a double deficit.

Conclusions : Our findings suggest two possible subtypes of dyslexia when subtypes are based upon brain morphology.

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Correspondence: *Michelle Y. Kibby, PhD, Psychology, SIUC, 1125 Lincoln Dr., LSII, Rm. 2S1, Carbondale, IL 62901. E-mail: mkibby@siu.edu*

D.D. SCHWARTZ & K.R. KRULL. Time Perception and Time Use in AD/HD: The Role of Interest.

Objective: This study investigates the relationship between time-perception, time-use, and boredom sensitivity in children with and without AD/HD. It is hypothesized that children with AD/HD will underestimate time during high-interest tasks and overestimate time during low-interest tasks, and that this effect will be attenuated or absent in controls.

Participants and Methods : Children between the ages 8-16 years with subtypes of AD/HD will be compared to one another and to clinical controls (i.e. those diagnosed with primary behavioral and/or emotional problems, but without AD/HD). All children completed a time-estimation task where they judged the duration of a 9-minute vigilance task (GDS) and a 9-minute videogame break. Other measures included a time-reproduction task using intervals of 2, 4, 12, 15, 45, and 60 seconds; the Boredom Proneness Scale (Farmer & Sundberg, 1986) modified for children; the Procrastination Scale (Scher & Osterman, 2002); and a standard neuropsychological battery.

Results : Results suggest a dramatic effect of interest level on time-estimation. Mean estimates were 3.05 minutes for the videogame and 24.75 minutes for the GDS. Reproduction intervals were consistently underestimated, especially at longer durations. Parent- but not self-report indicated a high level of procrastination, while parent- and self-reports of boredom proneness were similar.

Conclusions : Interest-level appears to have a pronounced effect on time-estimation in children with AD/HD. Relationships between interest-level and the other variables of interest (time-reproduction, boredom-proneness, procrastination, neurocognition) will be discussed.

Correspondence: *David D. Schwartz, Ph.D., Learning Support Center, Texas Children's Hospital, Clinical Care Center, Suite 1630, 6621 Fannin Street, Houston, TX 77030-2399. E-mail: ddschwar@texaschildrenshospital.org*

A.D. MATEREK, L.E. CUTTING & J.R. ABEL. Analytical Elements of Syntactic Processing in Older Children.

Objective: While numerous studies have investigated the role of syntactic comprehension in language acquisition, less research has been conducted with regards to online syntactic processing in children with reading disabilities (RD).

Participants and Methods : The present study examined both on-line and off-line sentence comprehension in 24 children (12 RD, 12 Control, ages 10 to 14). Participants were asked to listen to sentences of different syntactical structure and complexity (Subject-Subject; Subject-Ob-

ject) and subsequently answer true-false questions. The words in the sentences were presented one at a time auditorally, and participants controlled the presentation of the words by button press, with reaction time (RT) recorded for each word. Off-line comprehension was assessed by true-false questions after each sentence. Mean RT and accuracy of the true-false questions for both sentence types were correlated with phonological and working memory measures.

Results : Results indicated that all participants, regardless of group, correctly answered more true-false questions about Subject-Subject sentences than about Subject-Object sentences; however, control subjects were more accurate than RD subjects for both sentence types. On-line, there was a trend towards controls reacting slightly faster than RD subjects to Subject-Subject sentences, overall, as compared to Subject-Object sentences. Across both groups, phonological and working memory measures were correlated with Subject-Object, but not Subject-Subject accuracy, replicating previous findings that Subject-Object sentences place greater demands on memory.

Conclusions : Differences between RD and control groups remained significant when controlling for phonological and working memory, suggesting that older children with RD may exhibit difficulties with syntactic comprehension independent of their phonological deficits.

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*

B.R. WILLIAMS, E.H. STRAUSS, D.F. HULTSCH, M.A. HUNTER & R. TANNOCK. Inconsistency in Reaction Time Performance in Children with Attention Deficit Hyperactivity Disorder (ADHD).

Objective: Children with ADHD exhibit higher levels of reaction time (RT) inconsistency (moment-to-moment variation in performance) as compared to controls - an effect that has been attributed to periodic extremely slow responses. We examine this issue using methodology allowing for control of confounds related to repeated measurement.

Participants and Methods : Visual 2-choice RT data were examined in 158 children (6-12 years of age) across 3 groups: ADHD, ADHD + Reading Difficulties (RD), and healthy controls. Measures of inconsistency (i.e. within-subject SD) were taken separately across 32 trials, and in the fastest and slowest 25% of trials. Data were purified from the effects of practice and fatigue, and from group differences in mean RT.

Results : Those with ADHD exhibited higher inconsistency as compared to controls regardless of the presence or absence of RD. Behavioral ratings of symptom severity (inattention, and hyperactivity/impulsivity) were also related to inconsistency. Moreover, there was unique variation in inconsistency in the slow portion of the RT distribution that was attributable to symptoms of hyperactivity/impulsivity after controlling for inconsistency in the fast portion of the distribution.

Conclusions : This is the first study demonstrating that children with ADHD differ from controls on RT inconsistency while controlling for the effects of practice, fatigue, and group differences in mean RT. Limited evidence was provided to support the hypothesis that heightened inconsistency in ADHD children may be due to some mechanism selectively affecting the slow portion of the RT distribution. Further, this increased inconsistency in RT appears to reflect everyday functioning.

Correspondence: *Benjamin R. Williams, M.A., Department of Psychology, University of Victoria, P.O. Box 3050, Victoria, BC V8W 3P5, Canada. E-mail: benj@uric.ca*

J.A. MILLER, G.E. GETZ & S.A. LEFFARD. Neuropsychology and the Diagnosis of Learning Disabilities Under IDEIA 2004.

Objective: The United States government reauthorized its federal special education law in 2004 and the accompanying federal regulations were developed in 2005. In the latest version of the law, Individuals with Disabilities Education Improvement Act (IDEIA, 2004), the guidelines

for the assessment of specific learning disabilities were significantly changed. First, the ability-achievement discrepancy approach to diagnosis was deemphasized and, second, a response to intervention (RTI) approach was introduced. The recommendation to discontinue the ability-achievement discrepancy approach to diagnosis has a solid empirical base. However, the RTI approach lacks an adequate evidence base for its use for diagnosis or special education entitlement. The definition of a specific learning disability in IDEIA 2004 remains largely unchanged from previous versions of the law and continues to emphasize a cognitive processing basis to the disorder.

Participants and Methods : Applying a literature review and case example, the authors address the above changes to the special education law as well as the contribution neuropsychology can make to provide a diagnostic approach for specific learning disabilities.

Results : A neuropsychological approach to learning disability assessment is described. We further advocate for an integration of a neuropsychology-based processing approach to learning disability diagnosis and RTI.

Conclusions : We discuss the implications of these changes and recommendations to private practice developmental neuropsychologists and the international community.

Correspondence: *Jeffrey A. Miller, Ph.D., Duquesne University, 106B Canevin Hall, Pittsburgh, PA PA. E-mail: millerjeff@duq.edu*

G.E. GETZ, J.A. MILLER, H. MANGIS, M. STREET & M.D. FRANZEN. Behavior Rating Inventory of Executive Function in ADHD vs. Adjustment Disorder.

Objective: The Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy & Kenworthy, 2000) is a questionnaire developed for parents of school age children to assess executive function behaviors. Numerous studies have examined clinical populations utilizing the BRIEF. Specifically, as compared to children without clinical diagnoses, children diagnosed with ADHD have been shown to have significantly elevated scores on all subscales of the BRIEF, except on the Emotional Control subscale. However, it remains unclear as to whether differences consistently occur on the BRIEF in children diagnosed with ADHD and other clinical populations. The current study compared the scores of the BRIEF in children diagnosed with ADHD and children diagnosed with an Adjustment Disorder. It was hypothesized that the children diagnosed with ADHD would demonstrate significantly higher scores on all subscales of the BRIEF.

Participants and Methods : A retrospective chart review was conducted on 26 children diagnosed with ADHD and 12 children diagnosed with Adjustment Disorder. The groups did not differ in age, race, or sex.

Results : The results revealed that there were statistically significant differences between the two groups on all subscales ($t < 3.28$; $df = 36$; $p < .005$ for all cases) with the exception of the Emotional Control subscale ($t = 1.8$; $df = 36$, $p = .08$).

Conclusions : These results indicate that as compared to children diagnosed with Adjustment Disorder, children diagnosed with ADHD demonstrate more behavioral executive functioning difficulties as measured by the BRIEF. This suggests that the BRIEF may be sensitive in differentiating between ADHD and Adjustment Disorder. Future studies should continue to examine ratings on the BRIEF among different clinical populations.

Correspondence: *Glen E. Getz, Ph.D., Dept. of Psychiatry, Allegheny General Hospital, Four Allegheny Center, 5th Floor, Pittsburgh, PA 15212-5234. E-mail: ggetz@wpaahs.org*

M.M. MARTEL & J.T. NIGG. Executive Function, Speed, and ADHD Symptom Domains in Boys and Girls.

Recent multi-pathway models of ADHD hypothesize distinct streams of neuropsychological influence on symptoms of (a) inattention/disorganization and (b) hyperactivity/impulsivity. To evaluate this concept empirically, we previously showed in adults that executive function deficits

were related to ADHD inattentive symptoms, while speed deficits were related to both inattentive and hyperactive/impulsive symptoms (Nigg et al., 2005). In the present study we evaluated whether a similar pattern would hold in a sample of children. Participants were 266 children (174 boys), ranging in age from 6-13. Children and parents completed a multistage screening and diagnostic process. The sample includes non-ADHD Controls (n=80), ADHD Combined type (n=103), ADHD Inattentive type (n=40), ADHD hyperactive subtype (n=2), and ADHD-NOS (n=28). Children completed a neuropsychological battery designed to tap four basic components of executive functioning. Results from regression models looking at the joint effect of both symptom domains on neuropsychological scores indicated that key measures of executive function, namely response inhibition and set-shifting, were related to inattentive symptoms (Stop Signal Reaction Time [SSRT] $\beta=.35$, $p<.01$; Trails B Time, $\beta=.21$, $p<.05$) but not hyperactive symptoms. A key measure of speed (Trails A Errors) was related solely to hyperactive/impulsive symptoms ($\beta=.21$, $p<.05$). Some effects differed by child sex. Variability of reaction time was related to inattentive symptoms for girls ($\beta=.37$, $p<.05$) but not boys. Trails A Errors were related to hyperactive/impulsive symptoms for girls ($\beta=.54$, $p<.01$) but not boys. In conclusion, neuropsychological executive function deficits in ADHD may be related to specific symptoms domains, yet also differ by gender.

Correspondence: David J. Marks, Ph.D., Psychiatry, Mount Sinai Medical Center, 1 Gustave L. Levy Place, Box 1230, New York, NY 10029. E-mail: david.marks@mssm.edu

R.T. LAW & K.R. KRULL. Performance on a Word Selective Reminding Memory Test in ADHD Subtypes.

Objective: This study examined suggestions that individuals with Attention-Deficit/Hyperactivity Disorder (AD/HD) may differ in their efficiency of encoding and retrieving information based on their subtype of AD/HD.

Participants and Methods : Performance on the TOMAL Word Selective Reminding subtest was compared between children/adolescents diagnosed with AD/HD-Combined Type (AD/HD-C; n=22) and those diagnosed with AD/HD-Inattentive Type (AD/HD-I; n=22). The Buschke scoring method (Buschke and Fuld, 1974) was used to produce the following scores: Short-Term Recall (STR), Long-Term Retrieval (LTR), and Consistent Long-Term Retrieval (CLTR). STR refers to number of words recalled only after reminders, LTR is number of words recalled across two or more straight trials, and CLTR is number of words consecutively recalled without reminding for the remainder of the test.

Results : Independent T-Tests revealed no significant differences between the AD/HD-C and AD/HD-I groups. Because LTR and CLTR were significantly correlated with subject age ($r<.001$ and $r=.016$, respectively), differences in subtypes' memory scores were examined using ANCOVAs covaried by age, which revealed no significant differences. A trend toward an interaction was observed in LTR scores between subtype and age group (ages 9 and younger vs. 10 and older), but this interaction was only significant at the $p=.083$ level. This trend suggested that younger subjects had poorer long-term recall in the AD/HD-I group compared to AD/HD-C, whereas older children performed better in the AD/HD-I group.

Conclusions : Thus, no simple relationship was identified between AD/HD subtype and verbal encoding/retrieval, but there may be a subtle interaction between subtype and age that requires further investigation.

Correspondence: Robert T. Law, Ph.D., Schmieding Developmental Center, University of Arkansas for Medical Sciences, 3291 S. Thompson, Suite E-103, Springdale, AR 72764. E-mail: lawrobertt@uams.edu

N. CRAIG & R. KAPLAN. Diagnosing Adult ADHD: A Comparison of Two Continuous Performance Tests with a Symptom Checklist.

Objective: Although adult attention deficit hyperactivity disorder (ADHD) has generally gained acceptance as a valid condition, diag-

nostic controversies persist. Behavioral checklists and continuous performance (CP) measures are often used to help diagnose ADHD. We evaluated patients with a commonly used behavioral checklist and two commercially available continuous performance tests to compare subjective and objective indices of inattention and impulsivity, both symptoms of this disorder.

Participants and Methods : The participants were 37 referrals to the University of Connecticut Health Center ADHD Clinic. Each completed the Brown Attention Deficit Disorder (ADD) Scales, and was tested using the Conners' Continuous Performance Test II (CPT-II) and an abbreviated version of the California Computerized Assessment Package (CalCAP).

Results : Correlational analyses were conducted to examine the relationship between self-reported symptoms and performance on the CPT-II and CalCAP. There were few significant correlations between individual scores on the CPT-II and CalCAP. Similarly, there were almost no significant relationships between either the reaction time or accuracy measures of both CP tests and any of the individual Brown ADD Scales. Only the Clinical Confidence Index of the CPT-II, a composite score, was significantly correlated with the Brown ADD Scales.

Conclusions : In conclusion, self-reported symptoms of ADHD appear to be unreliable indicators of actual performance on objective testing, and there is a low correspondence between CP measures of reaction time and sustained attention.

Correspondence: Nancy Craig, M.A., University of Connecticut Health Center, 143 Elm Hill Rd., Vernon, CT 06066. E-mail: nancy.craig@sbcglobal.net

A.W. SHUNK, A.S. DAVIS & R.S. DEAN. Comorbidity Subtype Profiles for Attention Deficit Hyperactivity Disorder.

Objective: Individuals with a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) often have comorbid neuropsychiatric disorders. Secondary diagnoses can present additional challenges to the differential diagnosis of ADHD. The purpose of this study was to provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within the ADHD population and subtypes.

Participants and Methods : This study examined the secondary and tertiary diagnoses of 1010 individuals (mean age = 13.4 years; SD = 6.5) who were given a primary diagnosis of ADHD as the result of a comprehensive neuropsychological evaluation.

Results : An odds ratio revealed that 68% of the sample received a secondary neuropsychiatric diagnosis, 37% received a third diagnosis and 5% received a fourth diagnosis. Depression (14%), anxiety (12%), disruptive behavior (7%), PDD (4%), adjustment disorder (9%) and dyslexia (18%) were among the most common comorbid disorders. Subsequent subtype analysis revealed salient differences in prevalence rates of comorbid disorders among the predominately inattentive type (59%), hyperactive type (67%) combined type (83%) and NOS (71%). Depression and anxiety were most common in the combined subtype, while dyslexia and adjustment disorder were most common in the hyperactive and combined subtypes.

Conclusions : Results from this poster will help guide clinicians toward an accurate diagnosis for comorbid disorders among individuals who have ADHD. The combined type and hyperactive type were more likely to employ coexisting disorders than inattentive type.

Correspondence: Adam W. Shunk, M.A., Educational Psychology, Ball State University, 408 Darrell Drive, Muncie, IN 47303. E-mail: awshunk@bsu.edu

L. MCGRATH, C. HUTAFF-LEE, A. SCOTT, R. BOADA, L.D. SHRIBERG & B.F. PENNINGTON. Children with Comorbid Speech Sound Disorder and Specific Language Impairment Have Increased Rates of Attention-Deficit/Hyperactivity Disorder.

Objective: This study focused on the comorbidity between Attention-Deficit/Hyperactivity Disorder (ADHD) and Speech Sound Disorder

(SSD). SSD is a developmental disorder characterized by delays in producing intelligible speech. Previous research addressing the overlap of ADHD and SSD has typically used heterogeneous groups of speech-language disordered children, making the results difficult to interpret. This study employed more precise speech-language diagnostic criteria to create SSD subgroups. We predicted that SSD participants with comorbid specific language impairment (SLI) and persistent SSD would have increased rates of ADHD.

Participants and Methods : We recruited 108 children with SSD and 41 controls without SSD, aged 4-7 years. The SSD sample was further subdivided along two dimensions: (1) presence or absence of comorbid SLI and (2) persistent or resolved SSD. Parents and teachers provided ADHD ratings.

Results : Chi-square and ANCOVA analyses were used to compare ADHD diagnostic rates and ADHD symptom severity across subgroups. Results indicated that participants in the SSD + SLI group had higher rates of inattentive ADHD than those in the SSD-only and control groups, whose ADHD rates did not differ significantly. In addition, an unexpected interaction emerged such that children with SLI and resolved SSD had significantly higher ADHD inattentive ratings than the other subgroups.

Conclusions : One proposed explanation for this finding is that children with persistent SSD may possess a circumscribed phonological deficit that places them at risk for SLI only. In contrast, children with resolved SSD may possess a more general cognitive deficit that delays their speech acquisition and places them at risk for SLI and ADHD.

Correspondence: *Lauren McGrath, B.S., Psychology, University of Denver, 2155 S. Race St, Denver, CO 80209. E-mail: lmegrath@du.edu*

A.S. EVANS, A. PALAV, A. BOLLICH, J. WILSON & J. O'BRIEN. The Validity of the Test of Everyday Attention for Children (TEA-Ch) in Diagnosing ADHD in a Clinical Setting.

Objective: The Test of Everyday Attention for Children (TEA-Ch; Manly et al. 1999) is a new tool to assess attention, a core deficit of Attention Deficit/Hyperactivity Disorder (ADHD). The purpose of this study was to determine the validity of TEA-Ch subtests in making a diagnosis of ADHD in a clinical population.

Participants and Methods : Subjects were from a consecutive clinical sample (N=39; males=31; mean age=9.17;SD=2.17); exclusionary criteria included CNS dysfunction, significant psychiatric illness, or primary diagnosis of executive dysfunction. Unmedicated children diagnosed with ADHD-Combined-Type (ADHD-CT) (n=24; males=18) were compared to children without ADHD (n=15; males=13) on measures of selective visual attention, Sky-Search Accuracy (SSA) and Sky-Search Speed (SSS); sustained auditory attention (Score); and sustained divided visual/auditory attention (Sky-Search DT (SSDT)).

Results : Correlational analyses were used to examine the relationship between demographic variables and outcome variables. General linear multivariate analyses were used to compare groups on the four outcome variables: SSA, SSS, Score, and SSDT.

Correlations revealed a positive relationship between SSA and age ($r=.355$, $p=.002$) across groups; no other significant relationships between demographic and outcome variables emerged. Groups did not differ on the Peabody Picture Vocabulary Test-Third Edition (PPVT-III) ($t=-1.75$; $p=.1$). Multivariate analyses indicated significant group differences ($F(4,34)=2.82$, $p<.05$). Between-group effects revealed that the ADHD-CT group performed significantly poorer on SSA ($p<.05$) and SSDT ($p<.05$).

Conclusions : Results support usage of the TEA-Ch in diagnosing ADHD-CT in a clinical sample. Differences in SSA and SSDT support the assertion that executive functions, specifically visual attention and divided attention, are characteristic of ADHD-CT, as compared to other clinical populations. Correspondence: *Allison S. Evans, PhD, Neurodevelopmental Center, Memorial Hospital of RI/Brown Medical School, 555 Prospect Street, Pawtucket, RI 02860. E-mail: Allison_Schettini@brown.edu*

A.S. EVANS, A. BOLLICH, A. PALAV & J. WILSON. Distinguishing Executive Deficits Associated with Reading Disorders and ADHD.

Objective: The Delis-Kaplan Executive Function System (DKEFS; Delis et al., 2001), a new measure of executive abilities, may help elucidate deficits associated with Attention Deficit/Hyperactivity Disorder (ADHD) in children. The DKEFS use of standard scores on all trials of the Color-Word Interference Test provides a method of clarifying the impact of reading disorders (RD) on Stroop-tasks in children with and without ADHD.

Participants and Methods : The relationship of RD and executive deficits in children with ADHD and RD (ADHD+RD; n=10, males=7, age mean=11.53;SD=2.81), ADHD without RD (ADHD; n=16, males=11, age mean=12.41;SD=3.10), and clinical controls (n=11, males=8, age mean=12.36;SD=2.42) was examined.

Results : GLM analyses compared groups on Color-Naming (CN), Color-Word-Reading (CWR), Color-Word-Inhibition (CWI), and Color-Word-Inhibition-Switching (CWIS). There was a significant negative relationship between age and CN, CWI, and CWIS across groups ($p=.01-.05$); therefore age was covaried. Analyses revealed significant group differences ($F(8,62)=4.7$; $p<.001$). Between-group analyses indicated that group status significantly related to CWR, CWI, and CWIS ($p<.01$). Post-hoc analyses revealed that the ADHD+RD group scored significantly worse on CWR than the ADHD or Control groups. ADHD, regardless of reading ability, had a significant impact on CWI as compared to Controls. RD combined with ADHD performed significantly worse on CWIS than Controls; no other significant group differences emerged.

Conclusions : Results suggest that executive deficits may play a role in RD and support the usage of the DKEFS Color-Word Interference Test with this population. The age effect found across groups also suggests lack of development of executive abilities in untreated clinical populations, consistent with previous findings (Bollich et al., 2004).

Correspondence: *Allison S. Evans, PhD, Neurodevelopmental Center, Memorial Hospital of RI/Brown Medical School, 555 Prospect Street, Pawtucket, RI 02860. E-mail: Allison_Schettini@brown.edu*

S. DEY, B.F. SKOFF, K. BARRINGTON & L. MAR. Relationship between Executive Functions and Reading Problems in Children with ADHD.

Objective: Many studies have documented the increased incidence of reading problems (RP) in students diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). Recently, evidence indicates that deficits in executive functioning are commonly associated with ADHD. The present study was designed to determine the type of RPs common in students with ADHD, and to determine whether any specific executive functions may play a role in these problems.

Participants and Methods : We looked at reading rate, accuracy and comprehension using the Grey Oral Reading Test 4th Ed. (GORT-4) in a sample of 28 students diagnosed with ADHD. 2x2 chi-square analyses were then conducted to assess the relationship between reading measures and a battery of 10 tests used to assess executive functioning. Results from the GORT-4 indicated that 43% (N=12) of the students had RPs, as determined by a scaled score of 7 (16th %) or less: 11 had impaired reading rate, 7 had impaired reading accuracy, and none of the sample had impaired reading comprehension.

Results : Of the 10 measures of executive functioning, only deficits (SS < 7) on Planned Codes (Cognitive Assessment System) were significantly related to RPs, specifically impaired reading rate. This test is presumed to be a measure of planning, but also likely involves selective attention.

Conclusions : The results suggest that there may be a relationship between the executive deficits associated with ADHD and the prevalence and type of RPs in students with ADHD.

Correspondence: *Sangeeta Dey, PsyD, Neurodevelopmental Center, North Shore Children's Hospital, 57 Highland Ave., Salem, MA 01970. E-mail: sans25@hotmail.com*

T. HELLAND, S.H. OFTE & K. HUGDAHL. Level of Reading and Spelling at Age 6 in Children at Risk of Developing Dyslexia Corresponds with their Language Comprehension Skills at Age 5.

Objective: Does language comprehension in a group of 5-year olds at risk for developing dyslexia predict their reading/spelling skills at age 6? It was hypothesised that at-risk children at age 5 with impaired language comprehension would show low scores on reading/spelling tasks as well as cognitive tasks targeting dyslexia at age 6.

Participants and Methods : Subjects were 25 Norwegian at-risk children and 25 matched controls. Language comprehension scores at age 5 in the control group were used for sub-grouping the subjects into an m-group (median or above) and an bm-group (below median). WPPSI-scores at age 5 showed no subgroup differences. At age 6 the subjects were tested with multiple tasks within four domains: reading/spelling (R/S), working memory (WM), visuo-spatial skills (VS) and language (La). Scores within each domain were standardised and averaged into a single score. One-way ANOVAs with a Group (4: at-risk/m, at-risk/bm, control/m, control/bm) and Task (R/S, WM, VS, La) design was used, with Tukey HSD post hoc tests, all with an alpha level of $p < .05$.

Results : Lower scores were seen in the at-risk/bm subgroup vs. controls in all four domains, reaching significance for the R/S, WM, La, and close to significance for the VS domain.

Conclusions : Language comprehension skills at age 5 in children at risk of developing dyslexia seem to predict their reading/spelling skills at 6, ahead of formal training. Their impaired scores on the cognitive tests targeted for dyslexia underline this assumption, pointing to pre-literacy identification of dyslexia.

Correspondence: *Turid Helland, Ph.D, Psychology, University of Bergen, Christies gt. 12, Bergen 5000, Norway. E-mail: turid.helland@psy.uib.no*

H.N. BAWDEN, J.M. BYRNE & J. DOOLEY. Stability of Early Onset Attention-Deficit/Hyperactivity Disorder.

Objective: To examine the stability of behavior and neurocognitive abilities in young children with ADHD.

Participants and Methods : Fifteen preschoolers who met DSM-IV diagnostic criteria for ADHD and 15 typically developing preschoolers (Controls) completed diagnostic, neurocognitive, and behavioral assessments on two occasions, before they started school, and one year later. ADHD and Control participants were matched on gender, age, and socioeconomic status. Participants had normal language abilities, and no evidence of developmental delay, or neurological disorder.

Results : Paired comparisons revealed the following results: Diagnosis: 83% of participants retained their Preschool diagnosis. Neurocognition: ADHD preschoolers had more difficulty on measures of visual-spatial and phonological processing abilities than Controls, with the deficit in phonological processing persisting into Kindergarten. Memory: No between-group differences in verbal memory were evident on either occasion. Attention: Children with ADHD made more errors of omission on a checking type of task than Controls, but the difference only was significant when they were in Kindergarten. Externalizing Behavior: ADHD preschoolers were significantly more active and impulsive during the assessments than Controls, a pattern that persisted into Kindergarten.

Conclusions : The results indicated that: 1) ADHD can be diagnosed just prior to school entry; 2) The diagnosis of ADHD is relatively stable; 3) Phonological processing deficits have an early onset and appear stable; and 4) Attention deficits and behavior problems are apparent at an early age and are stable. Preschoolers with ADHD exhibit persistent and clinically significant behavior problems which warrant treatment. Correspondence: *Harry N. Bawden, Ph.D., Psychology, IWK Health Centre, 5850/5980 University Ave., P.O. Box 9700, Halifax, NS B3K 6R8, Canada. E-mail: harry.bawden@iwk.nshealth.ca*

M.Y. KIBBY & M.J. COHEN. Analysis of Children's Memory Scale Performance in Children with Dyslexia and/or ADHD.

Objective: Our goal was to compare how children with dyslexia and/or ADHD differed in performance on the Children's Memory Scale (CMS) when a clinical population was used.

Participants and Methods : Participants included 11 clinical controls, 18 children with dyslexia, 31 children with dyslexia and ADHD, and 52 children with ADHD. Participants completed the WISC-III or WISC-IV, components of the NEPSY, and the CMS.

Results : When controlling for unequal cell sizes, children with dyslexia+ADHD performed worse than those with ADHD only on Numbers Backward and Sequences. The rest of their performance on the CMS was comparable to the other groups, including Picture Locations. A Backward regression equation was performed with the total sample to see which cognitive abilities best predicted verbal working memory performance. When WISC VCI, NEPSY Phonological Processing and the NEPSY Tower were entered into the equation to predict Sequences, only Phonological Processing was predictive. In contrast, when focusing solely on children with dyslexia+ADHD doing the same regression equation, only the Tower was predictive of Sequences. For Numbers Backwards, Phonological Processing was predictive in the total sample, whereas nothing was predictive for those with dyslexia+ADHD. The results from the total group analyses remained the same when those with dyslexia+ADHD were excluded from the analyses.

Conclusions : Our results suggest those with comorbid dyslexia and ADHD have worse verbal working memory compared to those with ADHD alone. In addition, there may be different predictors of verbal working memory ability in those with comorbid dyslexia and ADHD compared to the rest of the sample.

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Correspondence: *Michelle Y. Kibby, PhD, Psychology, SIUC, 1125 Lincoln Dr. LSII, Rm. 281, Carbondale, IL 62901. E-mail: mkibby@siu.edu*

T. MONTIEL, E. MATUTE, C. HERNANDEZ & M. GUTIERREZ. Phonological Awareness in the Spanish-speaking School Age Child.

Objective: Achievement in phonological tasks is related to reading performance in childhood, and contributes to identify at-risk readers or dyslexics' children. More over, since reading acquisition can be influenced by the orthography proprieties of the language's written system, it is important to develop specific tools for reading evaluation for Spanish-speaking children. The aim of this study was to elaborate a phonological awareness abilities test for Spanish speaking children using three tasks levels: syllabic, intra-syllabic and phonemic.

Participants and Methods : One hundred and nineteen Spanish-speaking children (61 girls and 58 boys) ages 6 to 12 years old, were selected from one public and one private school in Guadalajara, México. The Evaluación de Conciencia Fonológica en Escolares- ECOFONE (Phonological awareness Assessment in the School age child), includes 10 phonological tasks, two of them assess the syllabic level: "syllable decoding", "syllable counting", other two tasks are related to the intra-syllabic level: "rime detection", "onset detection", and six tasks assess the phonemic level: "phonemic deletion", "word phonemic decoding", "non-word phonemic decoding", "phonemic substitution", "word phonemic blending" and "non-word phonemic blending".

Results : The effects of age and school grade are analyzed. Reliability and validity indexes were calculated.

Conclusions : The ECOFONE may fulfill the need for comprehensive, reliable, and objective evaluation of phonological awareness in Spanish-speaking children

Correspondence: *Esmeralda Matute, PhD, Instituto de Neurociencias, Universidad de Guadalajara, Rayo 2611, Col. Jardines del Bosque, Guadalajara 44520, Mexico. E-mail: ematute@cencar.udg.mx*

A.S. PRESTON, S.C. HEATON, G. SELKE & S. SIDDIQI. Effects of ADHD Medications on Behavior and Attentional Test Performance.

Objective: The most common treatment for ADHD is stimulant medication. According to parent and teacher behavior reports, medication successfully reduces symptoms in approximately two-thirds of cases. Previous studies suggest that some children treated with stimulant medication additionally perform better on Continuous Performance Tasks (CPTs). However, it is unclear whether stimulants more broadly improve performance on other tasks of attention. Therefore, in addition to expecting to replicate medication effects on the CPT-II and CPRS, we hypothesized that performance on TEA-Ch tests of sustained attention and attentional control would be significantly improved in the medication condition compared to the placebo condition.

Participants and Methods: Participants consisted of 20 children, ages 6-15, diagnosed with ADHD and taking a stable dose of stimulant medication for at least two months. The current study used a double-blind placebo-controlled design to assess the effects of traditional stimulant medications (e.g. Methylphenidate, Concerta, Adderall) on a multidimensional battery of attention (TEA-Ch, Conners' CPT-II, and CPRS parent ratings).

Results: Within-group comparisons did detect significant improvement in CPT-II performance (Confidence Index Score and Response Time Variability) and significant reduction in parent ratings of inattentive behaviors (CPRS DSM-IV Inattentive scale). However, analyses demonstrated no evidence of significant statistical or clinical changes on any TEA-Ch composite scales between the placebo and medication conditions.

Conclusions: These findings suggest that whereas parent-reported inattentive behaviors and performance on some attentional measures improve with medication for ADHD, others do not. Further study is needed to determine the reason that stimulant medication affects performance on some attentional measures but not others.

Correspondence: *Andrew S. Preston, M.S., Clinical and Health Psychology, University of Florida, 4357 SW 20th Lane, Gainesville, FL 32607. E-mail: apreston@phhp.ufl.edu*

L. BLASKEY, F. FERREIRA & J.T. NIGG. Inhibitory Language Deficits in Attention Deficit/Hyperactivity Disorder and Reading Disorder: A Candidate Shared Deficit.

Objective: Studies in the cognitive literature support a role for inhibition in language processing, but the developmental implications of these findings have not been widely explored. This study examined whether inhibitory mechanisms that protect language comprehension are impaired in children with Attention Deficit/Hyperactivity Disorder (ADHD) and Reading Disorder (RD), and whether such inhibitory deficits, if they exist, clarify the etiology of the high rate of co-occurrence between the two disorders.

Participants and Methods: Participants were 97 children aged 7 to 14 who were classified as ADHD, RD, or non-disordered control via thorough diagnostic assessment, including a structured diagnostic interview and parent and teacher behavioral ratings. Two language comprehension tasks from the cognitive literature believed to probe inhibitory mechanisms were used: 1) a sentence-level lexical ambiguity task (Gernsbacher, Robertson, & Werner, 2001) that measured interference control, and 2) a syntactic garden path revision task (Christianson, Hollingworth, Halliwell, & Ferreira, 2001) that examined use of semantic cues to revise misinterpretations on-line during sentence comprehension.

Results: Categorical and dimensional analyses revealed that: (a) higher levels of inattention and (b) ADHD diagnosis were associated with poorer inhibitory control of irrelevant information during lexical ambiguity resolution (e.g., $r=.26$, $p<.05$) and with decreased ability to revise or suppress misinterpretations after syntactic garden paths (e.g., $r=.32$, $p<.01$). Girls with ADHD were more impaired than boys. In children with RD, lower-order language problems affected higher-order inhibitory processes during language comprehension, yielding findings similar to those for ADHD.

Conclusions: The pattern of results for children with ADHD and children with RD suggested that they share inhibitory language deficits in higher-order language comprehension but that these may develop via different pathways.

Correspondence: *Lisa Blaskey, Ph.D., Psychiatry, Psychology Assessment Center, Massachusetts General Hospital, 5 Emerson Place, Suite 105, Boston, MA 02114. E-mail: lblaskey@partners.org*

A.S. PRESTON, S.C. HEATON, E.B. FENNELL, T. SCHWARTZ & S. MCCANN. Relationship Between Attentional Skills and Academic Achievement in ADHD.

Objective: Despite the high comorbidity between ADHD and Learning Disabilities, little is known about the relationship between performance on attentional tasks and tests of academic achievement. We hypothesized that performance on attentional tests would account for a significant amount of variance in scores on tests of academic achievement.

Participants and Methods: The current study assessed 43 children, ages 6 to 15, diagnosed with ADHD. Approximately half of the participants ($n=23$) were taking stimulant medication at the time of testing, although study findings were not impacted by medication status. Participants completed tests of IQ, academic achievement (WIAT), and attention (TEA-Ch), as well as parent ratings of inattentive behaviors (CPRS DSM-IV Inattentive scale). A multiple regression analysis was performed, entering Verbal IQ and CPRS DSM-IV Inattentive scores into the model first. Attentional performance scores (3 TEA-Ch composites) were entered as the predictor variables and performance on the WIAT Reading, Math, and Spelling tests as dependent variables.

Results: Our results demonstrate that performance on the TEA-Ch attentional control/switching tests accounted for a significant amount of the variance in performance on WIAT reading, math, and spelling, even after accounting for the variance from Verbal IQ and parent-reported inattentive behaviors. Additionally, TEA-Ch sustained attention predicted a significant amount of the variance in the WIAT math test but not on reading or spelling. TEA-Ch Selective attention did not account for a significant amount of variance on any WIAT test.

Conclusions: Results suggest that attention, specifically attentional control/switching, is an important function in academic performance above and beyond verbal intelligence and inattentive behaviors.

Correspondence: *Andrew S. Preston, M.S., Clinical and Health Psychology, University of Florida, 4357 SW 20th Lane, Gainesville, FL 32607. E-mail: apreston@phhp.ufl.edu*

P. CIRINO, L. EWING-COBBS, M. BARNES & J. FLETCHER. Cognitive Arithmetic Differences in Learning Disability Groups and the Role of Behavioral Inattention.

Objective: Attention difficulties are common in children with learning disabilities although little is known about whether arithmetic processing profiles in children with different types of learning disabilities vary as a function of attention problems. The objective of this study was to examine behavioral inattention in relation to group differences in arithmetic processing.

Participants and Methods: Participants were a community sample of 292 3rd and 4th grade students with reading and/or math disabilities, or controls (51 MD, 66 RD, 89 MDRD, and 86 Controls). Students were administered measures of cognitive addition, subtraction, and estimation. Performance across groups was compared using ANCOVA (with and without covariation for behavioral inattention and interactions).

Results: Groups did not differ on cognitive addition accuracy; however, reaction times of the MDRD and MD groups were slower than other groups, and MDRD were more variable than other groups ($p < .05$).

For cognitive subtraction, MDRD was less accurate than MD, who in turn were less accurate than Controls (all $p < .05$). Overall reaction times did not vary greatly overall by group. For cognitive estimation, MDRD and MD were less accurate than other groups ($p < .05$), and again fewer reaction time differences were noted.

Conclusions : The results are consistent with previous studies reporting similarities among children with MD or MDRD relative to other groups as well more severe processing deficits in children with MDRD. In general, behavioral inattention was also related to math performance, but did not interact with group differences, and group differences remained whether or not behavioral inattention was also considered.

Correspondence: *Paul Cirino, Ph.D., University of Houston, Dept. of Psychology, Ste. 126, Heyne Bldg., Houston, TX 77204. E-mail: pcirino@uh.edu*

Normal Aging

A.A. NELSON, M.A. BATTISTA, P.C. LEBBY & M. CANFIELD. The Cost of Switching: The Relationship Between Switch Costs and D-KEFS Trails Performance in Healthy Older Adults.

Objective: The purpose of this study was to provide validation for a popular test of executive functioning by examining its relationship with an experimental paradigm, which reliably captures components of executive control. This study also aimed to examine the effects of normal aging on set switching. The main hypothesis of this study was that the switching required for Condition 4 of the Trails subtest from the Delis-Kaplan Executive Function System (D-KEFS Trails) would share significant variance with alternation switches in the experimental task. The secondary hypothesis was that age would be significantly related to switching after controlling for baseline processing speed.

Participants and Methods : Forty-six healthy community-dwelling participants between the ages of 55 and 80 were recruited from the community. D-KEFS Trails was administered in a standardized format and the set switching task was administered according to the methodology reported in recent studies.

Results : Bivariate correlations revealed no significant relationships between D-KEFS Trails derived switching scores and the alternation condition of the set-switching task. Pearson correlations indicated that age was significantly associated with global but not local switch costs.

Conclusions : The current results do not support recent research that has observed a relationship, in younger adults, between alternation switches on the original TMT and alternation switches in this same set switching paradigm. The current study provides preliminary evidence, however, that D-KEFS Trails may be related to other switching constructs. The current study did not observe unique age-related decline in switching per se but identified an age-related decline in performing under the condition of a switch.

Correspondence: *Adam A. Nelson, PhD, VA Northern California Health Care System, 150 Muir Road, Martinez, CA 94553. E-mail: adamnel@yahoo.com*

M.C. GREENAWAY, G.E. SMITH, R.J. IVNIK & M.M. MACHULDA. Mayo's Older Americans Normative Studies (MOANS): Factor Analysis of an Expanded Neuropsychological Battery.

Objective: The original Mayo Cognitive Factor Scores were derived from a "core battery" consisting of the WAIS-R, WMS-R, and AVLT. The present study sought to clarify the factor structure of an expanded neuropsychological battery administered to normal controls as part of the Mayo Alzheimer's Disease Patient Registry.

Participants and Methods : Confirmatory factor analysis was performed on the WAIS-III, WRAT-3 Reading, Boston Naming Test, COWAT, Category Fluency, Rey-Osterrieth Complex Figure, Visual Form Discrimination, and Trail Making Test A & B performances of 314 normal elderly subjects. LISREL software was utilized to assess five a priori hypothesized factor models.

Results : A base four-factor model consisting of Verbal Comprehension, Perceptual Organization, Working Memory, and Processing Speed was utilized, consistent with the WAIS-III factor structure. No five factor model improved upon this base model, including no separate factor for "flexibility of thought" or division of construction/visuospatial ability, processing/motor speed, or "hold/no hold" language abilities. Allowing suggested modification indices improved the four-factor model, with WAIS-III arithmetic loading on both WM and PO factors, COWAT loading on VC and PS, Category Fluency loading only on PS, and WRAT-3 Reading loading on VC and WM.

Conclusions : Factor analysis of commonly used neuropsychological instruments in a normal elderly sample revealed the addition of non-memory measures to the WAIS-III did not produce novel factors, but instead supported the four WAIS-III factor scores. Thus, interpretation that these tests create cognitive domains beyond the WAIS-III factors may be unfounded. The application of this factor structure to clinical samples will require future study.

Correspondence: *Melanie C. Greenaway, Ph.D., Mayo Clinic, 200 1st St SW, Rochester, MN 55905. E-mail: chandler.melanie@mayo.edu*

F. MORENO-MARTINEZ & H. PERAITA. A new set of items for evaluation of living / nonliving dissociations with norms collected from healthy elderly Spanish.

Objective: We present a set of indexes of the properties of a body of 112 color photographs belonging to 14 semantic categories, half are living things (LT), and the other half are non-living things (NLT). These items were standardized in a group of healthy elderly Spanish controls on factors considered important by literature. This new set of items could provide a useful supplement to the commonly used Snodgrass and Vandervort corpus, specially with Spanish elderly population.

Participants and Methods : Sixty two native elderly Spanish speakers (mean = 67.2 years old) participated in this study. As in other normative studies, participants had to evaluate (with a Likert type scale) the following factors of each item: familiarity, visual complexity, age of acquisition, and object's manipulability. Furthermore, they had to indicate the name of each item.

Results : We calculated internal global consistency of each factor (reliability) with Cronbach coefficient α , as well as validity of the study by comparing our results with other Spanish and Anglo-Saxons studies calculating correlations among the factors.

Conclusions : Our study shares characteristics with other similar works, furthermore, it has high reliability indexes. We believe our norms provide a methodological tool for Spanish researchers. These items could be used in studies on semantic category-specific impairment in Spanish population, particularly in Alzheimer's disease, as well as in other brain pathologies, since they were elaborated according to theoretical controversy about the existence of LT / NLT dissociations in those populations. This study is particularly relevant in Spain, where we have not available many normative studies, and, to our knowledge, there are not works focused exclusively on elderly population.

Correspondence: *Francisco Javier Moreno-Martinez, PhD, Psicología Básica I, U.N.E.D., C/ Juan del Rosal, n[º] 10, Madrid 28040, Spain. E-mail: fmoreno@bec.uned.es*

H. YOO, J. LEE & K. DO. Age differences in integrating and coordinating visual and verbal information.

Objective: This study shows age differences among adults in their working memory abilities to integrate and coordinate multiple sources of information.

The paradigm that we used to study was originally developed by Yee, Hunt, & Pellegrino (1991). Two types of experimental situations that require a simultaneous management of multiple information sources were employed in the experiments. One type of situation, referred to as coordination, is a dual-task paradigm in which participants perform two tasks simultaneously. The key feature of coordination tasks is that the information from the two tasks is unrelated. A second type of information management situation, called integration, also requires participants to process two information sources simultaneously. In this case, however, the two sources of information are related to each other. Based on prefrontal theory of cognitive aging, we proposed that the central executive component of working memory plays a major role in integration, and that the performance in integration task declines with the aged.

Participants and Methods : 20 young participants and 16 old participants performed the coordination task, integration task. We measured response time and accuracy.

Results : Young participants showed a longer response time in coordination task than in integration task. In contrast to young participants, old participants showed a longer response time in integration task than in coordination task.

Conclusions : Main finding can be summarized as follows: First, young adults performed the integration task easier than coordination task. Second, old participants showed some difficulties in performing the integration task because of decline in executive function of working memory. Correspondence: *Hyunjoo Yoo, Psychology, Sungkyunkwan Univ., Psychology, Sungkyunkwan Univ., Myeoungnyun-dong3-ga Jongno-gu, Seoul 110745, South Korea. E-mail: hjyoo@skku.edu*

A.M. BRUSHFIELD, E. PIROGOVSKY, S. FERDON, M. MORELAND, B. CALLAHAN, R.J. HERNANDEZ, P.E. GILBERT & C. MURPHY. Differential Effects of Normal Aging on Memory for Odor-Place and Object-Place Associations.

Objective: The objective was to examine age-related impairments in odor-place and object-place associative memory.

Participants and Methods : Participants included healthy older adults over the age of 65 (n=28) and young adults 18-28 years of age (n=28). Twelve spatial locations were defined on a tabletop board positioned in front of the participant. Either 6 odors or 6 objects were presented one at a time and each was paired with a location on the board. The participant then was presented with each stimulus individually and asked to place it in its paired location.

Results : A 2 x 2 ANOVA was used to analyze the data. Older adults committed significantly more errors than young adults on the odor-place task. There were no significant differences detected between the two groups on the object-place task. Older adults committed significantly more errors on the odor-place task compared to the object-place task. However, there were no significant differences detected between the two tasks in young adults. Item recognition memory for the individual stimuli or locations used on the associative memory task was similar in both groups, indicating that the impairment in odor-place memory in older adults was not due to impaired memory for the individual components of the associations.

Conclusions : The results suggest that odor-place associative memory is particularly sensitive to age-related brain changes.

Correspondence: *Andrea M. Brushfield, BA, Psychology, San Diego State University, 5922 Rancho Mission Rd, Unit 70, San Diego, CA 92108. E-mail: andreamarie_78@hotmail.com*

T.D. VANNORS DALL, M. KRAUT, L.R. KINGERY, S. STERN, S.R. WALDSTEIN, G.D. PEARLSON & D.J. SCHRETLEN. Relationship of White Matter Hyperintensity Volumes with Cognitive Function in a Community Sample.

Objective: The severity of cerebral white matter hyperintensities (WMH) has been associated with neuropsychological deficits, particularly in

the areas of psychomotor speed and executive functioning. However, most investigations have relied on visual semi-quantitative ratings of WMH severity. In this study, we measured the aggregate volumes of WMH in various brain regions, and correlated these measurements with performance on multiple neuropsychological tests in a broadly representative sample of community-dwelling adults.

Participants and Methods : Participants were 230 reasonably healthy adults enrolled in the Johns Hopkins Aging, Brain, and Cognition Study of normal aging. We measured total, periventricular, and subcortical WMH volumes via manual tracing on axial T2 and proton density brain magnetic resonance images. Participants completed a comprehensive battery of neuropsychological tests. Pearson correlation with and without adjustment for age and education was used to examine the relationship between WMH volumes and test performance.

Results : Consistent with prior research, greater WMH volumes were modestly but significantly associated with poorer psychomotor speed, memory, and executive functions. While the magnitudes of these relationships were attenuated by removing variance associated with age and education, verbal memory and fluency remained significantly associated with total, periventricular, and subcortical WMH volumes. Poorer visual-constructional ability was also associated with greater subcortical WMH volumes. Participants with the highest quartile of aggregate WMH volumes performed significantly worse on tests of psychomotor speed and visuospatial learning.

Conclusions : Aggregate WMH volumes have small but statistically significant associations with psychomotor speed, memory, and executive functions, independent of age and education.

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*

J.L. PAXTON, T.J. HEAVEN, D.M. BARCH & T.S. BRAVER. Age Differences in Sustained and Transient Prefrontal Activity During Performance of a Cognitive Control Task.

Objective: Previous studies demonstrate that older adults are impaired relative to young adults on the AX-CPT task assessing the context processing component of cognitive control. Young adults show significant activation in the dorsolateral prefrontal cortex (PFC) while performing this task. A question arises about whether old adults will show increased PFC activation relative to young adults, potentially as a means of compensating for age related changes in context processing.

Participants and Methods : Using a mixed state-item design, we compared sustained and transient PFC activity in older and young adults while performing the AX-CPT task. Sixteen healthy older adult and 16 young adult participants were scanned while performing the AX-CPT task. BOLD signal was extracted using a 1.5T Siemens (TR = 2500 - 7500 ms, TE = 50 ms, flip = 90) with 3 runs of 40 trials. Functional images were movement corrected, co-registered, smoothed, and pooled across participants. Regions showing significant sustained or transient activation were identified using a conjunction approach.

Results : In this sample, older and young adults did not differ significantly in errors or reaction times. Older adults showed significantly greater sustained activation in PFC regions compared with young adults. In older adults, PFC activation correlated positively with a behavioral indicator of context processing ability. Transient activation in PFC regions was significantly greater in young adults, with temporal dynamics that suggested a proactive use of context.

Conclusions : The increased sustained activation of PFC regions in older adults combined with behavioral performance equivalent to younger adults may represent compensation for age-related deficits in context processing abilities.

Correspondence: *Jessica L. Paxton, Psychology, Washington University in St. Louis, Box 1125, One Brookings Drive, St. Louis, MO 63130. E-mail: jlpaxton@artsci.wustl.edu*

C.S. BLOSS, D.C. DELIS, A. JAK, M.W. BONDI, A.E. KANE & D.P. SALMON. The APOE-e4 Allele is Independently Associated with Lower Educational Attainment in an Elderly Sample.

Objective: Studies have reported a relationship between the APOE-e4 genotype and cognitive changes in normally-functioning elderly, middle-aged, and even young adults. Based on these findings, we hypothesized that the APOE-e4 genotype influences cognitive development in early life. As a preliminary test of this hypothesis, we assessed the degree to which this genotype is related to a proxy for early cognitive development, that is, years of educational attainment.

Participants and Methods : Normal control subjects (NC; n=266) and individuals with possible or probable Alzheimer's disease (AD; n=396) participated in the study. The mean age of study participants was 74 years (range 51 - 97). Hierarchical multiple regression was employed to test differences in mean years of education attained between three genotype groups (e4-positive, n=292; 3/3 homozygotes, n=302; e2-positive, n=53) and diagnostic category. In the first model, a set of dummy-coded variables representing the genotype groups were entered into the regression equation. In model two, diagnostic category was added to the equation.

Results : Model one revealed that e4-positive individuals attained significantly fewer years of education (14.3) relative to both e2-positive individuals (15.9; $p < .05$) and 3/3 homozygotes (14.8; $p < .05$). Model two revealed that individuals with AD attained significantly fewer years of education (14.2) than NC subjects (15.4; $p < .05$). However, the difference in years of education attained between e4-positive individuals and e2-positive individuals persisted ($p < .05$), even after taking into account diagnostic category.

Conclusions : These findings suggest that the e4 allele may be independently associated with lower educational attainment, and thus may exert influence on early cognitive development.

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*

K.J. BANGEN, K. RESTOM, T.T. LIU, A.J. JAK, S.D. HAN, A.S. FLEISHER, D.P. SALMON, L.J. THAL & M.W. BONDI. Age-Related Changes in Baseline Hippocampal Perfusion: An Arterial Spin Labeling Study.

Objective: Arterial spin labeling (ASL) is a magnetic resonance imaging (MRI) technique designed to directly measure cerebral blood flow. Using ASL, we assessed age-related changes in baseline hippocampal perfusion. We hypothesized that hippocampal perfusion would be reduced in older adults relative to young adults due to possible brain atrophy and cerebrovascular changes that occur in aging.

Participants and Methods : High resolution 3D FSPGR T1 weighted and PICORE/QUIPSS II ASL perfusion MRI scans were acquired during rest for 8 non-demented older adults (mean age = 79.3 years) and 5 young adults (mean age = 26.0 years). Regions of interest (ROIs) manually outlined in native space were used in the calculation of hippocampal perfusion.

Results : T-tests were performed comparing hippocampal perfusion between the two age groups. Marginally significant reductions in perfusion in both left ($p = .054$) and right hippocampi ($p = .055$) were observed in older relative to young adults. Additional t-tests demonstrated that right and left hippocampal volumes were significantly reduced in older compared to young adults ($p = .019$ and $.026$, respectively). However, these hippocampal structural differences between the two age groups were no longer significant once corrected for total brain volume. Hippocampal perfusion also demonstrated trends toward associations with cognition and vascular risk as measured by the Hachinski Ischemia Score.

Conclusions : Our findings provide evidence for age-related changes in hippocampal perfusion co-occurring with age-related structural changes. These results have implications for functional neuroimaging studies and support the utility of techniques designed to quantify cerebral blood flow.

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*

K. LUKATELA, J. CHASMAN, M. VRACEVIC, T. ANDY & M. BUTTARO. Executive Frontal Lobe Functions in Healthy Elderly with Active Lifestyle.

Objective: Cognitive studies of aging often neglect to control for non-age-related factors, such as lifestyle. In the present study our goal was to examine the effects of age on some of the frontal lobe functions while controlling for lifestyle factors.

Participants and Methods : Two groups of healthy, community dwelling elderly, younger group (age 65-74; n=13) and older group (age 75-84; n=12), were compared on their performance on frontal lobe tests involving speed, task switching, and inhibitory mechanisms. These tests included verbal fluency tests (phonemic and semantic), Trail Making Test A&B, and Stroop. Lifestyle factors were assessed with a Life Style Rating Scale (21 items, 5-point scale) that was constructed specifically for this study to measure different aspects of intellectual, leisure, social, and physical activities.

Results : Thus far our analysis is limited to active elderly and shows that the two age-groups did not differ on control measures such as education, and measures of intelligence and lifestyle. The age-groups did differ significantly on measures that involve task switching and response suppression such as Trails B ($p < .01$) and Stroop Color-Word ($p = .04$). The age-groups did not differ on measures of basic attention and speed (Trails A, Stroop-Color) or on the verbal fluency tests.

Conclusions : Our results indicate that aging in highly active elderly has selective effects on their performance on frontal tests with verbal functions being less age-sensitive while functions involving inhibitory mechanisms such as response suppression being more age-sensitive.

Correspondence: *Katarina Lukatela, Ph.D., Psychology, University of Connecticut, 406 Babbidge Rd., Storrs, CT 06269. E-mail: KLukatela@charter.net*

B.B. CONNOR, J. APPELMAN, N.M. JOYCE, R.A. WOOD, O.N. AH-SANUDDIN, J.A. HARDY, K.N. SCHILLING, B.L. COOK, D.F. BRENNER, J.A. DEWEY, D.M. GOLDMAN, H.W. MAHNCKE & M.M. MERZENICH. Enhancement of Neurocognitive Function in Healthy Older Adults Using a Novel Brain Plasticity Training Program.

Objective: This study extends the results of previous studies using a novel brain-plasticity based training program designed to enhance memory and cognition in older adults. We report initial results from a pilot randomized controlled trial of this training program in community dwelling healthy older adults who were younger and had a broader range of cognitive abilities than the previously studies.

Participants and Methods : Ninety-eight normal older adults (mean age = 71.2; range = 60-87) were randomly assigned to treatment, active control, or no contact groups. Treatment and active control groups trained on a computer for 60 minutes/day, 5 days/week for approximately 40 hours. Standardized neuropsychological outcome measures were administered pre- and post-training, including the RBANS.

Results : Initial inspection of the data showed a significant relationship between pre-training RBANS Total score and change scores in the treatment group ($p < .05$); participants with lower pre-training scores showed larger improvements; no such relationship was seen in either control group. Examination of participants with pre-training RBANS Total score of < 115 showed a significant improvement (5.5 points). Change scores were largely driven by improvements in delayed memory ($p < .05$). Improvement was not found in treatment group with pre-training RBANS Total score of > 115 . No significant change in either control group was seen regardless of pre-training RBANS Total score.

Conclusions : This form of brain-plasticity based training can drive generalized improvements in standardized measures of neuropsychological function in older adults functioning cognitively at levels up to substantially above average. Whether the inability of higher functioning individuals to show gains is due to ceiling effects of training program or of the outcome measures is the focus of current investigations. Correspondence: *Bonnie B. Connor, PhD, Research & Outcomes, Posit Science, 114 Sansome Street, San Francisco, CA 94104. E-mail: bonnie.connor@positscience.com*

Symposium 16

3:15–4:45 p.m.

Diffusion Tensor Imaging: Applications to Neuropsychological Research

S. MORI. Principle, Applications, and Limitations of Diffusion Tensor Imaging.

Diffusion tensor imaging (DTI) is an exciting new MR modality that can visualize white matter anatomy. However, its application to clinical studies is still limited. DTI provides two types of new anatomical information. One is diffusion anisotropy and the other is fiber orientation. Anisotropy can be presented as a scalar value and provides a new type of image contrast. Interpretation of increase or decrease of anisotropy is, however, far from clear. Unlike conventional relaxation-based contrast, there are many anatomical factors that change diffusion anisotropy. Fiber orientation information can reveal intra-white matter architecture. There are no other methods that can provide equivalent information non-invasively. The shortcoming is that quantification is not straightforward.

To deal with these advantages and disadvantages of DTI, it is very important to understand how DTI raw data are acquired and what kinds of simplifications and assumptions we make during data processing. In this presentation, I would like to go over important aspects of DTI data acquisition and theory. Several application studies will be introduced and important limitations as well as promising futures will be discussed. Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

J. RANJEVA, B. AUDOIN, M. AU DONG, S. CONFORT-GOUNY, J. PELLETIER & P.J. COZZONE. DTI and FMRI to Study Working Memory in Early Multiple Sclerosis.

At the very early stage of multiple sclerosis (MS), a multifocal demyelinating disease, cognitive impairments appear limited to attentional working memory and conflict monitoring capacity. We suggest that this pattern might be related to disruption of neural connections among cortical associative areas, occurring as a consequence of diffuse demyelination processes.

However, morphological substrates of such cognitive impairments are not well characterized. Lesion volume and brain atrophy as depicted by conventional MRI do not correlate with these clinical impairments. In contrast, advanced MRI acquisitions such as diffusion tensor imaging (DTI) or magnetization transfer ratio (MTR) imaging allow to evidence subtle tissue damage, even in the normal appearing white matter (NAWM) and in gray matter by using histogram metrics or statistical mapping analyses of fractional anisotropy, mean diffusivity and MTR

maps. Recent studies demonstrate that DTI and MTR parameters measured in NAWM correlate to working memory task performances. In addition, fMRI studies suggest the presence of compensatory mechanisms inside the working memory network, involving variations in brain activities and in hierarchical organization.

We present and discuss the added values of multimodal MRI protocol including DTI, MTR and fMRI that allows to better characterize both structural and functional brain changes related to dysfunction of working memory network in early MS patients.

Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

G. MOELLER, K.M. HASAN, J.L. STEINBERG, L.A. KRAMER, D.M. DOUGHERTY, R.M. SANTOS, I. VALDES, A.C. SWANN, E.S. BARRATT & P.A. NARAYANA. Diffusion Tensor Imaging and Behavior in Cocaine Dependence.

The purpose of this study was to compare corpus callosum white matter integrity as measured by diffusion tensor imaging (DTI) between 18 cocaine dependent subjects and 18 healthy controls, and to determine if any differences between groups were related to impulsivity. The Barratt Impulsiveness Scale (BIS-11) and a continuous performance test: the Immediate and Delayed Memory Task (IMT/DMT) were collected as measures of impulsivity. Results of the DTI showed significantly reduced fractional anisotropy (FA) in the genu and rostral body of the anterior corpus callosum in cocaine dependent subjects compared to controls. Within cocaine dependent subjects there was a significant negative correlation between FA in the anterior corpus callosum and behavioral laboratory measured impulsivity. Since FA is affected both by the state of myelin and axonal structure, further analyses were performed to gain more information about the underlying pathology related to these findings. Diffusion tensor eigenvalues, which represent diffusion along the fiber tract (l1) or perpendicular to the fiber tract (lt), provide enhanced pathologic specificity compared to FA and mean diffusivity indices. Group comparisons of eigenvalues showed a significant increase in lt in the genu of the anterior corpus callosum in cocaine dependent subjects compared to controls. There was no significant difference in l1 between groups. Based on prior studies suggesting that alteration or damage to myelin increases diffusion normal to the direction of fiber tracts (lt) with minimal effect on l1 our findings are consistent with altered myelin in the anterior corpus callosum in cocaine dependent subjects.

Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

E.V. SULLIVAN, E. ADALSTEINSSON & A. PFEFFERBAUM. White Matter Integrity Quantified with Diffusion Tensor Imaging and Fiber Tracking in Normal Aging and Chronic Alcoholism.

In the quest for identification of brain mechanisms underlying disruption of cognitive and motor functioning by aging and disease, neuropsychology is shifting focus from single brain loci to systems. This shift heralds the relevance of connecting elements of brain circuitry and the possibility that disruption of connections are effective in producing functional impairment. Diffusion tensor imaging (DTI) and tractography reveal regional patterns of sparing and disruption of white matter microstructure, even in conditions exerting subtle effects, including normal aging and alcoholism. In aging, DTI studies reveal regional variability and declines in anisotropy in healthy men and women. Aging shows an anterior-posterior gradient of anisotropy decline with selective disruption of supratentorial frontally-based fibers. In complement to anisotropy, diffusivity increases with age. Using quantitative fiber tracking, we found an anteroposterior gradient in anisotropy, diffusion, and number of fibers in older compared with younger adults, the extent of which predicted

Stroop test word reading. In chronic alcoholism, our DTI studies indicate significant deterioration in the size and tissue quality of the corpus callosum that was equivalently present in men and women, endured at least through the early period of recovery, and contributed to performance deficits in working memory, visuospatial ability, interhemispheric information transfer, and gait and balance. The interaction of alcoholism and age exerted a compounded untoward effect on callosal microstructure. Observation of expected associations and double dissociations provides support for anisotropy and diffusivity as functionally relevant metrics that are continuous and demonstrable within the range of normal age- and alcoholism-related brain deterioration.

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Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

E.D. BIGLER, A.L. ALEXANDER, J. LAINHART & M. LAZAR. Diffusion Tensor, Structural and Volumetric MRI Analyses in Autism.

One of the most consistent findings in autism is that macrocephaly occurs at a significantly increased prevalence rate. One hypothesis is that a brain overgrowth occurs early in the disorder, resulting in a larger than normal brain. We have applied a variety of neuroimaging techniques to study this problem in an ongoing longitudinal investigation of the neuroimaging correlates of autism, including standard structural MRI volumetrics, diffusion tensor imaging (DTI) and voxel based morphometry. For these studies we have concentrated on whole brain analyses and three specific regions of interest (ROI): the corpus callosum (CC), superior temporal gyrus (STG) and temporal stem (TS) of the temporal lobe. Two quantitative DTI indices were examined: Apparent diffusion coefficient (ADC) and fractional anisotropy (FA). The ROIs were also examined with DTI tractography methods. Integrating these image analysis methods demonstrated a variety of brain differences between autism and control subjects. Controlling for head size differences, increased white matter volume was found in the autism subjects. ADC values measured in global white matter were significantly increased in subjects with autism compared to controls. Decreased FA values in the voxel-wise analyses were also significant in several regions. DTI analyses also yielded regional CC differences. Absolute size of the STG did not differ between controls and subjects with autism, but the functional relationship between STG size and language ability was different. Differences in TS functional organization were also noted. The implication of these neuroimaging findings to the understanding of the neurobiology of autism will be discussed.

Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

E.A. WILDE, J.V. HUNTER, Z. CHU, E.D. BIGLER, M.A. FEARING, G. HANTEN, X. LI, M. NEWSOME, R. SCHEIBEL & H.S. LEVIN. Diffusion Tensor Imaging in Relation to Cognitive Control in Children Following Moderate to Severe Traumatic Brain Injury.

We performed diffusion tensor imaging fiber tracking (DTI-FT) in 16 children aged 9-16 at least 1 year post-moderate to severe traumatic brain injury (TBI) and in individually age- and gender-matched typically-developing children using a 1.5T Philips scanner and Philips fiber tracking 4.1V3 Beta 2 software. We hypothesized that TBI would reduce fractional anisotropy (FA) reflecting white matter (WM) injury, and that FA would be related to both cognitive control and global outcome. To investigate the validity of DTI-FT, we analyzed FA in relation to WM volume (measured using conventional MRI morphometry with established inter-examiner reliability). Analyses revealed significant group differences between mean FA in fiber systems emanating from the left ($p=.019$) and right temporal stem ($p<.001$), and the body ($p<.001$), splenium ($p<.001$) and genu ($p=.003$) of the corpus cal-

losum. FA in posterior brain regions was related to processing speed ($p=.043$), and parietal FA was marginally related to resistance to interference ($p=.060$) on the Flanker Task. Probability curves suggested that FA in the corpus callosum was related to Glasgow Outcome Scale scores. We confirmed that prefrontal FA calculated from DTI-FT was related to prefrontal WM volume ($p=.003$) and that left temporal FA and WM were also marginally related ($p=.067$). DTI-FT FA was also correlated with lesion volumes in regions such as frontal ($p=.006$), left temporal ($p=.006$) and corpus callosum splenium ($p<.001$). Pending confirmation of these validity data and further DTI studies of TBI, DTI-FT may elucidate changes in the developing brain which have significance for cognition and functional outcome after TBI.

Correspondence: *Harvey S. Levin, Ph.D., Cognitive Neuroscience Lab, Baylor College of Medicine, 1709 Dryden Rd ste 725, Houston, TX 77030. E-mail: hlevin@bcm.tmc.edu*

Poster Session 11 /4:00–5:30 p.m.

Child - Acquired Disorder: TBI

A. FERGUSON SMITH, R. MORRIS, M. FOSTER, M. MORRIS, R. SEVCIK & T. KING. The Predictive Contributions of Spatial Planning to Adaptive and Cognitive Functioning in Children Diagnosed With Brain Tumors.

Objective: To date, the effect of planning ability on adaptive functioning has not been extensively examined in children treated for brain tumors. Findings indicate that individuals with brain tumors are more likely to experience poor planning ability (Boyd & Sautter, 1993) and that children with even mild neurological complications demonstrate impairments in adaptive functioning (Fletcher et al., 1990). The purpose of this study is to assess spatial planning and to examine its utility in predicting adaptive and cognitive functional impairment in children diagnosed and treated for brain tumors.

Participants and Methods : Forty children diagnosed with a brain tumor (mean age at diagnosis 8.6 years) were administered the Rey-Osterrieth Complex Figure (ROCF) task, the Vineland Adaptive Behavior Scale (VABS), and the Stanford-Binet Intelligence Scale: Fourth Edition (SB:IV) at an average of one year post diagnosis and again at two years post diagnosis.

Results : Linear regressions were used to examine the relationship between planning ability and functional ability in children with brain tumors. The results of this investigation did not support the use of spatial planning as a predictor of adaptive functioning at one year or two years post diagnosis. However, spatial planning was an important predictor of cognitive functioning, accounting for a significant amount of variance at both one year and two years post diagnosis.

Conclusions : These results were not as expected. Additional exploratory analyses suggest that it is spatial skill and not spatial planning that predicts adaptive functioning in this population. This study suggests that spatial planning skills are important in cognitive outcomes in this population. However, with a large portion of the variance unaccounted for in adaptive functioning, and an inability to predict global day-to-day functioning, exploration of other factors is warranted.

Correspondence: *Ayanay Ferguson Smith, M.A., Psychiatry and Health Behavior, Georgia State University and Medical College of Georgia, 6273 Southland Trace, Stone Mountain, GA 30087. E-mail: aysmith@mcg.edu*

T. FAY, K.O. YEATES, H. TAYLOR, S. WADE, T. STANCIN & D. DROTAR. Behavior Problems Following Mild to Moderate Pediatric Traumatic Brain Injury: Prevalence, Risk Factors, and Correlates at 12 Months Post Injury.

Objective: To investigate the prevalence, risk factors, and correlates of significant post-injury behavior problems in children with complicated mild to moderate traumatic brain injury (TBI) as compared to children with orthopedic injury (OI).

Participants and Methods: Participants include 39 children with mild to moderate TBI and 49 children with OI, from 6-12 years of age at the time of injury. Retrospective ratings of premorbid behavior problems were assessed using the Child Behavior Checklist (CBCL) shortly after injury, and post-injury ratings of behavior problems were obtained at a 1-year follow-up. Only children who did not meet criteria for pre-injury caseness (i.e., CBCL Total Score ≥ 60) were included. Injury severity, child cognitive and adaptive functioning, and family functioning were examined as potential risk factors and correlates of post-injury caseness. Group (TBI vs. OI) and post-injury caseness (present/absent) were treated as independent variables in repeated-measures analyses of variance.

Results: The prevalence of post-injury caseness did not differ between the TBI (12.8%) and OI (10.2%) groups. However, children with TBI who displayed post-injury caseness showed greater injury severity than those without caseness, as well as declining adaptive functioning, declining IQ, and increasing parental distress, over the first year post injury. Similar changes were not seen in children with OI who displayed post-injury caseness or in either group for children without post-injury caseness.

Conclusions: Children with mild to moderate TBI are not at increased risk for significant post-injury behavior problems, but the occurrence of such problems is related to distinct child and parent risk factors.

Correspondence: *Taryn B. Fay, M.S., Ohio State University, 314 Buttricks Avenue, Columbus, OH 43215. E-mail: fay.39@osu.edu*

N.C. WALZ, S.L. WADE, K.O. YEATES & H.G. TAYLOR. Stability and Correlates of Temperament Following TBI and Orthopedic Injuries in Preschoolers.

Objective: The impact of TBI on childhood temperament was examined in a prospective, longitudinal study of children with TBI or orthopedic injuries (OI). The first study aim was to examine whether the groups differed on pre- and post-injury temperament characteristics. The second aim was to examine the relationship between core neuropsychological abilities (executive functions and social pragmatics) immediately after injury and the temperament construct of effortful control 6-months later.

Participants and Methods: Fifty children with TBI, aged 3-6 years at the time of injury were compared to an aged-matched group of 106 children with OI. Individual differences in emotional reactivity and self-regulation were assessed by having parents complete the Children's Behavior Questionnaire (CBQ).

Results: The TBI and OI groups did not differ on parent report of pre-injury temperament. Approximately 6-months post-injury, the TBI group showed significantly more negative emotional reactivity (anger/frustration), less soothability, and less inhibitory control compared to the OI group. The two groups did not differ significantly on the four other temperament dimensions (Attentional Focusing, Low Intensity Pleasure, Perceptual Sensitivity, and Smiling/Laughter). Pre-injury ratings on all temperament dimensions were highly correlated with post-injury ratings (.70 to .85), indicating a high degree of stability. Ratings of effortful control 6 months post-injury were significantly correlated with some measures of behavior inhibition, performance on first-order theory of mind tasks, knowledge of social language rules, and some measures of working memory shortly after injury.

Conclusions: Findings revealed disruption of certain temperament dimensions following preschool TBI and linked effortful control to executive functions and social pragmatics. Implications for social outcomes and intervention will be discussed.

Correspondence: *Nicolay C. Walz, Ph.D., Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave., MLC 3015, Cincinnati, OH 45229-3039. E-mail: nicolay.walz@cchmc.org*

H.M. CONKLIN, C.F. SALORIO, J.A. KENT & B.S. SLOMINE. Performance- and Rater-Based Measures of Working Memory in Children and Adolescents Following Moderate to Severe Traumatic Brain Injury.

Objective: Pediatric traumatic brain injury (TBI) often involves disruption of frontal/subcortical pathways through direct contusion to the frontal lobes or diffuse axonal injury impacting these pathways. Working memory (WM) is a critical executive function supported by frontal/subcortical pathways that facilitates organized, future-directed behavior. Accordingly, this study sought to investigate performance-based and rater-based measures of WM in children and adolescents who sustained moderate to severe TBIs.

Participants and Methods: Digit span backward tasks (from the Wechsler Scales and Children's Memory Scale) and the Behavior Rating Inventory of Executive Function (BRIEF) were administered to 64 children and adolescents who were seen through the rehabilitation continuum (Male= 38, Female= 26; Age at Injury= 10.96 ± 3.96 ; GCS= 5.53 ± 3.17).

Results: As a group, WM was impaired relative to normative samples (BRIEF WM Index T-Score > 65 in 44% of the sample; digit span backward Scaled Score < 7 in 47% of the sample). Consistent with past research, there was no statistical association between performance- and rater-based measures of executive functions ($r = -.14, ns$). Injury related factors, household constitution and premorbid academic performance were not predictive of performance on either WM measure when analyzed with linear regression. In contrast, developmental factors (i.e., age-at-testing and time-since-injury, but not age-at-injury) were predictive of performance on one or both WM measures. Of note, scores on the BRIEF WM index increased (indicative of worse performance) across the study age range, despite being age-corrected.

Conclusions: Results indicate WM impairment following pediatric TBI on both performance- and rater-based measures, with these children showing greater departure from their peers with increased age. These findings have important implications for outcome prediction, family education, intervention design and evaluation of intervention success.

Correspondence: *Heather M. Conklin, Ph.D., Neuropsychology; Kennedy Krieger Institute/ Johns Hopkins School of Medicine, 1750 East Fairmount Avenue, Baltimore, MD 21231. E-mail: hmconklin@yahoo.com*

T. SHANY-UR, R. TOMER & S. SHAMAY-TSOORY. Does Impaired Understanding of Emotional Deception Entail Impaired Understanding of Cognitive Deception and Knowledge of Social Display Rules in Children with Brain Damage?

Objective: Children with brain damage, who often demonstrate impaired social behavior, were found to have difficulties understanding emotional deception in narratives. Our objective was to examine the relationship between emotional deception, cognitive deception and social display rules among children with brain damage. We hypothesized they would demonstrate a selective difficulty with emotional deception while understanding cognitive deception would remain intact. It was further hypothesized they would demonstrate impaired knowledge of social display rules.

Participants and Methods: The performance of twelve 8 to 14-year-old children with documented brain damage was compared to that of twelve matched healthy controls, on tasks measuring social display rules, emotional deception and cognitive deception. We tested the first hypothesis using an emotional deception task, in which characters in narratives must not express what they feel, and a cognitive deception task we developed, in which characters in narratives must not express what they know. To test understanding of display rules, we designed a task that taps this ability.

Results : One-way ANOVA showed patients were significantly less accurate than controls in understanding emotional deception and social display rules, but not in understanding cognitive deception. Significant correlations were found between all tasks. Both groups most accurately performed the cognitive deception task, and least accurately performed the display rules task. These differences in performance were significant.

Conclusions : Results indicate that cognitive deception is easier to comprehend and may develop before the ability to understand emotional deception and social display rules, suggesting a possible developmental course for these social skills, which is delayed among children with brain damage.

Correspondence: *Tal Shany-Ur, M.A., Psychology, Haifa University, 14/4 Refidim St., Tel-Aviv 69982, Israel. E-mail: talshany@zahav.net.il*

L.K. AYR, K. YEATES, G. TAYLOR, M. BROWNE, B. BANGERT, A. DIETRICH, K. NUSS, J. RUSIN & M. WRIGHT. Dimensions of Post-Concussive Symptoms in Children with Mild Head Injuries.

Objective: The study objective was 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).

Participants and Methods : Participants include 164 children with MHI and 84 children with orthopedic injuries (OI), from 8-15 years of age, who were recruited as part of an ongoing prospective, longitudinal study. Parents and children complete a 50-item rating scale within 2 weeks of injury, rating the frequency of symptoms 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 rotated factor matrix for parent ratings was consistent with the target matrix. The eigenvalue plot suggested a four factor solution, and the RMSEA value for four factors (0.08) demonstrated reasonable fit. Factor loadings were consistent with the partially specified target. The rotated matrix for child ratings was less consistent with the target matrix. The eigenvalue plot suggested a three or four factor solution. Although the RMSEA (0.06) suggested a reasonable fit, factor loadings were consistent with the target matrix for cognitive and somatic symptoms but not for emotional or behavioral symptoms.

Conclusions : Parent ratings of PCS yield dimensions consistent with those reported in studies of adults with MHI. Child ratings of PCS yield cognitive and somatic symptom dimensions, but emotional and behavioral dimensions are less compelling.

Correspondence: *Lauren K. Ayr, M.A., Ohio State University, 314 Buttes Ave, Columbus, OH 43215. E-mail: ayr.1@osu.edu*

S.M. RUMBLE, T.G. BURNS, D. BAKER & A. VAN WINKLE. Gender Differences in Verbal Learning and Memory After Traumatic Brain Injury in Children.

Objective: This is a study of gender differences in memory and learning after pediatric traumatic brain injury (TBI). It was conducted to validate a finding in a study by J. Donders and N. Hoffman (2002) that found a female advantage on the California Verbal Learning Test-Childrens Version (CVLT-C; D.C. Delis, J.H. Kramer, E. Kaplan, & B.A. Ober, 1994) during the first 12 months following injury. The aforementioned study also reported higher processing speed scores in females, which was thought to account for this performance discrepancy. The current study intended to validate the female advantage in verbal learning and memory following pediatric TBI

Participants and Methods : Twenty-seven boys and 19 girls ages 5-16 were evaluated using the CVLT-C within 24 months after acquiring a TBI. Processing speed scores were obtained for 13 of the 46 subjects via the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV).

Results : One-way analysis of variance tests revealed no statistically significant difference between the gender groups and total CVLT-C score, regardless of various demographic and neurological variables. A trend was found in the total sample between processing speed score on the WISC-IV and total CVLT-C score ($p=.07$).

Conclusions : Results do not support the 2002 study which found a female advantage on total CVLT-C score after pediatric TBI, however; the current study did reveal a trend between processing speed and total CVLT-C score in the sample that approached significance. It is concluded that the female advantage found in the 2002 study was more likely due to processing speed, rather than gender.

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*

M. ROBERTS, S.E. WRIGHT & R.J. ROBERTS. Post-concussive Symptoms in a Pediatric Population: The Importance of "What We Ask, Whom We Ask, and When We Ask It".

Objective: A small, but significant, percentage of children manifest persistent post-concussive symptoms following a mild traumatic brain injury (MTBI). The objective of the current paper was to examine the difference in symptom rates between normative and clinical samples.

Participants and Methods : Participants for the normative sample included 98 elementary aged children. Participants for the clinical sample included 33 elementary aged children, drawn from referrals for pediatric neuropsychological evaluation following incomplete recovery from a MTBI. Data included parent responses to an interview form of the Behavioral Symptom Questionnaire (BSQ), a 30-item questionnaire assessing the presence and frequency of post-concussive symptoms.

Results : Cause of head injury (with percentage of sample) for the clinical sample included fall (36), motor vehicle accident (33), hit by object (21), and bicycle/pedestrian/sledding accident (3). Average time elapsed since the injury (at time of evaluation) was three years, 4 months (ranged from 2 months to 12 years). In the normative sample a score of 9 on the BSQ represented the 90th percentile, and 17 represented the 95th percentile. Eighty-two percent of total BSQ scores in the clinical sample were at or above the 90th percentile. Sixty-four percent scored at or above the 95th percentile.

Conclusions : The findings demonstrate that a significant percentage of the clinical population manifest persistent post-concussive symptoms (as measured by the BSQ) 40 months following a mild traumatic brain injury. These findings highlight the importance of querying about specific and more subtle post-concussive symptoms, and of querying about these symptoms beyond the acute trauma (i.e., one or more years post-injury).

Correspondence: *Sara E. Wright, Ph.D., Pediatrics, University of Iowa Carver College of Medicine, 2611 Rohret Road SW, Iowa City, IA 52240. E-mail: sara-wright@uiowa.edu*

S.L. WADE & M. WU. Educational Concerns and Services following Pediatric Brain Injury.

Objective: Traumatic brain injury was added to the list of IDEA disabilities in 1990. However, evidence suggests that schools may continue to have difficulty identifying and appropriately serving children with TBI.

Participants and Methods : In this study, we asked parents of children with a moderate severe TBI if they had concerns about how the child was doing in school following their injury, if the child was receiving special services or accommodations, and if the child had an individualized education plan (IEP). The sample consisted of 110 children ages 5-16 ($M = 10.95$) who were injured between 1 and 27 months previously ($M = 9.58$; $S.D. = 6.6$).

Results : Nearly 60% of parents reported concerns with their child's educational progress since their injury. However, only 1/3 were receiving

special education assistance and 29% had an IEP. Among the parents with educational concerns, 40% of the children were receiving special education and 31% had an IEP. Among children with severe TBI, 63% of parents had educational concerns and 44% of the children were receiving special education and had an IEP. A comparable proportion of parents of children with moderate TBI noted educational concerns, although only 27% of the children were receiving special education assistance and only 23% had IEPs. Parents of children in high school were most likely to endorse educational concerns (70%) and their children were also more likely to be receiving services (45%).

Conclusions : These findings suggest that younger children and those with less severe injuries may not be receiving the educational services that they need.

Correspondence: *Shari L. Wade, Ph.D., Rehabilitation, Cincinnati Children's Hospital Medical Center, 3333 Burnet Ave., MLC 4009, Cincinnati, OH 45229-3039. E-mail: shari.wade@cchmc.org*

J. LANDA & A. EVEN. Cerebello-Frontal Diaschisis as an Explanatory Mechanism for Mutism in a Case of Traumatic Brain Injury.

Objective: Cerebellar mutism and subsequent dysarthria are well-described complications of posterior fossa resection of tumor in children. Despite various studies pointing to a possible involvement of frontal regions, the mechanism underlying this phenomenon is yet to be described, and clinical studies can contribute to our understanding.

This study present a case of cerebellar mutism following a traumatic-brain-injury, which also presented with frontal deficits seen in imaging methods and neuropsychological tests.

Participants and Methods : B.Y, an 8-years old boy, was referred to a children's rehabilitation department, following traumatic brain injury. At first he presented with mutism which transformed into dysarthric speech later on, a progress that resembled the cerebellar mutism phenomenon described in children undergoing resection of posterior fossa tumor.

In proximity to injury, he underwent SPECT and six months later he was also referred to MRI and a complete neuropsychological evaluation.

Results : SPECT during the mutism phase revealed hypoperfusion in an inferior left frontal region. However, in a MRI performed six months after injury there was no evidence for frontal abnormality, but old hemorrhages were seen in the right cerebellum.

Also, various neuropsychological tests pointed to difficulties in executive functions, which imply to an involvement of frontal regions in the brain.

Conclusions : This case study points to a link between the cerebellum and frontal regions, which is especially prominent during childhood. It is offered that subsequent speech disorder, and executive disfunctions are explained through the effects of the cerebellar abnormalities on frontal regions, through the mechanism of diaschisis.

Correspondence: *Janna Landa, MD, Pediatric Rehabilitation, The Chaim Sheba Medical Center, 31 Zora Street, Zur Yigal 44862, Israel. E-mail: janna.landa@sheba.health.gov.il*

M.A. FEARING, E.D. BIGLER, E.A. WILDE, J.V. HUNTER & H.S. LEVIN. Morphometric Findings in the Thalamus and Brainstem in Children after Moderate to Severe Traumatic Brain Injury.

Objective: Generalized whole brain volume loss is well documented in moderate-to-severe traumatic brain injury (TBI), in both adults and children. Whether this atrophy occurs specifically in the thalamus and brainstem, and to what degree, has not been systematically studied in children. In the current study we compared thalamic and brainstem volumes of children who had sustained a moderate to severe TBI at least one year earlier with findings in an age- and gender- matched comparison group of uninjured children.

Participants and Methods : All quantitative analyses were based on 1.5 Tesla magnetic resonance (MR) imaging and controlling for head size age we obtained left, right and total brainstem (including midbrain,

pons, medulla, tectum, and tegmentum) and thalamic volumes in 16 TBI subjects (age range 9-16) and 16 age and demographically matched controls. Intra- and interrater reliabilities were assessed ($r = .90$) and quantitative analyses performed by two independent raters following an established protocol.

Results : Based on MANCOVA controlling for age and head size, significant differences in the thalamus and the midbrain region of the brainstem were found.

Conclusions : Volumetric differences in thalamic and brainstem structures were associated with TBI. Since much of the midbrain houses white matter pathways, it was assumed that the significant reduction in mid-brain volume reflects the susceptibility of these pathways to TBI. Similarly, reduction in the size of the thalamus was also probably a reflection of the secondary effects (i.e. transneuronal degeneration) of nonspecific diffuse axonal injury and reduction in cortical volume following TBI. The relationship between the brainstem and cognitive measures of attention, processing speed, and auditory recognition will be discussed.

Correspondence: *Michael A. Fearing, Brigham Young University, 1001 SWKT Tower, Provo, UT 84602. E-mail: mfearing@charter.net*

M.R. PRASAD, D.R. MENDEZ, C.S. COX & L. EWING-COBBS. Health Related Quality of Life in Infants and Preschoolers with Traumatic Brain Injury.

Objective: Health related quality of life and parental stress have been demonstrated to be areas of concern in school-aged children with traumatic brain injury (TBI). The objective of this study is to assess health status and quality of life of infants and preschoolers with TBI.

Participants and Methods : Caregivers of infants and preschoolers with accidental or inflicted TBI under the age of 5 years ($n=65$) were asked to complete the Infant Toddler Health Status Questionnaire (ITHSQ) at one year post injury. Injury severity ranged from mild to severe. Caregivers of healthy comparison children were also asked to complete the ITHSQ ($n= 35$).

Results : Significant group differences were found between the TBI group and the comparison group on caregiver functioning including general health of the caregiver ($F(3,95)=5.10, p=.002$) and emotional impact on caregiver ($F(3, 95)=4.41, p=.024$). Children with TBI were rated as having poorer general health ($F(3,95)=2.90, p=.04$), physical abilities ($F(3, 95)=6.70=.0004$), behavior ($F(3, 95)=2.75, p=.05$), and general abilities ($F(3,95)=2.92, p=.04$).

Conclusions : TBI in early childhood can impact the general health status of children and their caregivers as well as caregiver emotional functioning at one year post injury. In addition, infants and preschoolers with TBI are perceived by their caregivers as having difficulties in behavior and abilities. These findings suggest that health related quality of life issues are present in families of very young children with TBI. Supported by R01-NS029462 and H133G040279.

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*

L. HAHN, S. HEATON, C. KIMBERG & S. HACKER. Attentional Profiles in Pediatric TBI and ADHD: A Pilot Study.

Objective: It is well established that children who sustain a severe traumatic brain injury (TBI) can experience persistent attentional problems. Some have described these symptoms as being similar to those seen in children diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). In fact, researchers in recent years have coined the phrase "acquired ADHD" to describe the profile of attentional impairments of children recovering from TBI. However, the etiology of these behavioral disorders is clearly different, and there are few studies directly comparing the attentional profiles of children with TBI to those with a diagnosis of ADHD.

Participants and Methods : This pilot study compared attentional scores of un-medicated children, ages 6 to 16, who had sustained a Severe TBI (n=9) with children diagnosed with ADHD (n=24). Children with severe TBI were examined within 3 months of their injury. Groups were compared across composite scores from Test of Everyday Attention for Children (TEA-Ch; Selective, Sustained and Attentional Control) and Conners' Continuous Performance Test (CPT-II; Confidence Index). Groups were also compared on DSM-IV Inattention and Hyperactivity scales from the Conners' Parent Rating Scale (CPRS).

Results : Analyses revealed that the two groups displayed similar patterns of attentional deficits across the attentional tasks (impaired sustained and attentional control, intact selective attention). In contrast, the ADHD group was rated on the CPRS DSM-IV scales as having significantly higher elevations of inattention and hyperactivity ADHD symptomatology.

Conclusions : Results suggest that children with severe TBI do, in fact, display attentional impairments similar to those seen in ADHD. However, the behavioral symptoms are distinctly different between the groups. Correspondence: *Lisa Hahn, M.A., University of Florida, 2601 NW 23rd Blvd., Apt. 160, Gainesville, FL 32605. E-mail: lhahn@phhp.ufl.edu*

Drug/Toxin-Related Disorders (Incl. Alcoholism)

N.P. VADHAN, C.L. HART, W.G. VAN GORP, M. HANEY & R.W. FOLTIN. Does Smoked Marijuana Disrupt Decision-Making in Experienced Users?

Objective: Recent preliminary findings from this laboratory indicated that smoking a low to moderate $\Delta 9$ -THC concentration cigarette improved the performance of experienced marijuana users on a modified Gambling task. The current study is a more extensive effort to characterize the effects of marijuana intoxication on gambling task performance in experienced marijuana smokers.

Participants and Methods : A within-participant double-blind design was employed in this study. Thirty-six marijuana users, who reported smoking approximately 24 marijuana cigarettes per week, completed this 3-session outpatient study; sessions were separated by at least 72-hrs. Participants completed a modified computerized gambling task once at baseline, and three times after smoking a single marijuana cigarette (0%, 1.8%, or 3.9% $\Delta 9$ -THC). Marijuana cigarettes were administered in a double-blind fashion and the sequence of $\Delta 9$ -THC concentration order was balanced across participants.

Results : Marijuana increased the time that participants required to complete the task, relative to placebo. However, decision-making (i.e., "advantageous" vs. "disadvantageous" card selection) and money earned on the task were unaffected by marijuana. Furthermore, of all demographic and drug use variables examined, only level of education was associated with baseline performance on the modified Gambling task.

Conclusions : Smoked marijuana may slow down decision-making, but may not disrupt the advantageousness of decisions, in experienced users. These data are consistent with other findings from our laboratory that cognitive speed, but not accuracy, is affected by marijuana smoking in experienced marijuana users.

Correspondence: *Nehal P. Vadhan, PhD, Psychiatry, Columbia University/NYSPI, 1051 Riverside Drive #66, New York, NY 10016. E-mail: npv2101@columbia.edu*

A.D. SCHWEINSBURG, B.J. NAGEL, B.C. SCHWEINSBURG, R.J. THEILMANN, L.T. EYLER & S.F. TAPERT. Adolescent Marijuana Use and fMRI Response During Verbal Learning.

Objective: Studies have suggested verbal learning decrements related to heavy marijuana use among adults and adolescents, yet the neural

substrates are poorly understood. We used functional MRI (fMRI) to describe brain response during verbal encoding among heavy marijuana using teens and nonusing controls after 28 days of verified abstinence. We predicted that marijuana users would show less fMRI response than controls.

Participants and Methods : Participants were ages 16 to 18 and included 12 heavy marijuana users (MJ) (546.7 average lifetime uses) and 12 demographically similar nonusers. MJ teens had used more alcohol than controls. Tobacco and other drug use were limited in both groups. All teens provided biweekly urine toxicology samples to confirm abstinence for 28 days before scanning, ensuring that group differences were not due to recent drug use. During fMRI scanning, teens performed a verbal paired associates learning task including subsequent recall testing.

Results : Although groups performed comparably on verbal pair recall, MJ teens showed less brain response than controls in medial pre-cuneus, right cerebellum, right angular gyrus, right anterior cingulate and left dorsolateral prefrontal cortex (clusters >762 microliters, $p < .05$). In these regions, controls showed increased activation during encoding relative to rest, but MJ teens evidenced reduced encoding response compared to rest. There were no brain regions in which MJ teens showed more response than controls. Group differences remained after controlling for alcohol use.

Conclusions : Despite comparable task performance, heavy marijuana using teens showed less learning-related brain response than controls, consistent with adult research. This pattern may indicate use of alternate strategies and greater rehearsal during resting blocks. Group effects were observed after 28 days of confirmed abstinence, which could suggest persisting marijuana-related changes or premorbid differences in brain functioning.

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*

J. JACOBUS, R. GONZALEZ, J.R. O'NEILL, M.L. KOHNKE, L. SWOROWSKI & E.M. MARTIN. Ecstasy use is associated with prospective memory deficits.

Objective: 3,4-methylenedioxyamphetamine (MDMA, ecstasy) is putatively neurotoxic and thought to disrupt serotonergic prefrontal-subcortical brain systems that include hippocampus, prefrontal cortex, and basal ganglia. Episodic and working memory deficits have been reported among MDMA users, but few studies have examined the effects of ecstasy use on prospective memory (PM), an executive process responsible for forming, maintaining and retrieving a future intention.

Participants and Methods : In this preliminary investigation we examined PM among 38 HIV seronegative club drug using men who have sex with men (MSM). Participants were stratified according to reported lifetime amount of MDMA use: 1) none (n = 14); 2) light use (1-15 times; n = 9); 3) moderate use (16-50 times; n = 8); 4) heavy use (>50 times; n = 7). Subjects were asked to indicate whenever a seven minute interval had elapsed in the absence of external retrieval cues.

Results : Groups did not differ significantly on age, sex, education, estimated VIQ, BDI scores, or prevalence of dependence and abuse of alcohol and other drugs ($ps > .05$). There was a significant group difference in PM performance, $F(3,34) = 6.46$, $\eta^2 = .36$; heavy MDMA users scored significantly worse than medium and non-users ($ps < .05$).

Conclusions : Our findings suggest deficits in PM with greater amounts of ecstasy use. It is noteworthy that greater deficits in PM among individuals with HIV have been reported, thus prompting the question of interactions between HIV serostatus and ecstasy use in future studies. Supported by NIDA13800.

Correspondence: *Joanna Jacobus, B.A, Psychiatry, University of Illinois, Chicago, 1601 W. Taylor #404, Chicago, IL 60612. E-mail: jjacobus@psych.uic.edu*

M.J. REINHARD, P. SATZ, G. ORDOG, C. SCAGLIONE & L.F. D'ELIA. Neuropsychological Exploration of Alleged Mold Neurotoxicity.

Objective: To explore cognitive and emotional correlates of toxic mold exposure and potential dose-response effects for both outcomes.

Participants and Methods : Forty-one patients (29 female, 12 male) in litigation reporting cognitive complaints secondary to mold exposure received comprehensive neuropsychological (NP) assessments. Tests showed all to be putting forth sufficient effort. Within-group comparisons were made between estimates of pre-morbid intellectual functioning (North American Adult Reading Test- NAART) and current Wechsler Adult Intelligence Scale (WAIS) -IQ scores. NP performance was grouped into 6 commonly used cognitive domains and z-scores were derived for each domain. To assess for potential dose-response relationship and/or recency effect, self-reported length of exposure and time since last exposure were matched with cognitive outcomes and Minnesota Multiphasic Personality Inventory-II (MMPI-2) clinical scales.

Results : NAART estimates of pre-morbid functioning were not significantly different from Full Scale IQ ($t(38) = 1.3, p = .19$), or Verbal IQ ($t(36) = .96, p = .34$). All cognitive domain z-scores were within .5 standard deviations of the normative mean. Correlations between length of exposure, time since last exposure and cognitive domains were non-significant. Overall MMPI-2 profile indicated scales 1, 2 and 3 were elevated. Scale 1 ($p = .007$) and 3 ($p = .019$) significantly correlated with length of exposure.

Conclusions : Despite CNS complaints seen with mold exposed individuals our initial results did not uncover concomitant cognitive deficits and a dose-effect for cognition was not seen. The MMPI-2 may be sensitive to increasing physical and emotional sequelae as length of exposure increases, and our method of an aggregate cognitive profile may not be best suited for what could be associated non-specific symptoms. A larger sample is needed as sub-samples or outliers may exist for this population and further analysis utilizing biological, behavioral and cognitive markers is warranted.

Correspondence: *Matthew J. Reinhard, Psy.D., Psychiatry and Biobehavioral Sciences, UCLA Neuropsychiatric Institute, 760 Westwood Plaza, #CS-746, Los Angeles, CA 90095. E-mail: mreinhard@mednet.ucla.edu*

C.B. FORTIER, C.M. STEPHEN, D.F. JOHN, E. STEFFEN & R.E. MCGLINCHAY. Discrimination and Reversal Associative Learning in Abstinent Chronic Alcoholics.

Objective: Evidence has shown that alcoholism leads to volume reductions in brain regions critical for associative learning using eyeblink classical conditioning (EBCC). Specifically, cerebellar shrinkage causes impairment in simple forms of EBCC, whereas changes in forebrain structures (e.g., frontal cortex and underlying white matter) results in impairment in more complex EBCC tasks. This study examined the ability of abstinent chronic alcoholics (ALC) to acquire learned responses during both simple (delay) and complex (trace) discrimination and discrimination reversal EBCC paradigms and relates this performance to functional and structural changes in the cerebellum and frontal lobes.

Participants and Methods : To date, participants include 13 ALCs. During discrimination, one tone (Conditioned Stimulus;CS+) predicted the occurrence of an airpuff (Unconditioned Stimulus;US) while another tone (CS-) served as a neutral stimulus. After a number of trials the significance of the tones reversed. Subjects were presented with 45 of each trial type randomly intermixed. During delay learning the US coterminated with the CS, whereas in trace learning a 1000 ms silent trace period preceded the US.

Results : Results revealed a significant difference in the % Conditioned Responses (CRs) acquired during delay discrimination (mean % difference between CS+/CS- trials=32, $p < .05$) and a trend toward impairment during reversal learning (mean % difference=16, $p = .07$). The ability of ALCs to differentially respond during trace discrimination was

further reduced (mean % difference=15, $p = .09$), and was absent during trace reversal, as the ALCs continued to produce CRs to the old CS+ resulting in an equal number of CRs to the CS+ and CS- (mean % difference=1, $p = .87$). Correlations with neuropsychological data are expected to support these findings.

Conclusions : These data support the notion that ALCs are increasingly impaired in learning EBCC tasks as the tasks become relatively more complex and likely require the involvement of forebrain structures. Correspondence: *Catherine B. Fortier, PhD, VA Boston Healthcare System, MDRC 151-A, 150 South Huntington Ave, Boston, MA 02130. E-mail: cbrawn@bu.edu*

M.A. FEARING, R.O. HOPKINS & E.D. BIGLER. Variability in Basal Ganglia Lesions Following Anoxic Brain Injury.

Objective: Basal ganglia (BG) lesions and neuropsychological impairments following anoxic brain injury are common. We assessed 6 anoxic subjects (A1-A6) for onset, location, and presentation of BG lesions, and their relationship to neuropsychological outcome.

Participants and Methods : 6 patients with anoxic brain injury (4 men), with a mean age of 31 ± 16 years and mean educational level of 13 ± 3 years, underwent neuropsychological testing and brain imaging.

Results : Neuroimaging findings were variable. Patient A1 had no BG lesions at 5 weeks but had "Swiss cheese" BG lesions bilaterally at 9 months. Patient A2 demonstrated no BG abnormalities at day 1, but had perfusion defects at 4 months. Patients A3 A4, and A6 had bilateral BG lesions at initial scanning, and A4 lesions remained at 15 days and 1 year. Patient A5 demonstrated BG lesions bilaterally at 2 1/2 years post-injury. Regarding neuropsychological outcome, all patients demonstrated some type of cognitive impairment. A1, A2, and A3 had impaired memory and executive function. Patient A4 had only impaired memory. Patient A5 had impaired memory, executive function, and attention. Patient A6 displayed difficulties on memory, attention/concentration, and executive function. Five of the 6 patients had symptoms of depression, with 2 patients (A3, A5) having symptoms of PTSD.

Conclusions : There was marked variability in basal ganglia lesion onset, location and presentation following anoxic brain injury. Most patients had neuropsychological sequelae with impaired memory and executive function the most common. Thus, basal ganglia damage and neuropsychological sequelae following anoxic brain injury are heterogeneous.

Correspondence: *Michael A. Fearing, Brigham Young University, 1001 SWKT Tower, Provo, UT 84602. E-mail: mfearing@charter.net*

M.A. FEARING, R.O. HOPKINS, L.K. WEAVER & E.D. BIGLER. Neuropsychological and Neuroimaging Outcomes Following Group Carbon Monoxide Poisoning.

Objective: Carbon monoxide (CO) is common and results in cognitive and affective morbidity. We assessed 11 young college graduates with accidental CO poisoning of 6 hours duration due to a furnace malfunction. The patients were staying in three adjoining rooms, with 4 patients directly above the furnace (CO level 303 ppm), and 7 patients in adjacent rooms (CO level 270 ppm).

Participants and Methods : There were 8 men and 3 women, with a mean \pm SD age of 26 ± 2.4 years, education level of 16 ± 0.6 years, COHb level of $19.3 \pm 5.8\%$. All patients underwent neuropsychological testing and 9 patients underwent brain imaging. Time from CO poisoning to testing was 4 months.

Results : The patient's reported symptoms at testing included 63% with residual headaches, 36% fatigue, and 18% dizziness. Neuropsychological scores showed some variability, with the majority of the cognitive impairments being mild. Of the CO poisoned group 72% had impaired

memory, 45% attention/concentration, and 27% executive dysfunction. One patient had symptoms of depression, two had PTSD, and one reported emotional volatility and anxiety. Two of 9 patients with brain imaging had normal brain scans. However, 36% of the patients had bilateral basal ganglia lesions and 36% had mild hippocampal atrophy.

Conclusions : This young, highly educated group of CO poisoned patients had mild cognitive impairments including memory, attention/concentration, and executive function. Few patients had affective changes. The majority had neuropathological changes on brain imaging. CO-related morbidity may occur even in young, highly educated patients.

Correspondence: *Michael A. Fearing, Brigham Young University, 1001 SWKT Tower, Provo, UT 84602. E-mail: mfearing@charter.net*

G.W. FONG, B. KNUTSON, J.M. BJORK, C.L. DANUBE, S.M. BENNETT & D.W. HOMMER. Differential Activation of Reward Circuitry During Reward Outcome in Alcoholics Who Subsequently Relapse: A fMRI Investigation.

Objective: Recent neuroimaging studies have demonstrated alcohol cue induced neural activation in reward related areas of alcoholic but not healthy control subjects. Among alcoholic subjects, more pronounced activation was observed in those who subsequently relapse. We sought to examine activation patterns in reward related areas in response to successful and unsuccessful monetary reward outcome in a detoxified sample of alcoholic inpatients whose maintenance of sobriety was determined at a later date.

Participants and Methods : 14 alcoholic subjects from an inpatient alcohol treatment unit were tested after 3 weeks of abstinence. All subjects underwent event-related fMRI while performing a monetary incentive delay task where they saw a cue signaling potential monetary reward and were required to respond when they saw a target after a variable delay. Feedback was given indicating the amount of reward obtained. If subjects responded during target display, they received the expected reward (~66% "hit" rate). Comparison of successful versus unsuccessful reward outcome at baseline was examined in each group separately. Subjects were contacted 3 months later to determine maintenance of abstinence (7 subsequently relapsed).

Results : Activation differences between successful and unsuccessful reward outcomes across all subjects within each group were examined. Results showed activation of the mesial prefrontal cortex in the subsequently abstinent (SA) group but not the relapsed (SR) group. Activation of the ventral striatum and posterior cingulate appeared greater in magnitude and extent in the SR group. Common areas of activation included the superior frontal gyrus and putamen.

Conclusions : These findings suggest differential recruitment of reward related areas in subsequently abstinent and relapsed alcoholic inpatients, prior to determination of outcome. These differential activation patterns may reflect altered reward network functions as a result of abuse or premorbid features that contribute to ongoing maladaptive alcohol use.

Correspondence: *Grace W. Fong, Ph.D., Medical College of Wisconsin, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: gfong@mail.mcu.edu*

J.B. FULTON, R.O. HOPKINS & L.K. WEAVER. Depression, Anxiety, and PTSD Following Mass Carbon Monoxide Poisoning.

Objective: Mass carbon monoxide (CO) poisoning has occurred in warehouses, ice skating rinks, and schools. There is no information regarding affective outcome following mass CO-poisoning. We assessed affective outcomes at 3 months post-CO poisoning in a group of young males at a Job Corps site.

Participants and Methods : 28 of 56 students in a dorm had CO poisoning due to a broken furnace vent pipe, of which 13 received HBO2 therapy and 15 were transported 8 hours later to the local ED of which 4 received oxygen therapy. Three months post-CO poisoning question-

naires of depression, anxiety, and posttraumatic stress disorder (PTSD) were administered. Descriptive statistics were carried out for demographic medical, and affective scores. Independent samples t-tests compared affective test scores for subjects that received HBO2 compared to no HBO2.

Results : Of the 28 subjects, 25 were current smokers, 10 had history of drug or alcohol abuse, and 11 had a psychiatric history. The mean age was 19 (+) 2 years and mean education level was 10 (+) 2 years. The mean COHb level was 11.9 (+) 7.9% and 14 lost consciousness. 43% (12/28) had moderate-to-severe depression, 32% (9/28) moderate-to-severe anxiety, and 79% (22/28) had PTSD. The HBO2 group had significantly higher anxiety and PTSD scores compared to the no HBO2 group ($p < 0.001$).

Conclusions : Mass CO poisoning of young males resulted in a high prevalence of depression, anxiety, and PTSD. Despite similar levels of depression, subjects who received HBO2 had worse anxiety and PTSD compared to those with no HBO2. Potential explanations discussed include trauma associated with a life threatening illness, transportation to a treatment center, and disruption to social and education domains. Correspondence: *John B. Fulton, BS, Psychology, Brigham Young University, 769 S. 320 W., Provo, UT 84601. E-mail: jbf39@email.byu.edu*

C. CHEN, C. TSAI, M. HO, Y. YANG & C. BRADSHAW. The Performance of Alcoholic Patients on an Impulsive Choice Task: A Quantitative Analysis.

Objective: Impulsive choice is the selection of small immediate gains rather than larger delayed gains, or a predisposition to take risks. The present study aims to evaluate the alcoholic patients' sensitivity to the interplay between delayed and probabilistic reinforcement.

Participants and Methods : 33 healthy volunteers and 31 patients fulfilled the DSM-IV diagnostic criteria for alcohol use disorders were recruited. They pressed two buttons (A and B) for monetary rewards. The reward size was equal for A and B. A produced a probabilistic reward ($p_A=0.5$) after a short delay, d_A , and B a certain reward ($p_B=1.0$) after longer delays, d_B . d_A was manipulated across 5 blocks of 50 trials. Indifference delays, $d_{B(50)}$ (value of d_B yielding 50% choice of B) were estimated for each participant in each block. The $d_{B(50)}$ s derived from all blocks for both groups were compared using ANOVA with repeated measure. A linear function of $d_{B(50)}$ vs d_A was fitted; the slope and intercept provided indices of sensitivity to reinforcement delay and probability. These indices were compared between groups using independent t -test ($\alpha=0.05$).

Results : The results showed that each participant's $d_{B(50)}$ increased linearly with d_A [$F(4,248)=85.69, P<.001; r^2>.90$]. There were also a significant main effect of group [$F(1,62)=8.58, P<.005$], and a significant group x block interaction [$F(4,248)=7.33, P<.009$]. The control group showed steeper slope of the linear function than that obtained from the patient group [$t(62) = 2.61; P<.01$], but the intercept did not differ between the two groups [$t(62) < 1$].

Conclusions : The results suggest that compared to the control group, the alcoholic patients are less tolerant to the delayed reward; and they are more likely to choose the probabilistic reward as the durations of the delays increase. Very few studies have attempted to separate impulsivity per se from the other behavioural functions. The study shows how inter-temporal choice theory helps to disentangle the interacting factors that determine impulsive choice.

Correspondence: *M-YHo, PhD, Institute of Clinical Behavioral Sciences, Chang Gung University, 259, Wen Hua 1st Road, Kwei Shan, Tao Yuan County 333, Taiwan. E-mail: myho@mail.cgu.edu.tw*

M.J. TAYLOR, B.C. SCHWEINSBURG, A. GONGVATANA, O.M. AL-HASSOON, R.J. THEILMANN & I. GRANT. Microstructural Disruption of White Matter Integrity in Recently-Detoxified Alcoholics Measured with Diffusion Tensor Imaging.

Objective: The goal of this study was to evaluate the impact of long-term alcoholism on the integrity of frontal and posterior cerebral white

matter using diffusion tensor imaging (DTI). When axonal integrity is disrupted, an increase in diffusion and a concordant decrease in anisotropy can occur. The average diffusion coefficient (ADC) was hypothesized to be elevated in alcoholics relative to non-alcoholic controls, while fractional anisotropy (FA) was hypothesized to be lower in alcoholics.

Participants and Methods : Thirty-three recently detoxified alcoholics (sober 2-6 weeks) in treatment at the VA San Diego Healthcare System and 16 non-alcoholic controls were evaluated using DTI. The groups were equated on age (mean = 46.5 years), education (mean = 13.3 years), gender (96% male), and ethnicity (86% Caucasian). Alcoholics met DSM-IV criteria for alcohol dependence and consumed a minimum of six drinks per day for the most recent five years. FA and ADC were calculated for regions of interest in frontal and posterior white matter.

Results : ADC was significantly higher in alcoholics compared to controls in both frontal [$F(1,47)=4.38$, $p<.05$] and posterior [$F(1,47)=12.08$, $p=.001$] white matter regions. In addition, significantly lower FA was present in posterior white matter of alcoholics compared to controls [$F(1,47)=10.04$, $p<.01$] with a similar trend in frontal white matter.

Conclusions : These results are consistent with studies using other neuroimaging methods (e.g. structural MRI and MR spectroscopy) that suggest alcoholism-associated changes in white matter. Increased ADC and decreased FA could indicate disorganization of cerebral white matter due to atrophy of both the myelin sheath and axon itself.

Correspondence: *Michael J. Taylor, PhD, Psychiatry, University of California, San Diego, 9500 Gilman Drive - 0603V, La Jolla, CA 92093-0603V. E-mail: mjtaylor@ucsd.edu*

K. SULLIVAN, M.H. KRENGEL, T. THOMPSON & R.F. WHITE. Pesticide Exposure, Health Functioning, and Neuropsychological Outcome in Gulf War I Veterans.

Objective: Current hypotheses regarding the sustained health complaints of Gulf War I (GW) veterans invoke exposure to multiple chemical exposures. In order to explore this notion, we examined veterans responsible for pesticide control for their various military units during the GW.

Participants and Methods : GW pesticide control personnel were exposed to several different types of pesticides and at larger doses than general military personnel, making them a unique group to study. Veterans were divided into high and low exposure groups. Study participants responded to a self-report survey regarding their current health concerns, psychological functioning and cognitive complaints. They were given a comprehensive neuropsychological assessment, including measures of mood, motor functioning, short-term memory and attention.

Results : Preliminary analyses have been completed on 33 subjects. The veterans rank health symptoms such as skin rash, fatigue, and depression as significant complaints. Multiple chemical sensitivity and hypertension appeared to be significant in this group. In addition, chronic post-traumatic stress disorder was highly prevalent. When neuropsychological variables were analyzed, veterans with high exposures were significantly different from veterans with low exposures on motor functioning and reaction time. Further analyses revealed significant effects of pyridostigmine bromide (PB) on test scores in this domain.

Conclusions : These preliminary results suggest that there are differences in neuropsychological variables between high and low pesticide and PB exposed groups. The relationship of exposure to health outcome will be discussed.

Correspondence: *Maxine H. Krengel, Ph.D., Psychology, VA Boston Healthcare System, 150 S. Huntington Ave, 116B-4, Boston, MA 02130. E-mail: mhk@bu.edu*

N.P. VADHAN, K.M. CARPENTER, C.L. HART, E.V. NUNES & R.W. FOLTIN. Attentional Bias Towards Cocaine-Related Verbal Stimuli in Cocaine-Dependent Individuals: A Comparison of Treatment-Seekers and Treatment-Nonseekers.

Objective: When tested using modified Stroop color-naming tasks, drug-dependent individuals demonstrate attentional bias as shown by interference from verbal stimuli associated with their drug of choice. We have previously reported that attentional bias, measured using a Stroop color-naming task modified to include cocaine-related words, predicted treatment outcome. The purpose of this study was to determine the relationship between the treatment-seeking status of cocaine-dependent individuals and attentional bias towards cocaine-related verbal cues.

Participants and Methods : We compared performance on a drug Stroop task between 32 participants who were seeking treatment for their cocaine dependence (25 males, seven females) and 15 participants who were not seeking treatment for their cocaine dependence (14 males, one female).

Results : Treatment-seekers demonstrated slower reaction times in the presence of drug-related words, relative to nondrug words (interference), whereas treatment-nonseekers demonstrated quicker reaction times in the presence of drug-related words, relative to nondrug words (facilitation). Moreover, a significant difference was detected between these groups on reaction times specifically for cocaine-related words, indicating that the attentional changes were related to the drug of choice.

Conclusions : Thus, the presence of verbal descriptors of cocaine-related stimuli and experiences alters performance on an otherwise automatic attentional task in cocaine-dependent individuals that are both seeking treatment and not seeking treatment. However, the direction of effects suggest that the verbal encoding and processing of cocaine cues and experiences differ between these groups. These data also provide further evidence in support of drug Stroop task performance as a marker of engagement in clinical treatment.

Correspondence: *Nehal P. Vadhan, PhD, Psychiatry, Columbia University/NYSPI, 1051 Riverside Drive #66, New York, NY 10016. E-mail: npv2101@columbia.edu*

Traumatic Brain Injury

L. MOTTRAM & J. DONDERS. Cluster Subtypes of the California Verbal Learning Test Childrens Version (CVLTC) after Pediatric Traumatic Brain Injury.

Objective: The purpose of this study was to determine the presence of common profile subtypes on the California Verbal Learning Test-Childrens Version (CVLT-C) in children with traumatic brain injury (TBI).

Participants and Methods : This sample consisted of 175 children with a diagnosis of TBI were selected from a 9-year series of consecutive referrals to a regional Midwestern rehabilitation facility. Children with premorbid academic, substance, neurological, or psychiatric histories were not included in this study. Demographic variables, injury severity parameters, and WISC-III factor scores were included in the analyses. The CVLT-C and WISC-III, routinely administered in neuropsychological evaluations were utilized.

Results : Four key z-score variables (i.e., List A-Trial 1, List A-Trial 5, long delay free recall, and false positives) were used in a two-stage cluster analysis. The first stage involved Ward's minimum variance agglomerative clustering technique with squared Euclidean distance as a measure of similarity. The Complete Linkage procedure was utilized as a reliability check and the k-means iterative partitioning procedure was the second stage of the cluster analysis. Demographic variable, injury severity parameters, and WISC-III factor scores were examined investigate the external validity. Four cluster subtypes were found.

Conclusions : Two cluster subtypes each were differentiated by level and pattern of performance. No significant differences among the clusters were found for demographic variables. Significant differences among the four clusters were found for injury severity parameters and factor scores of the WISC-III. Although no unique profile on the CVLT-C after TBI in children was found, both level and pattern of performance on the CVLT-C were affected by injury severity and processing speed. Correspondence: *Lisa Mottram, PhD, Psychology; Delnor-Community Hospital, 2271 Oakridge Dr. Apt. 13, Aurora, IL 60502. E-mail: neuro215@juno.com*

S. KASHLUBA, J.E. CASEY & C. PANIAK. Sensitivity and Specificity of ICD-10 Postconcussion Syndrome After MTBI.

Objective: To investigate the utility of the ICD-10 diagnostic criteria for self-reported postconcussion syndrome (PCS) symptoms following mild traumatic brain injury (MTBI). The ICD-10 criteria for PCS incorporate nine symptoms measurable by self-report; however, it is unclear whether endorsement of all nine optimally characterizes PCS or whether some combination of the nine is optimal. The present study examined whether the ICD-10 PCS symptoms could accurately classify MTBI patients and uninjured control participants at 1-month and 3-months post-injury and, if so, how many of the nine symptoms required endorsement for optimum classification.

Participants and Methods : The 110 MTBI patients and 118 control participants were group-matched on age, gender, and education level. Symptom endorsement rates were drawn from MTBI and control participants' responses to the Problem Checklist from the New York Head Injury Family Interview in which the nine ICD-10 PCS symptoms are included.

Results : Investigation of the accuracy of the ICD-10 PCS criteria in classifying MTBI patients was conducted by receiver-operating characteristic curve analysis and an examination of utility estimates. The ICD-10 symptoms accurately classified MTBI patients at 1-month post-injury (area under the curve was 0.74; $p < .001$, $SE \pm .032$). However, the optimal positive test threshold of five symptoms endorsed coincided with a sensitivity of only 73% and specificity of 61%. The ICD-10 symptoms were no greater than chance in classifying MTBI patients at 3-months post-injury (area under the curve was 0.55; $p > .05$, $SE \pm .039$).

Conclusions : Even soon after MTBI, a diagnosis of PCS using the ICD-10 self-reported symptoms is relatively inadequate and prone to misdiagnosis.

Correspondence: *Shauna Kashluba, M.A., Psychology; University of Windsor, 173 Chrysler Hall South, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: kashlub@uwindsor.ca*

J. CANTIN & M. PEPIN. Evolution of the condition of people with mild traumatic brain injury: A prospective study.

Objective: To identify, prospectively, the nature of symptomatic, cognitive and affective modifications associated with mild TBI.

Participants and Methods : 79 patients with mild TBI and 15 patients with an orthopaedic injury (OI) were evaluated two weeks, three months and six months after their accident. A group of 20 healthy people was also evaluated once only.

Results : Patients with mild TBI reported more post concussion symptoms (of physical nature mostly) on the Rivermead than the patients with an OI and healthy people at the first evaluation only. However, there was no significant difference between the patients with mild TBI and the patients with an OI on neuropsychological tests, nor on scores on anxiety and depressive questionnaires, at the three evaluations. Six months after the accident, 13.6% of the mild TBI patients showed a chronic post concussion syndrome (PCS). Interestingly, 5.9% of the pa-

tients with OI (at six months after the accident) and 15% of the healthy people presented with the same kind of syndrome. Although the mild TBI group with PCS had more depressive and anxious symptoms than the other two groups, all three groups showed similar scores on cognitive tests.

Conclusions : These results suggest that mild TBI causes little objective cognitive problems but that a subgroup of people suffers from chronic affective difficulties six months post injury. In addition, the presence of post concussion symptoms in healthy individuals suggests that these clinical manifestations may not be specific to mild TBI.

Correspondence: *Jean-Francois Cantin, M.Ps., Programme TCC, IRDPQ, 525 boul Hamel, Quebec, QC G1M 2S8, Canada. E-mail: Jean-Francois.Cantin@irdpq.qc.ca*

J. CANTIN, B. MCFADYEN, J. DOYON, B. SWAINE, D. DUMAS & M. VALLEE. Relationship between cognitive measures and locomotor performance in complex environments in persons with traumatic brain injury and healthy subjects.

Objective: To evaluate how cognitive function and divided attention affect the locomotor performance in TBI.

Participants and Methods : Participants were 10 persons with moderate to severe TBI and 10 healthy subjects matched for age and gender. Results from neuropsychological evaluations (Trail Making A and B, Digit and Spatial Span, Stroop, SDMT, Brown-Peterson, Letter-Number Sequencing, D2) were correlated with locomotor performance during unobstructed and obstructed gait both with and without visual distraction (adapted Stroop Bar and Word tests).

Results : Previous analyses had shown that subjects with TBI walked slower, had higher clearance margins and took longer to read during the simultaneous Stroop tasks than healthy subjects. The current analyses revealed that subjects with TBI showed significantly lower scores than healthy subjects on Trail Making B, Stroop A, B and C, SDMT, D2 and Brown-Peterson tests. Significant relationships were found between scores on Trail Making B and clearance margins for subjects with TBI but not for healthy subjects. Significant relationships between scores on clinical Stroop tests and adapted Stroop reading time were obtained for healthy subjects only.

Conclusions : Executive dysfunction may contribute to the relationship between scores on Trail Making B and clearance margin for subjects with TBI. In addition, the absence of a relationship between Stroop reading time in the laboratory and the clinical Stroop scores for the subjects with TBI could be explained by the greater presence of distractors in the more complex laboratory environment.

Correspondence: *Jean-Francois Cantin, M.Ps., Programme TCC, IRDPQ, 525 boul Hamel, Quebec, QC G1M 2S8, Canada. E-mail: Jean-Francois.Cantin@irdpq.qc.ca*

L.E. DREER, D. SALISBURY, T. NOVACK & S. PENNA. Social Problem-Solving Abilities and Functional Outcomes Following Traumatic Brain Injury.

Objective: The purpose of the current study was to examine self-reported social problem-solving abilities and functional outcomes following traumatic brain injury.

Participants and Methods : Thirty-two patients with traumatic brain injury (24 men and 8 women; M age = 38.84, SD = 15.93) participated in this ongoing longitudinal study. In this investigation, we were interested in patients' self-reported social problem-solving abilities (Social Problem Solving Inventory-Revised, Short-form, SPSI-R; D'Zurilla et al., 2002) and community integration (Community Integration Questionnaire, CIQ; Willer et al., 1993) at 3 months post discharge. The SPSI-R contains five subscales: two constructive or adaptive dimensions (Positive Problem Orientation, PPO; Rational Problem Solving, RPS) and three dysfunctional dimensions (Negative Problem Orientation, NPO; Impulsivity/Carelessness Style, ICS; and Avoidance Style, AS). The CIQ consists of three subscales of integration: home, social, and productive activity.

Results : Preliminary data indicated that greater adaptive problem solving dimensions (i.e., PPO, RPS) were significantly related to greater social ($r = .49$) and home integration ($r = .44$). However, more dysfunctional dimensions of social problem-solving (i.e., NPO, ICS, AS) were associated with primarily poorer social integration ($r = .40$). Interestingly, social problem-solving was unrelated to productive activity.

Conclusions : Increased independence was found among individuals employing more constructive social problem-solving styles; lowered independence, social in particular, was associated with more dysfunctional social problem-solving styles. In this ongoing study we will further examine the predictive utility of social problem-solving abilities on community integration longitudinally at 6 and 12-month follow-up. Implications for integrating social problem-solving components into rehabilitation efforts that focus on integration back into the home and social situations will be discussed.

Correspondence: *Laura E. Dreer, Ph.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 1720 University Blvd, Suite 380, Birmingham, AL 35233. E-mail: dreer@uab.edu*

Y. GOVEROVER, M.V. JOHNSTON, J. TOGLIA & J. DELUCA. What is the Relationship between Functional Performance to Task-Specific and General Self Awareness in Individuals with Brain Injury.

Objective: To examine the relationship between general and task specific awareness to the performance of Instrumental Activities of Daily Living (IADL) and to community integration reports among adults with brain injury.

Participants and Methods : Participants with brain injury recruited from cognitive rehabilitation outpatients unit were included in this study. correlational research design was used to examine the relationship among: General self-awareness with collateral report of relatives or rehabilitation staff (Awareness Questionnaire); ADL-task specific awareness (Assessment of Awareness of Disability); higher levels of self-awareness and self-regulation skills (SRSI). IADL was assessed using a performance-based standardized measure (AMPS); Community Integration Questionnaire (CIQ) was filled by participants.

Results : Results showed significant relationship between general self awareness and task specific awareness; between task specific self-awareness and community integration. IADL as measured by the AMPS, was not significantly correlated with any of the outcome measures.

Conclusions : General self-awareness is related to task specific self-awareness. While significant relationships were expected to be found between IADL performance and self-awareness, these relationships were not significant. The results are discussed within the framework of a conceptual model illustrating the multifaceted nature of self-awareness and its relationship to everyday functional activities.

Correspondence: *Yael Goverover, PhD, Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: ygoverover@kmrrec.org*

J. BENGE, J.S. CARSELLI & R.O. TEMPLE. Wisconsin Card Sorting Test: Factor Structure and Relationship to Productivity and Supervision Needs Outcome in Severe Traumatic Brain Injury.

Objective: The Wisconsin Card Sorting Test (WCST) has been demonstrated to have a relatively stable factor structure in brain-injured samples. However, no studies have evaluated the relationship of its factors to functional status. The purpose of the current study is to replicate the factor structure of the WCST in individuals who suffered severe traumatic brain injury (TBI) and to explore the relationship of the obtained factor scores to productivity and supervision needs.

Participants and Methods : Participants in this study were residents of an inpatient post-acute brain injury rehabilitation program. As part of the program, participants were administered the WCST around the time of admission. In addition, the Supervision Rating Scale (SRS) and Community Integration Questionnaire Productivity scale (CIQ-P) were

administered at admission and follow-up. Using WCST data from 143 participants, an exploratory factor analysis was performed yielding a 3 factor solution, similar to previous reports in the literature (Greve et al 2001). The resulting factor scores were used to predict productivity and need for supervision at follow-up, controlling for status at admission. To control for chronicity, separate analyses were performed for individuals greater and less than one year post-injury.

Results : For individuals in the chronic group, findings suggest a relationship between failure to maintain set and decreased productivity. Nonperseverative errors also were related to increased supervision needs.

Conclusions : Although effect sizes were modest, these findings provide a concrete example of the relative utility of neuropsychological measures in predicting vocational and supervision outcomes

Correspondence: *Jared Benge, M.S., University of Houston, 3813 Pin Oak Dr N, Pearland, TX 77581. E-mail: jfbenge@uh.edu*

R. NAKASE-RICHARDSON, M. SHERER, S.A. YABLON & C.C. EVANS. Initial Neuroimaging is Predictive of Confusion at One-Month Post Traumatic Brain Injury.

Objective: Evaluate the contribution of early neuroimaging in the prediction of acute confusion status at one-month post traumatic brain injury (TBI).

Participants and Methods : Prospective study in a consecutive sample of TBI admissions to an inpatient brain injury rehabilitation program. Eighty participants from a sample of 144 TBI Model System admissions. Assessments included weekly determination of acute confusion status with a variety of delirium measures. Ratings by experienced clinical neuropsychologists were utilized to determine if subjects met DSM-IV Diagnostic Criteria. Evaluations closest to one-month post injury were utilized for study purposes.

Results : Binary logistic regression was used to predict DSM-IV diagnosis of acute confusion/delirium at one-month post injury. Age, education, emergency department Glasgow Coma Scale (GCS), and number of lesions (intraparenchymal contusions and extra-axial collections) on initial CT scan accounted for 33% of outcome variance with age, GCS, and number of lesions on CT scan being significant predictors. The values of the coefficients reveal individuals at the 75th percentile of age (43) were 2.4 times more likely to be confused than individuals at the 25th percentile (21). Individuals with 4 lesions on CT (75th percentile) were 2.64 times more likely to be confused than individuals with 1 lesion (25th percentile). Individuals with a GCS of 5 were 2.94 times more likely to be confused than individuals with a GCS of 12.

Conclusions : In addition to demographic and traditional injury severity indices, initial CT scan findings provide unique contributions in predicting neurobehavioral status at one-month post injury.

Correspondence: *Risa Thompson-Richardson, Ph.D., Neuropsychology, Methodist Rehabilitation Center, 1350 East Woodrow Wilson Drive, Jackson, MS 39216. E-mail: nakase@aol.com*

R.B. TANGEN & M. THOMPSON. WISC-IV Performance after Pediatric Traumatic Brain Injury.

Objective: The intellectual functioning of children after traumatic brain injury (TBI) has been documented; however, the Wechsler Intelligence Scale for Children (WISC-IV; 2003) was recently revised. There has been little research regarding the performance of children with TBI, especially during acute recovery. It was hypothesized that children with TBI would perform worse than children with orthopedic injuries on the Perceptual Reasoning (PRI), Verbal Comprehension (VCI), and Processing Speed (PSI) indexes based on pilot data in the WISC-IV manual.

Participants and Methods : Participants ($n = 34$, 63% male) were selected from consecutive referrals with a traumatic injury who completed the WISC-IV. Twenty-four children sustained moderate or severe TBI, with severity rating based on published criteria. Ten children sustained orthopedic/spinal injuries, without any sign of head injury. Participants (mean age = 11.2) were an average of 4 weeks post-injury.

Results : A series of ANOVAs were performed. Planned comparisons showed the combined TBI groups performed worse than the orthopedic group on Full Scale IQ [F (1,33) = 14.07, $p < .001$], PRI [F (1,33) = 18.64, $p < .000$], VCI [F (1,33) = 5.62, $p < .02$], and PSI [F (1,33) = 5.23, $p < .03$]. Planned comparisons did not show a significant difference between moderate and severe TBI groups.

Conclusions : The WISC-IV was sensitive to differences between children with moderate-severe TBI and orthopedic injuries, but not to differences between moderate and severe TBI during acute recovery. Children with moderate-severe TBI during acute recovery appear to have broad deficits including verbal, visual perceptual, and processing speed deficits.

Correspondence: *Rachel B. Tangen, Ph.D., Department of Psychology, Children's Hospital, 200 Henry Clay Ave., New Orleans, LA 70115. E-mail: rtangen@chnola.org*

T. HART & J. WHYTE. Neuropsychological Validation of an Attention Rating Scale for Traumatic Brain Injury.

Objective: The Moss Attention Rating Scale (MARS) provides a quantitative, naturalistic measure of attention dysfunction after TBI. The MARS has adequate inter-rater reliability, and factor analysis and Rasch analysis have generated a 22-item version with 3 factor scores (Initiation, Restlessness/Distractibility, Sustained/Consistent). It was hypothesized that as a specific measure of attention, MARS scores would correlate (1) more strongly with attention-related than non-attention-related psychometric scores, and (2) more strongly with Cognitive items of the Functional Independence Measure (FIM) than with Motor FIM items.

Participants and Methods : 61 persons with moderate-severe TBI were rated on the MARS by treating therapists close to rehabilitation discharge (mean = 2 months post injury), and tested on a battery with 5 putative measures of attention (Digits, Cancellation, Symbol Digit, Trails, Self-Ordered Pointing) and 2 measures presumed to depend less on attention (Visual Naming, Grip Strength). Correlations were computed among total MARS scores, factor scores, the 2 sets of tests, FIM, and injury severity measures.

Results : MARS ratings were significantly correlated ($r=.51$) with an attention test composite score, but not with grip strength ($r=.34$). However, the difference between correlations did not reach significance. Visual Naming correlated with the attention composite at $r = .69$. MARS ratings did correlate higher with FIM Cognitive ($r=.73$) than FIM Motor ($r=.59$), but both were significant. MARS and injury severity indices were weakly related. Of the MARS factors, participants were significantly worse on Sustained/Consistent Attention than either Initiation or Restlessness/Distractibility.

Conclusions : Preliminary results suggest that MARS is measuring attention-related constructs, not solely level of global function or injury severity. Psychometric validation of behavioral rating scales is clearly challenging, due to shared variance among measures of theoretically separable cognitive constructs.

Correspondence: *Tessa Hart, PhD, MRRI, 1200 W Tabor Rd, Philadelphia, PA 19141. E-mail: thart@einstein.edu*

J.H. STOUTER, M. SHERER, C. EVANS, R. NAKASE RICHARDSON, J. OLIVIER, S.A. YABLON, E. MANNING, C. VICKERY & J. IRBY. Relationship of Initial CT Scan Data to Early Neuropsychological Assessment in TBI Patients.

Objective: This study examined the relationship between initial computed tomography (CT) scan findings and early cognitive status in traumatic brain injury (TBI) patients. The study objective was to determine whether CT scan findings provide information that makes a contribution to prediction of early cognitive status beyond that made by demographic and injury severity variables.

Participants and Methods : Participants were 89 patients admitted for inpatient rehabilitation after TBI. Subjects were predominantly male

(72%) with mean age and education of 31 and 12 years, respectively. Injury severities as determined by Glasgow Coma Scale criteria were mild (N=23), moderate (N=19), and severe (N=47). CT scan data were obtained within 24 hours of injury. The average time from injury to neuropsychological evaluation was 30 days. Factor analysis of neuropsychological test scores revealed Memory, Cognitive Processing Speed, and Language/Attention factors. Associations among demographic, injury severity (time to follow commands), CT scan variables and the three factor scores were examined using bivariable correlations and multivariable linear regression.

Results : The Memory factor was predicted by education and injury severity with a trend for number of lesions on initial CT. The Cognitive Processing Speed factor was predicted by age, education, and total contusion volume on initial CT with trends for injury severity and abnormal CT (yes/no). The Attention/Language was predicted by age and injury severity.

Conclusions : The associations between initial CT scan findings and early cognitive status were modest at best. Demographic variables (age and education) and injury severity (time to follow commands) were more useful in predicting early cognitive status. The hypothesis that initial CT scan findings would make an additional contribution to prediction of early cognitive status was not supported.

Correspondence: *Josephine H. Stouter, Ph.D., Neuropsychology, Methodist Rehabilitation Center, 1350 E. Woodrow Wilson, Jackson, MS 39216. E-mail: jstouter@mmrc rehab.org*

M. WRIGHT, M. SCHMITTER-EDGEcombe & A. CURREN. Investigating the Foundations of Verbal Memory Dysfunction Following High-Velocity Closed-Head Injury: An Application of the Item Specific Deficit Approach to the CVLT.

Objective: List learning studies of memory in traumatic brain injury participants have yielded mixed results. Some evidence has suggested that disrupted acquisition is the primary deficit, while other data implicated retention difficulties. Discrepancies may have resulted from heterogeneous samples. In the current study, California Verbal Learning Test (CVLT) data from a homogeneous sample of high-velocity closed-head injury (HVCHI) participants were examined.

Participants and Methods : Sixty-three HVCHI participants and 63 age and education matched controls participated in this study. The CVLT data were analyzed at the item level, and indices of retention and retrieval were controlled for level of acquisition.

Results : The HVCHI group showed significant difficulties on indices of acquisition (items acquired at a low level), retention (items lost/items gained), and retrieval (items recovered/items gained). Hierarchical regression analysis showed that both acquisition and retention difficulties accounted for unique variance in HVCHI participants' long-delay free recall, and acquisition difficulties accounted for the majority of the variance. Examination of strategy use showed that HVCHI participants showed less semantic clustering during learning and at the short delay-recall test compared to controls. Unlike the control group, the HVCHI group did not show increased semantic clustering at the long-delay recall free recall test following the short-delay semantically cued recall test.

Conclusions : Overall, the results suggest that HVCHI survivors primarily suffer from acquisition deficits that are characterized by poor strategy use. Additionally, HVCHI survivors' mild difficulties with retention may also be related to insufficient strategy use during acquisition.

Correspondence: *Matthew Wright, M.A., Psychology, Washington State University, 148 S. Sepulveda # 3, Los Angeles, CA 90049. E-mail: matthewjustinwright@hotmail.com*

G. PELED, O. BARAK, J. ROCHBERG & Y. HAREL. Hope and its Role as Mediator of Depression Severity Following Traumatic Brain Injury.

Objective: Depression is a common, well-documented phenomenon following traumatic brain injury (TBI). However, in comparison with other

sequelae of TBI, it is poorly conceptualized, as it represents a heterogeneous category with multiple etiologic and clinical implications. The goal of the present study was to investigate the role of hope as a mediator of depression following TBI. Coping within a hopeful state of mind should enable better rehabilitative results, thus diminishing the degree of experienced depression. In accordance with hope theory, even severely depressed people can maintain an internal core of hope. Study hypotheses were that despite a high prevalence of depression and a low degree of hope following TBI, still there are significant differences among people in the degree of hope experienced within a given severity level of depression.

Participants and Methods : 78 persons with medically documented TBI were asked to complete the Beck depression inventory revised (BDI-R), the life orientation test revised (LIT-R) as a measure of general optimism, and the adult hope scale (AHS).

Results : Participants' mean scores on the BDI-R were significantly higher than Israeli normal controls, while mean scores on the LIT-R and the AHS were significantly lower. Significant negative correlations were found between BDI-R scores and both LIT-R and AHS scores, reflecting the reciprocal connections between depression and hope. However, after grouping participants' BDI-R results based on depression severity, distinct sub-groups of optimism (LIT-R) and hope (AHS) were mapped.

Conclusions : The present study provided an initial evidence of reduced levels of hope and optimism following TBI, in addition to replicating findings of high rates of depression post injury. In addition, it was shown that within a given level of depression severity, people may retain varying degrees of hope and optimism. These differences may serve to further explore unaccounted heterogeneity of hope presentations in depressed persons with TBI.

Correspondence: *Ohr Barak, Ph.D., Behavioral Sciences, Tel-Aviv Jaffa Academic College, Rabenu-Yerucham St, #14, Tel-Aviv 68152, Israel. E-mail: obarak@netvision.net.il*

B.K. LEBOWITZ, J.L. VASSALLO, R.D. VANDERPLOEG & G. CURTISS. The Cognitive Effects of Persistent Post-Concussion Syndrome Following Mild Traumatic Brain Injury.

Objective: Post-concussion syndrome (PCS) refers to a constellation of cognitive, neurological, and psychological symptoms that commonly occur following a mild traumatic brain injury (MTBI). For most individuals, this syndrome is short-lived, with complete symptom resolution within several months post-injury. However, a subgroup of individuals continue to endorse PCS symptoms for years after the injury. Although cognitive complaints are common in this subgroup, it is not clear if this group differs on cognitive measures from individuals with a history of MTBI who do not meet PCS symptoms criteria.

Participants and Methods : Using a large, non-referred sample of veterans with a history of MTBI, the current study compared those individuals who met symptoms criteria for PCS ($n = 89$) to those who did not ($n = 178$) on neuropsychological measures chosen to assess a range of cognitive domains (language, memory, visual cognitive abilities, attention, executive functions).

Results : A 2 (Group) X 8 (Measure) MANOVA with General Technical Test (GTT; a measure of general intellectual capacity) entered as a covariate was performed. Overall, while the groups differed in GTT score (having no PCS scoring higher), no significant group differences on the cognitive measures were revealed, $F(1, 257) = 1.748, p > .05$.

Conclusions : Taken together, the results of this study suggest the presence of persistent PCS symptoms, including cognitive complaints, following MTBI does not affect cognitive abilities.

Correspondence: *Brian K. Lebowitz, Ph.D., Harvard Medical School, 99 Chestnut St, Apt 1B, Brookline, MA 02445. E-mail: BKL26@yahoo.com*

L. DE BEAUMONT, M. LASSONDE, B. BRISSON & P. JOLICOEUR. N2pc and P300 Alterations in Concussed Athletes.

Objective: This study sought to investigate the pervasive effects of concussions on asymptomatic athletes when rapid shifts in the distribution of visual-spatial attention is required, by measuring the N2pc component in a visual search task that could also allow us to replicate the previously observed effects on the P3b.

Participants and Methods : Sixteen concussed University Football players were matched according to age and education with teammates who have no history of neurological insults. Two coloured squares with an open side were presented in the upper left visual field and two others were presented in the upper right visual field. One square was coloured differently (unique colour square) from the three others and participants had to locate it and press on the letter V of a computer keyboard when either its left, upper, or right side was open, the frequent condition, and press on the letter N when its lower side was open, the rare condition.

Results : We found a significantly prolonged N2pc latency after computing the lateralized readiness potential at PO7-PO8 electrode site ($F(1, 32) = 2.39; P < .035$) as well as a significantly reduced P3b amplitude at Pz electrode site ($F(1, 32) = 5.01; P < .031$) in asymptomatic concussed athletes (AC athletes).

Conclusions : AC athletes appear to be engaged significantly longer on an attended target compared with normal controls in a visual search task. This finding may be due to pervasive difficulties in concussed athletes at regulating the amount of attentional resources allocated to non-target stimuli.

Correspondence: *Louis De Beaumont, BA, Psychology, University of Montreal, 1100 Av. Ducharme Apt. 10, Outremont, QC H2V 1E3, Canada. E-mail: louis.de.beaumont@umontreal.ca*

C. MCKAY, J. WERTHEIMER, N. FICHTENBERG & J.E. CASEY. Reliability and Validity of the RBANS in a Traumatic Brain Injured Population.

Objective: Although initially designed as a screening measure for dementia, the RBANS has become increasingly utilized in other populations since it reliably assesses individual neurocognitive domains in a rapid, efficient manner. The present study examined the convergent validity of the RBANS as compared to frequently administered instruments in a traumatic brain injured population.

Participants and Methods : Seventy-one individuals who sustained a traumatic brain injury were included in this study. The RBANS subtests were compared to the CVLT-II, COWAT, BVRT, MAE Visual Naming, and the WAIS-III Digit Span and Digit Symbol Coding subtests.

Results : The RBANS subtests showed moderate to strong internal reliability within the sample. Most of the subtests displayed moderate to strong correlations with the other neuropsychological tests, including the CVLT-II, COWAT, and WAIS-III subtests. The strongest correlations were within the RBANS Attention Index as both the Digit Span and Coding subtests showed strong correlations with their WAIS-III counterparts. List learning, picture naming, and list recall subtests all showed strong correlations with comparable tests (i.e., CVLT-II and Multilingual Aphasia Examination Visual Naming).

Conclusions : In conclusion, construct validity supported the individual domains, such that the RBANS appears to be measuring distinct abilities that help compliment and supplement other neuropsychological instruments tapping those functions within a TBI sample. Moreover, the results of this study, in addition to its administration advantages (i.e., short administration time, co-normed indices, alternate forms), provides support for the use of the RBANS as a clinically valid and reliable tool in the brief screening of individuals with traumatic brain injury.

Correspondence: *Cherisse McKay, Psychology, University of Windsor, 542 Randolph Avenue, Windsor, ON N9B 2T6, Canada. E-mail: cherissemckay@hotmail.com*

J.A. THYSEN, T. LEE-WILK, R.L. KANE, C. MACKENZIE, J. SPECTOR, K. AUMAN, J. KUFERA, K. MURDOCK, P. IMLE & P. DISCHINGER. The Relationship Between S100B Protein Levels and Effort in Mild Traumatic Brain Injury.

Objective: To assess the relationship between S100B protein (a biological marker of astroglial cell death representative of CNS damage) and the Word Memory Test (WMT), a test of effort and motivation, in a sample of participants with mild traumatic brain injury (mTBI). The WMT is viewed as a test more sensitive to effort than to brain injury. We hypothesized there would be no relationship between S100B and WMT performance.

Participants and Methods : Thirty-four participants admitted to an ER of an urban hospital, ages 18-64, with Glasgow Coma Scales between 13-15, participated in this longitudinal investigation. S100B protein was measured upon admission, within 3-10 hours post-injury. Each participant was administered the WMT 7-10 days following the injury. Repeat WMT data were also available for 32 participants 3 months post injury.

Results : At 7-10 days, 7 participants (18%) failed the Immediate Recall trial (IR) and two participants (5%) failed the Delayed Recall trial (DR) of the WMT. These same two individuals also failed the IR condition. At 3 months, 1 individual failed IR and none failed DR. Results of regression analyses indicated no relationship between S100B protein levels and performance on WMT performance at both one week and three months.

Conclusions : No relationship was demonstrated between a biological marker of brain injury (S100B) and WMT performance. A 5% failure rate on both IR and DR was observed at one week. No participant failed both IR and DR at 3 months.

Correspondence: *Terry Lee-Wilk, Ph.D., School of Medicine, University of Maryland, 701 W. Pratt Street, 5th Floor, Baltimore, MD 21201. E-mail: terrymaylee@hotmail.com*

T. LEE-WILK, P. DISCHINGER, C. MACKENZIE, K. MURDOCK, P. IMLE, J. SPECTOR, J. KUFERA, K. AUMAN, J.A. THYSEN & R.L. KANE. The Relationship Between S100B Protein and Neuropsychological Performance in Mild Traumatic Brain Injury.

Objective: To assess the relationship between S100B protein (a biological serum marker of astroglial cell death representative of CNS damage) and measures of neuropsychological functioning in a sample of participants with mild traumatic brain injury (mTBI).

Participants and Methods : Thirty-four participants, ages 18-64, with mTBI (Glasgow Coma Scale 13-15) admitted to an emergency room of an urban hospital were included in this longitudinal study. S100B protein was measured by blood draw upon admission, within 3-10 hours post-injury. Participants were subsequently assessed (within 7-10 days of injury) with the Automated Neuropsychological Assessment Metrics (ANAM), a computerized library of tests designed to serially assess neuropsychological functioning. To reduce the number of variables, several test measures were combined into a weighted composite. In addition, we also included measures of simple (sRT) and choice (pRT) reaction time.

Results : Results of regression analyses adjusted for age, gender, and education indicated a significant relationship between S100B and sRT ($F=9.51$, $p=0.004$). There was no significant relationship between S100B and either the composite score ($F=0.49$, $p=0.488$) or pRT ($F=0.79$, $p=0.381$).

Conclusions : Our findings indicated a significant association between S100B protein and sRT. This finding is of interest since sRT is emerging in the literature as a sensitive measure to the effects of concussion. Findings from previous research have been mixed with studies finding and failing to find relations between S100B and performance on cognitive tests. In this analysis of data from our study, S100B was related to reaction time but not to more complex cognitive tasks.

Correspondence: *Terry Lee-Wilk, Ph.D., School of Medicine, University of Maryland, 701 W. Pratt Street, 5th Floor, Baltimore, MD 21201. E-mail: terrymaylee@hotmail.com*

A.D. BAGLEY, M.T. SWIGGER, D.S. KOSSON, J.L. WOODARD & C.W. LEJUEZ. Traumatic Brain Injury and Risk-Taking Behavior in a Criminal Population.

Objective: Violence-related traumatic brain injury (TBI) has been rarely addressed in previous literature but is an increasing area of interest (Kolakowski-Hayner & Kreuter, 2001; Hanks, et al., 2003). Research indicates that traumatic brain injury can lead to increased impulsivity (McAllister, 1992), antisociality (Labbate, Warden & Murray, 1997), and risk-taking behaviors (Levine, et al. 2005), all of which have implications for subsequent criminal activity in inmates with a history of TBI (Greve, et al., 2001). The current study examined the relationships between self-reported TBI characteristics, risk-taking behaviors, and a behavioral task (e.g. Balloon Analogue Risk Task) intended to identify the propensity for real-life risk-taking behavior.

Participants and Methods : Seventy-six male inmates from a Midwestern county jail were interviewed and tested for the study.

Results : Results indicate that a history of TBI in inmates was correlated with criminal but not recreational or general risk-taking behaviors. Additionally, the number of symptoms from the most severe head injury correlated with performance on the BART and recreational risk-taking behavior.

Conclusions : Based on these findings, the presence of TBI does not have equivalent relationships with all types of risky behavior. It is suggested that TBI leads to greater impulsivity and likelihood of criminal risk-taking or that these individuals were greater in criminal risky behavior prior to the head injury. Findings also indicate that individuals with a disposition for recreational risk-taking report a more symptomatic TBI and have greater performance deficits, as a result, on a risk-taking measure. This finding may be explained by greater severity of TBI. Recommendations for future studies are addressed.

Correspondence: *Amy Bagley, MA, Psychology, Rosalind Franklin University, 30035 N Waukegan Rd., Lake Bluff, IL 60044. E-mail: baglady1@hotmail.com*

E. BALDWIN & J.L. GESS. The Functional Consequences of Lightning Injury: A Case Study.

Objective: The literature examining the functional consequences of lightning injury highlights common deficits in cognition, mood, and behavior. However, very few studies present the recovery profile of such patients. Those that do are conflicting with some showing a pattern of global decline and others showing improvement. Behavioral disturbances in this population resemble those associated with traumatic brain injury, and are commonly linked to depression and PTSD related to the injury. The current study presents longitudinal data from a young male who was struck by lightning. Although he made strong cognitive recovery on neuropsychological testing, he experienced remarkable behavioral deterioration.

Participants and Methods : A 24-year-old male who was struck by lightning and suffered cardiac arrest requiring CPR and cardioversion. The patient had CT and MRI scans of his head following the injury and received neuropsychological evaluations at one week, and at one-, four-, and thirteen months post-injury.

Results : Both the CT and MRI were read as normal. Results from the assessments revealed initially severe deficits in memory followed by substantial cognitive improvement to close to premorbid levels; however, the patient had significant behavioral decline, including personality change and loss of functional independence. Although symptoms of depression and PTSD are commonly reported in this population, this patient evidenced behavior changes in the absence of obvious psychiatric disorder.

Conclusions : Although cognitive deficits associated with lightning strike may resolve, the behavioral disturbance can persist with important functional consequences. This case illustrates the importance of long-term follow-up after electrical injury and supports the argument for functional imaging of these patients.

Correspondence: *Erin Baldwin, MA, Psychology Department, Georgia State University, P.O. Box 5010, Atlanta, GA 30302-5010. E-mail: ebaldwin1@student.gsu.edu*

B.N. PATRY, C.A. MATEER & H. TUOKKO. "Navigating Your Week": A New Board Game to Measure Prospective Memory in Adults with Traumatic Brain Injury.

Objective: Prospective memory (PM) is a common and debilitating difficulty faced by individuals who have had a traumatic brain injury (TBI). Yet, there are no tasks developed for this population that have good ecological validity and that yield more than a single pass or fail score. Therefore, we designed a board game called "Navigating Your Week" based on a PM task described by Rendell and Craik (2000). This game allowed for the detailed analysis of error types and the manipulation of cue saliency. A second PM measure called the Prospective Remembering of Actions and Sentences (PROAS) was also designed and administered based on traditional PM measures.

Participants and Methods : Twenty adults with a mild to severe TBI and 20 age-, gender-, and education-matched controls completed both PM measures. In the Navigating Your Week game, participants read cards describing activities to do later in the game. Other cards contained a cue (salient or not) indicating that the time had come to perform some activity. In the PROAS, participants had to make a verbal or action response to auditory or visual cues. Additionally, participants completed a self-report measure of PM.

Results : Those with TBI scored significantly below controls on both PM tasks, even when controlling for anxiety and depression. Scores on both PM tasks were correlated highly, and were predicted by PM self-reports. Notably, participants rated the board game as engaging and representative of their daily activities.

Conclusions : Implications for assessing and rehabilitating PM are discussed, along with the advantages of the Navigating Your Week game over existing PM measures.

Correspondence: *Brigitte Patry, MA, Psychology, University of Victoria, 1526 Aline Avenue, Ottawa, ON K4A 3Y7, Canada. E-mail: bpatry@uvic.ca*

K. GANESALINGAM, K.O. YEATES, S. WADE, H.G. TAYLOR, N.C. WALZ & T. STANCIN. Executive Functions and Social Outcomes in Preschool Children 6 Months Following Traumatic Brain Injury.

Objective: Data from an ongoing prospective, longitudinal study were used to examine executive functions, social outcomes, and their relationship after traumatic brain injury (TBI) in preschool children.

Participants and Methods : Participants included 3 to 6 year old children with moderate to severe TBI, and a comparison group of children with orthopedic injuries (OI). All participants were first assessed shortly after the injury and at 6 months post-injury. Current findings are based on a sample of 52 children with TBI and 111 children with OI, about half of whom have completed assessments at 6 months. Executive functions were assessed using neuropsychological tests and parent ratings of behaviors believed to reflect executive functions. Parents also provided ratings of social outcomes.

Results : After controlling for age and socioeconomic status, children with TBI scored lower on neuropsychological tests of executive functions than children with OI. Group differences were also found on parent ratings of executive functions and social outcomes after controlling for socioeconomic status, with poorer functioning among children with TBI. Neuropsychological test results were weakly related to behavioral ratings of executive functions and social outcomes. Behavioral ratings of executive functions predicted significant variance in social outcomes, although shared rater and method variance may have contributed to these associations.

Conclusions : The few significant relations between neuropsychological measures of executive functions and parent ratings of social outcomes suggest that the more purely cognitive aspects of executive functions are only weakly related to children's social functioning.

Correspondence: *Kalaichelvi Ganesalingam, PhD, Psychology, Columbus Children's Hospital, 700 Children's Drive, Columbus, OH 43205. E-mail: GanesaKa@chi.osu.edu*

A. TELLIER, S.C. MARSHALL, K.G. WILSON, A.M. SMITH, M. PERUGINI, B. GARBER, I.G. STIELL, D.A. COYLE & K. O'ROURKE. Mild Traumatic Brain Injury: How heterogeneous is it?

Objective: The heterogeneity that characterizes the clinical presentation of patients having sustained a mild traumatic brain injury (mTBI) has been recognized for some time. Our own group previously published neuroimaging data that brought to light the fact that the qualifier "mild" is misleading in some cases given the structural and behavioural sequelae that can be experienced by some mTBI patients (Tellier et al, 1994, 1999). It has also been convincingly argued by others that, notwithstanding the widely accepted definition of a mTBI based on a Glasgow Coma Scale (GCS) score of 13 to 15, individuals with GCS scores of 13 and 14 might represent a different subgroup of mTBI patients than those with a GCS of 15. The present study, which took place in the context of a larger prospective study, was an attempt at investigating the possibility that those two subgroups of mTBI patients might indeed present with distinct neuropsychological and neuroimaging profiles.

Participants and Methods : The cognitive data were collected from measures of sustained attention, processing speed and working memory that were administered one month post-injury to a sample of 117 mTBI patients who presented to the Emergency Department of a lead trauma center over a 15-month period. CT scans were obtained at the time of the initial hospital visit. While the majority of participants (70.9%) had an initial GCS score of 15, 29.6% of the sample obtained a GCS score of 13 or 14.

Results : The two subgroups of mTBI patients did not differ with respect to their neuropsychological performance or frequency of CT scan abnormalities ($p > 0.05$).

Conclusions : Contrary to previous reports, our data did not support the notion that initial GCS scores might be indicative of clinical heterogeneity within a group of mTBI individuals.

Correspondence: *Andree Tellier, Ph.D., Neuropsychology (Psychology), Ottawa Hospital, Civic Campus, 1053 Carling Avenue CPC 3rd Floor, Ottawa, ON K1Y 4E9, Canada. E-mail: Atellier@ottawahospital.on.ca*

R.S. SCHEIBEL, M.R. NEWSOME, J.L. STEINBERG, R.G. SHARMA, D.A. PEARSON, R.A. RAUCH, H. MAO & H.S. LEVIN. Brain Activation During Response Inhibition after Moderate to Severe Traumatic Brain Injury.

Objective: Response inhibition (RI) is mediated by prefrontal cortex, its circuitry, and associated cortical regions that are vulnerable in traumatic brain injury (TBI). Previous investigations using functional magnetic resonance imaging (fMRI) during RI have reported different activation patterns in patients with TBI, relative to control subjects. The current study used fMRI to study RI following TBI and to examine regressions with RI accuracy and reaction time.

Participants and Methods : Fourteen patients with moderate to severe TBI were compared to 10 orthopedic injury (OI) controls matched on age, education, and task performance. Participants underwent fMRI during the Arrows inhibition task.

Results : TBI patients had RI-related brain activation within frontal and parietal structures and, relative to OI controls, greater activation within medial areas that included anterior cingulate cortex. However, the OI group exhibited a stronger relationship than the TBI group between high accuracy and activation within anterior midline structures. Regressions

with reaction time also provided evidence for a functional dissociation of activation with response speed. When TBI patients responded quickly they engaged midline structures, whereas this relation was not present in the OI group. Slower responses within the TBI group were associated with the recruitment of right lateral frontal and parietal areas.

Conclusions : TBI patients had greater brain activation than OI patients during the RI task. However, the activation pattern within the TBI group varied with response speed and, unlike the OI subjects, there was no consistent relationship with RI accuracy. These findings may reflect less efficient utilization of neural resources to perform RI after TBI.

Correspondence: *Randall S. Scheibel, Ph.D., Physical Medicine and Rehabilitation, Baylor College of Medicine, 2005 Shoal Court, Pearland, TX 77584. E-mail: scheibel@bcm.tmc.edu*

M. THERIAULT, M. FILIPINNI, L. DE BEAUMONT & M. LAS-SONDE. Well-functioning multiple concussions athletes show attenuated P3 component amplitude.

Objective: The present study contrasted the performance of well-functioning University football athletes who sustained multiple concussions with that of control athletes.

Participants and Methods : Participants for this study were recruited from college football teams. They were subdivided into two groups: 11 well-functioning athletes with a history of multiple concussions and 10 others presenting with no prior history of concussions. All participants were submitted to a three-tone auditory Oddball paradigm while ERP were recorded.

Results : Results from ERP recordings exerted a significantly reduced P3a amplitude at frontal electrode sites ($t = 2.24$; $p < 0.05$) as well as yielding a trend toward significance for a lowered P3b amplitude over posterior electrode sites ($t = 1.98$; $p = 0.062$).

Conclusions : These findings suggest that despite functioning normally in their daily lives, concussed athletes still show subtle deficits in cognitive functioning. Thus, knowing that subclinical abnormalities on ERP components persist despite normal overt functioning, this may contribute as a significant risk factor in the reported increased risk for sustaining subsequent concussions.

Correspondence: *Martin Theriault, B. Sc., psychology, University of Montreal, Dept. of psychology, C.P. 6128, succ. Centre-Ville, Montreal, QC H3C 3J7, Canada. E-mail: martin.theriault@umontreal.ca*

K.F. PAGULAYAN, S.S. DIKMEN & N.R. TEMKIN. Determinants of Patient and Collateral Report of Functional Status After Traumatic Brain Injury.

Objective: Self-report measures are frequently used with both patients and their collateral reporters (CR) to assess recovery following traumatic brain injury. The factors that may impact these reports are not fully understood.

Participants and Methods : 159 patients with complicated mild to severe TBI and their CR completed the Sickness Impact Profile at one year post injury. Regression analyses examined the variables associated with the patient and CR reports of physical and psychosocial difficulties.

Results : The level of reported physical difficulties was much smaller than the level of reported psychosocial difficulties, and more of the variance was explained for the patient and collateral report of psychosocial functioning than physical functioning (62% and 56% for patient and CR on psychosocial factor vs. 31% and 23% respectively on physical factor). For psychosocial functioning, increased difficulties reported by the patient were associated with more emotional distress, pre-existing psychiatric difficulties, worse neuropsychological performance, and younger age. More difficulties reported by the CR were associated with more caregiver burden, more patient and CR depression, as well as more severe brain injury.

Conclusions : The relationship between the patients report of difficulties and their neuropsychological functioning provides support for the ecological validity of neuropsychological measures.

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*

M. MCCLINCY, J. PARDINI, M. LOVELL, V. FAZIO & M. COLLINS. Relation Between Symptom Report of Feeling Slowed Down and Cognitive Performance on Neuropsychological Testing.

Objective: Several recent studies have suggested that cognitive deficits may linger after the amelioration of overt symptomatology following sports related concussion. The purpose of this study was to examine the relation between subjective reports of feeling slowed down on a symptom inventory to neurocognitive performance on visuomotor speed tasks (e.g., objective evidence of slowing) in the concussion recovery process.

Participants and Methods : The ImPACT test battery was administered to 104 male high school and collegiate athletes, within seven days of sustaining a concussion. The ImPACT visuomotor speed composite and patient report of feeling slowed down were analyzed to detect significant differences in time required to achieve full return to baseline performance.

Results : Repeated measures ANOVAs were conducted to ensure that initial departure from baseline after injury and subsequent recovery was demonstrated in both the visuomotor speed score and athlete report of feeling slowed down. Subsequent post-hoc testing (using the Bonferroni distribution to strictly compensate for subject variance) was performed to determine if statistically significant differences existed between baseline and post-concussion testing sessions. The repeated measures ANOVAs were highly significant for each of the dependent variables (for Visuomotor speed, $F(3,309) = 26.01$, $p < .01$; for feeling slowed down, $F(2,294) = 45.98$, $p < .01$). Regarding differences between baseline and post-concussion testing sessions, significant deficits were found in visuomotor speed at two days post concussion ($p < .01$). Feeling Slowed Down reporting showed a significant difference from baseline at days two and seven post-injury ($ps < .01$).

Conclusions : Our conclusions are interesting given that the symptom report of feeling slowed down outlasted the impairment of visuomotor speed as determined by neuropsychological testing. This finding challenges published research suggesting that cognitive deficits outlast self-reported symptoms.

Correspondence: *Jamie Pardini, Ph.D., UPMC Sports Med, 3200 Water St., Pittsburgh, PA 15203. E-mail: j_pardini@verizon.net*

V. FAZIO, J.E. PARDINI, M.R. LOVELL & M.W. COLLINS. A Comparison of the Diagnostic Utility of the SCAT and ImPACT Assessment Systems in Sports Concussion.

Objective: The 1st International Symposium on Concussion in Sports in Vienna, Austria detailed a "comprehensive systematic approach to concussion injury" which included neuropsychological testing as a key component of the evaluation process (Aubry et al., 2001). The Concussion in Sports group (CIS) identified neuropsychological testing as "one of the cornerstones of concussion evaluation" (Aubry et al., 2001, p. 8). The most recent CIS conference in Prague in 2004 proposed a new classification system and a new brief, measurement tool for acute assessment of concussion (the SCAT). Neuropsychological testing was recommended for use only if the athlete demonstrated impairment on sideline assessment. This study is designed to examine the utility of the SCAT by comparing its diagnostic accuracy to a validated computer-based neuropsychological battery and commonly used neuropsychological measure.

Participants and Methods : Data from 50 acutely concussed high school athletes will be analyzed during the 2005 football season utilizing descriptive statistics. Specifically, the correlation between the SCAT, Symbol Digits Modalities, and the ImPACT computer based test were examined

Results : On SCAT evaluation all athletes had negative neurological exams and adequate memory performance. On average concussed athletes recalled 4.9/5 immediate recall words ($m=4.91$), 3.73/5 ($m=3.73$) delayed recall words, and scored 5/8 on digits backward ($m=5.00$). In comparison, impairment was evident on specific measures of neuropsychological functioning (SMDT, ImPACT).

Conclusions : Preliminary data demonstrate a significant “value added” of neuropsychological testing, relative to brief sideline procedures such as the SCAT. Traditional neurocognitive testing is warranted for better assessment of injury severity, as well as careful management of concussion. Correspondence: *Vanessa Fazio, MA, Sports Medicine- Concussion Program, University of Pittsburgh Medical Center, 3200 Water Street, Pittsburgh, PA 15203. E-mail: faziovc@upmc.edu*

L.E. DREER, D.C. MARSON, S. KRZYWANSKI, J.S. HUTHWAITE, M.J. DEVIVO & T.A. NOVACK. Neurocognitive Predictors of Medical Decision-Making Capacity in Patients with Traumatic Brain Injury.

Objective: To identify neurocognitive predictors of medical decision-making capacity (MDC) in patients with traumatic brain injury.

Participants and Methods : 20 normal adult controls and 24 inpatients with moderate to severe TBI were administered a consent capacity instrument (Capacity to Consent to Treatment Instrument (CCTI)), and a battery of neuropsychological measures empirically linked to MDC. Neurocognitive predictor models were developed for the TBI and control groups at inpatient hospitalization and 6 month follow-up for three different treatment consent abilities: S3 (appreciating the consequences of a treatment decision), S4 (reasoning about treatment), and S5 (understanding the treatment situation and choices). Univariate and multivariate analyses were conducted to predict capacity performance at each time point in the TBI group.

Results : At baseline, a measure of short-term verbal memory predicted TBI group performance on S4 (reasoning) and S5 (understanding), and a measure of working memory predicted S3 (appreciation). At 6 month follow-up, a measure of executive function predicted TBI group performance on S3 and S5, while measures of working memory and short-term verbal memory predicted S4. Executive measures tended to replace verbal memory measures as mediators of recovery of consent capacity over the 6 month period.

Conclusions : Multiple cognitive functions are associated with impairment and recovery of MDC and TBI. The results offer insight into the relationship between different thresholds of competency and the cognitive functions and recovery characteristic of TBI. Implications of the results for brain injury rehabilitation will be discussed.

Correspondence: *Laura E. Dreer, Ph.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 1720 University Blvd, Suite 350, Birmingham, AL 35233. E-mail: dreer@uab.edu*

A.A. PICA, K.L. MORDECAL, M.C. DUX & J.L. WOODARD. The Utility of Group Administration of Paper and Pencil Neuropsychological Measures in Sports Concussion Baseline Assessment.

Objective: The purpose of this study was to develop normative data for group administration of several common paper and pencil neuropsychological measures. In addition, performance differences on group versus individually administered tests were examined in the context of sports concussion baseline testing in high school athletes.

Participants and Methods : Normative data for group administration was based on a sample of 70 male high school athletes who completed a pre-season baseline assessment in the context of a larger sports-related concussion study. Measures included: Hopkins Verbal Learning Test-Revised (HVLT-R), Brief Visuospatial Memory Test-Revised, WAIS Digit Symbol Coding (DS), WAIS Symbol Search (SS), a mathematical pro-

cessing task, PSU Cancellation, and measures of motor and perceptual processing speed developed by Salthouse. An additional sample of 73 male high school athletes was used for between-groups analyses to compare performance during group versus individual administration of DS, SS, and HVLT-R.

Results : Normative data were derived for group-administered versions of the above measures. Test-retest reliabilities for the Salthouse tasks ranged from .68 to .86. Performance during group administration was significantly better for HVLT-R learning ($t(140) = -2.56, p < .05$) and SS ($t(141) = -2.25, p < .05$) compared to individual administration, while no significant group differences were found for HVLT-R total immediate and delayed recall or DS.

Conclusions : Results suggest that group administration of paper and pencil neuropsychological measures may be a time and cost efficient alternative to expensive computer based testing for baseline assessment in the context of sports concussion research. The advantages and disadvantages of individual versus group administration are discussed.

Correspondence: *Ashley A. Pica, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 622 W. Buckingham Pl. Apt. 2, Chicago, IL 60657. E-mail: ashleyapica@yahoo.com*

L. REES & T. TOMBAUGH. A Measure of Information Processing Speed: the Computerized Tests of Information Processing (CTIP).

Objective: There are few reaction time (RT) neuropsychological tests that are available to the clinician for determining the degree of impaired speed of information processing and assessing recovery of function. Most psychologists rely on the PASAT that tends to be viewed as aversive and practice effects make it unsuitable for repeated testing. Consequently, we set out to develop a computerized battery of reaction time tests that varied in the degree of cognitive demands from the simple RT through to a more complex semantic search. The Computerized Test of Information Processing (CTIP: Tombaugh & Rees, 1999) was designed to measure the speed of processing through 3 tasks that vary in complexity of cognitive processing demands.

Participants and Methods : Participants were a control group ($N=60$), a mild TBI group ($N=59$) and a severe TBI group ($N=45$), matched on age, education and gender.

Participants were recruited from a local hospital and no one was involved in litigation and/or disability claim. Tests were administered in the context of a neuropsychological battery of tests.

Results : A repeated measures ANOVA revealed significant differences in latencies and number of correct responses across groups, tests and group x test interaction. Latency data for different types of injuries (e.g., MVA vs falls) was also examined. Repeated measures ANOVA also failed to reveal any practice effects.

Conclusions : The current shows that the progressive increased cognitive loads associated with the three subtests are reflected in progressively longer reaction times, that differing levels of performance are clearly visible across clinical groups, and that no within session practice effects are evident. Overall, the CTIP offers considerable promise as a clinical tool to measure speed of information processing across a variety of neurological conditions.

Correspondence: *Laura Rees, PhD, Psychology, Hospital, 505 Smyth Rd, Ottawa, ON K1H 8M2, Canada. E-mail: lrees@ottawahospital.on.ca*

A. SIM, K. WILSON & L. TERRYBERRY-SPOHR. Normative Study of Post-Concussion Symptoms in High School Athletes and the Effects of Previous Head Injury.

Objective: Due to their efficacy and ease of use, the use of post-concussion symptom checklists are increasingly advocated in the management of sports-related concussion. Little normative data exist, however, regarding the frequency and type of symptoms endorsed by nonconcussed and concussed high school athletes. Accordingly, the purpose of the present investigation is to provide norms for high school athletes on a post-concussion symptom checklist.

Participants and Methods : 477 male (80%) and female (20%) athletes were administered a 25-item post-concussion symptom checklist during their preseason as part of a baseline testing protocol. 128 athletes endorsed a previous history of head injury. Data are also provided for 14 athletes who sustained an in-season concussion.

Results : Nonconcussed athletes endorsed an average of 3.83 (SD=4.32) symptoms. There was no gender difference in number of symptoms endorsed. Individuals with a previous history of head injury, however, endorsed significantly more symptoms than those with no such history ($F=11.563$, $p=.001$), with an average of 5.07 (SD=5.42) symptoms. Previous history of head injury also elicited a greater endorsement of symptom severity than those with no such history ($F=14.682$, $p<.001$). The three most common symptoms endorsed by the nonconcussed participants were: drowsiness, fatigue, and joint stiffness. The three most common symptoms endorsed by concussed athletes were: headache, fatigue, and drowsiness.

Conclusions : The present study provides normative data on post-concussion symptoms in a high school population. Results suggest that individuals with a history of previous head injury/concussion are likely to endorse significantly more symptoms and greater symptom severity than those with no such history. Therefore, clinicians who utilize post-concussion symptom checklists should use caution when evaluating high school athletes with a previous history of head injury so as to not overpathologize their level of post-concussive symptomatology and severity.

Correspondence: Anita Sim, M.A., University of Nebraska, 12901 N MacArthur Blvd, Apt # 110, Oklahoma City, OK 73142. E-mail: anitasim1@gmail.com

SATURDAY MORNING, FEBRUARY 4, 2006

Paper 4

9:00–10:30 a.m.

Language, Reading, and Dyslexia

R.E. FRYE, J. MCGRAW FISHER, A. COTY, J. LIEDERMAN & E. HALGREN. **Dyslexic Readers Fail to Use Large Scale Neural Network During Phonological Decoding.**

Objective: Recent fMRI evidences that young adult dyslexic readers with persistently poor reading skills activate classical cortical language areas, whereas young adult dyslexic readers who develop adequate reading skills activate non-classical cortical language areas. This study used magnetoencephalography (MEG) to help explain this paradox. It was hypothesized that persistently poor readers activate the classical language system in a different sequence as compare to normal readers.

Participants and Methods : College students with and without a history of dyslexia were screened for adequate and poor reading abilities and confounding medical disorders. Dyslexic and normal participants were matched for age, gender and IQ. Whole-head MEG fields were recorded while participants performed a simple visual non-word rhyme task. Anatomically-constrained sensitivity-normalized estimates produced dynamic statistical parametric maps of brain activation every 5ms.

Results : Although normal and dyslexic readers activated several similar cortical areas, the sequence in which these areas were activated was very different for the two groups. Normal readers demonstrated cooperative activity between several cortical language regions, manifesting valleys of activity between occipitotemporal, anterior, middle and superior temporal, and inferior frontal regions during the word decoding. Dyslexic readers activated the language system in a more linear sequence without feedback between various subcomponents of the system.

Conclusions : Although normal and dyslexic readers commonly activate some of the same cortical areas during language processing, the functional significance of these areas may be different in the two groups. This study suggests that dyslexic readers use classical cortical language areas in a functionally different manner than normal readers.

Correspondence: Richard E. Frye, M.D., Ph.D., F.A.A.P., Pediatrics, University of Florida, P.O. Box 100296, Gainesville, FL 32610-0296. E-mail: drfryemdpd@gmail.com

L.H. LU, C.M. LEONARD, I.D. DINOVA, P.M. THOMPSON, E. KAN, J. JOLLEY, A.W. TOGA & E.R. SOWELL. **Differentiating Between Phonological Processing and Rapid Naming Using Structural MRI.**

Objective: The double-deficit hypothesis of dyslexia posits that two different constructs, phonological processing and naming speed, contribute to problems in reading acquisition. Support for this hypothesis included studies demonstrating that children with deficits in both have lower scores on reading tasks than children with deficit in only one of these areas. Critics argued that the double deficit could be due to a statistical artifact caused by grouping children based on their performance on two correlated variables. This called into question the validity of naming speed as a separate construct from phonological processing. We approached this problem by examining structural brain changes specific to phonological processing and rapid automatized naming. We examined whether improved performance on each of these tasks was correlated with cortical thickness change in different anatomical brain regions.

Participants and Methods : We studied 31 normally developing children (between ages 5 and 11) longitudinally over two years. We used cortical pattern matching methods to analyze structural MRI data, and multiple regression to correlate within-individual changes in gray matter thickness to changes on Phonological Processing (PHONO) and Rapid Automatized Naming (RAN).

Results : Patterns of contribution to cortical thickness by PHONO and RAN were similar overall. However, PHONO and RAN both contributed unique variance to cortical thickness, as did their interaction. Effects were most salient in the right anterior temporal lobe and the left inferior temporal pole.

Conclusions : Naming speed and phonological processing each contributed to unique variance in cortical thickness change. This finding may provide support for naming speed as a separate construct from phonological processing.

Correspondence: Lisa H. Lu, Ph.D., Neurology, Univ of California, Los Angeles, Laboratory of Neuro Imaging, 710 Westwood Plaza, Rm 4-238, Los Angeles, CA 90095. E-mail: lisa.lu@loni.ucla.edu

S.R. PATAEL, M. MENAHEMI, O. HERZBERG, A. LEV, A. BREZNER & M. FAUST. **Semantic and Phonological Processing in Oral Reading and Oral Naming: A Case Study of Deep Dyslexia.**

Objective: Deep dyslexia is an acquired reading disorder characterized by the production of semantic errors during oral reading and an inability to read nonwords. Most models accounting for the pattern of semantic errors postulate that the semantic-lexical route in these patients is impaired, although whether the semantic errors reflect a deficit in the se-

semantic system or whether the semantic system cannot address entries in the phonological lexicon properly is still disputed. The main hypothesis of the present study is that if patients with deep dyslexia have difficulty with phonological access, then both reading and naming should show poor phonological processing coupled with good semantic processing.

Participants and Methods : 28-year-old right-handed native-Hebrew-speaking woman, diagnosed with deep dyslexia performed two parallel tasks; oral picture naming using the tip-of-the-tongue (TOT) experimental paradigm and oral reading for the same set of words.

Results : The subject performed poorly on both tasks. However, she could correctly recognize all presented items. When experiencing a TOT state and asked to give partial information on the missing target word, the subject was able to supply partial semantic information. However, she could not supply any phonological information. In addition, comparing responses for each item on the naming and reading tasks showed high consistency in immediate naming as well as in supplying similar semantic information.

Conclusions : These findings support the claims that semantic errors in deep dyslexia are related to a phonological deficit that leads to failure in inhibiting the semantic system.

Correspondence: *Smadar R. Patael, Psychology, Bar-Ilan, 12 Hagon Eliyahu, Ramat-Gan 53264, Israel. E-mail: smadar.pa@gmail.com*

A.J. LUNDERVOLD, M. POSSERUD & L. SORENSEN. Intellectual, behavioural and emotional function among children with teacher reports of language impairment.

Objective: Poor language ability is associated with cognitive, emotional and behavioural problems, and early detection and remediation is thus extremely important. The present study explore the importance of teacher reports of language problems in predicting intellectual, behavioural and emotional function as measured two years later.

Participants and Methods : All subjects participated in the Bergen Child Study (BCS) of the 9430 children attending 2nd to 4th grade in Bergen, October 2002. Teachers filled in 9133 forms with five questions about language function. A composite score was defined as impaired when a definite problem was reported on at least one item or a mild problem was reported on at least two items. A subsample (n=278) was assessed about two years later. Intellectual function was measured by WISC-III, and emotional and behavioural problems were defined as a KiddieSADS diagnosis of ADHD/ODD and depression/anxiety, respectively.

Results : Language problems were reported in 11.4 % in the population. The corresponding number in the subsample was 27.2%, 46.8% in the group with behavioural and 42.3% in the group with emotional problems. All sub-scores on WISC-III were significantly lower among language impaired children than among their non-impaired peers. Language impaired boys obtained a diagnosis more frequently than girls, while language impaired girls showed poorer WISC-III results than language impaired boys. The gender differences were significant in the population and in all sub samples.

Conclusions : When primary school teachers report language problems in a child, further assessment on measures of cognitive, behavioural and emotional function is warranted.

Correspondence: *Astri J. Lundervold, PhD, Dep. of Biological and Medical Psychology, University of Bergen, Jonas Lies vei 91, Bergen 5009, Norway. E-mail: astri.lundervold@psych.uib.no*

J. WISE, R. SEVCIK, M. LOVETT, M. WOLF & R. MORRIS. Cognitive, Linguistic, and Neuropsychological Skills Associated with Successful Dyslexic Remediation.

Objective: Children with dyslexia are a heterogeneous group (Howes, Bigler, Burlingame, & Lawson, 2003). The purpose of this study was to examine the cognitive, linguistic, and neuropsychological skills exhibited by children with dyslexia who evidenced either below-average improvement or above average improvement in word identification skills in response to 70 hours of reading intervention efforts.

Participants and Methods : Participants were 32 students who evidenced below-average improvement and 29 students who evidenced above average improvement. Participants received 70 hours of small group reading intervention and were administered all measures in their schools.

Results : MANOVA analyses indicated that the two groups of students did not differ significantly ($p > .05$) in their entering levels of reading achievement or rapid naming skills. Groups also did not differ significantly on measures of short-term memory, working memory, or non-verbal IQ. Students evidencing below-average improvement, however, possessed significantly ($p < .05$) lower entering levels of phonological awareness than students with above average improvement. In addition, students with below-average improvement demonstrated significantly lower receptive vocabulary, expressive vocabulary, and listening comprehension skills than students with above average improvement. Finally, students with below-average improvement demonstrated significantly lower scores on neuropsychological assessments than students with above average improvement.

Conclusions : Results are consistent with previous research indicating that word identification skills are largely independent of IQ (e.g., Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1994) and that oral language skills are importantly related to reading achievement (e.g., Cooper, Roth Speece, & Schatschneider, 2002). Findings support the suggestion that a language impaired-reading impaired reading disabled subtype should be considered for classification (McArthur, Hogben, Edwards, Heath, & Mengler, 2000).

Correspondence: *Justin Wise, Ph.D., Psychology, Georgia State University, P. O. Box 5010, Atlanta, GA 30302. E-mail: psyjcw@langate.gsu.edu*

Symposium 17

9:00–10:30 a.m.

Multicultural Neuropsychological Assessment: Challenges and New Perspectives

Y. STERN, E. ZARAHN & B. RAKITIN. fMRI Studies of the Neural Representation of Cognitive Reserve.

Susceptibility to age-related memory changes is inversely related to variables such as IQ and education, suggesting the existence of cognitive reserve (CR) that mitigates the effects of aging on cognitive function. Individual differences in how the brain mediates the performance of tasks could be a neural correlate of CR, and these might change with aging. We have proposed two complementary facets to CR: neural reserve: individual differences in the efficiency or capacity of the brain networks typically used during task performance; and neural compensation: the use of alternate brain networks in response to brain pathology. To explore the anatomic basis for CR, 40 young and 18 elder healthy subjects were scanned while performing a delayed item recognition task. A dominant spatial pattern representing working memory (WM) related neural activity was expressed by both young and elder subjects and had large weights in areas including premotor, prefrontal, and parietal cortices. The intensity of expression of this pattern was greater in the elderly. The degree of measured neural efficiency in each subject correlated with measures of IQ. This variability in neural efficiency may

be an example of differential neural reserve. CR-related spatial components were detected in the fMRI data which did not resemble the spatial pattern corresponding to the simple WM-related neural activity. The expression of these CR-related components was seen almost exclusively in the elder subjects, suggesting that these may represent active compensation for the neural effects of aging. Thus, this may be an example of neural compensation.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

J.J. MANLY, R. CABO, N. SCHUPE, M. TANG & Y. STERN. Literacy and incident dementia among ethnically diverse elders.

Prior research suggests that literacy has a profound effect on neuropsychological test performance across verbal and nonverbal domains, and that this effect is independent of other demographic factors such as age, years of education, sex, ethnicity, and language use. In the current longitudinal study, we wished to determine the independent relationships of years of education and literacy to cognitive test performance to incident dementia. We evaluated 1,192 English-speaking elderly at a baseline and at least one follow-up visit. Participants were 44.3% Caucasian, 49.8% African American, 3.9% Hispanic, and 2.0% described their race/ethnicity as "other". All were non-demented at their baseline evaluation, and were administered the WRAT-3 Reading recognition test and a neuropsychological test battery. At follow-up, which was an average of 3.7 (2.7) years later, there were 92 cases of incident dementia. The relative risk (RR) relating race to incident dementia was 2.1 after adjustment for sex and age at baseline. The RR relating ethnicity and dementia remained unchanged after adding years of education into the model, which was also significant. However, after literacy level was entered into the model the RR associated with non-white ethnicity became non-significant, while the risk associated with fewer than 12 years of education was essentially unchanged. These findings suggest that both years of education and literacy level are strong predictors of incident dementia among an ethnically diverse cohort of English speaking elders. However, we found that literacy level significantly attenuated the effect of ethnicity, while accounting for years of education did not.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

F. OSTROSKY-SOLIS, G. OBERG, J. MANLY, E. MATUTE, T. JUDD & Y. STERN. Multicultural Neuropsychological Assessment: Challenges and New Perspectives.

Symposium Description : The search for similarities and differences in neuropsychological functions among persons from different cultures, countries, linguistic backgrounds, and levels of education is a major theme in cross-cultural neuropsychology. From a practical point of view, in clinical practice, professional ethics emphasizes the importance of providing services that are ethnically, linguistically, and culturally sensitive, thus it is necessary to use instruments that take into account the interrelationships between affecting variables such as age, sex, race, culture, formal schooling and quality of education. If these variables are not considered, health care professionals might not be able to detect cognitive impairment thus denying possible treatments or over diagnosing cognitive impairment in normal individuals. From a theoretical point of view, this analysis can further our understanding of how cultural experiences modify cognitive skills and thus recognize culture-specific differences. The purpose of this symposium is to present recent challenges and new perspectives. The papers include data collected in different countries and languages, in a wide age range spectrum, addressing issues such as the analysis of literacy and incident dementia among ethnically diverse elders (Manly), neuropsychological evaluation of Spanish speaking children (Matute), skills requires for a competent forensic cross-cultural neuropsychological evaluation (Judd), verbal fluency

across cultures and languages (Ostrosky) as well as neural correlates of IQ and education in activation tasks (Stern). It is hoped that analyzing the variables that affect performance will further our understanding of the interaction between different spheres of human experience, eventually resulting in a complete interdisciplinary theory of brain-behavior relationship and culture.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

E. MATUTE, M. ROSSELLI, A. ARDILA & F. OSTROSKY-SOLIS. A Neuropsychological Battery for Spanish-speaking children.

It is well known that Neuropsychological assessment has to be adapted culturally. Some cultural aspects that have been lighted out that affect the results of a neuropsychological assessment are: schooling, literacy, poverty and language. However, there are other aspects more subtle that may bias the results of a child neuropsychological assessment such as: child interaction with adults, behavior in a test situation, familiarity with test material and test situation. Moreover, Hispanic children are often assessed through neuropsychological measures designed for other countries or cultures

given the lack of such instruments for this specific population.

Consequently, there is a need to have culturally adapted neuropsychological assessment material that includes relevant items for Spanish speaking communities, and not only "norms" of a given test in a specific population. The Evaluacion Neuropsicologica Infantil- ENI (Child Neuropsychological Assessment) was developed to assess a wide spectrum of cognitive functions, including constructional abilities, memory, delayed memory, perceptual abilities, oral language, metalinguistic awareness, reading, writing, calculation abilities, spatial skills, attention, concept formation and executive functions. Normative data were collected from 788 monolingual Spanish speaking children in Mexico and Colombia, aged 5 to 16 years. The effects of age, gender and country of origin were analyzed. Reliability and validity indexes were calculated. The ENI may fulfill the need for comprehensive, reliable, and objective evaluation of a broad range of cognitive functions in Spanish speaking children.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

T. JUDD. Cross-Cultural Forensic Neuropsychological Assessment.

Competent forensic cross-cultural neuropsychological evaluation requires the following skills beyond within-culture clinical neuropsychology skills:

- 1) Knowledge and skills concerning cross-cultural evaluation in general (how to work with an interpreter, principles of acculturation, dimensions of cultural impact on behavior, principles of test translation and adaptation, etc.)
- 2) Knowledge concerning the specific culture/language of the focus person.
- 3) Knowledge of neuropsychological literature regarding the culture/language of the focus person.
- 4) Access to appropriate test materials and norms.
- 5) Knowledge concerning the specific forensic question(s).
- 6) Knowledge concerning the level of proof needed.
- 7) Knowledge of concepts of justice and legal systems in both cultures.
- 8) Knowledge concerning the professional ethical principles applicable to the situation.
- 9) Knowledge concerning assessment of symptom validity and of specific competencies and adaptive behavior that are not typically assessed in clinical evaluations.

Ability to communicate that information convincingly to a lay and legal audience. This presentation will concern how to determine if one has the requisite competencies for a specific case, and how to develop the needed competencies.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

F. OSTROSKY-SOLIS, M. RAMIREZ, A. LOZANO & A. ARDILA. Semantic Verbal Fluency: A Cross-Cultural Analysis.

Semantic Verbal Fluency (SVF) is one of the most widely-used test in the assessment of normal and pathologic functioning, whether at clinical or experimental levels. It has been found that demographic variables such as age, sex and the educational level influence semantic fluency. However, most of the studies have been focused on measuring the involvement of one of these variables, and the study of the interaction between age and level of education has been analyzed mostly in elderly adults (from 55 years on). Furthermore, reported studies have included very wide educational ranges, for example, subjects with 0 to 8 years of education have been grouped within the same range. The purpose of this study was twofold. First, performance on SVF test in 2011 subjects neurologically intact, adult, Spanish-speaking subjects was analyzed in order to establish the contribution of age and education to total score on the SVF test. Sample age ranged from 16 to 96 years and level of education ranged from 0 to 24 years. Second, data from more than 1000 neurologically intact subjects from five different countries and four different languages were analyzed. The results indicate that the SVF test shows similar data among languages and countries, provided, age and level of education of the subjects are considered. We propose that the differences found in this study may be due to the variability in the administration and grading of the tests, rather than to a cultural effect.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

Symposium 18

9:00–10:30 a.m.

Models of Thyroid Hormone Influence on the Developing Brain

J.F. ROVET, D. FEIG, C. WESTALL & K. PERLMAN. Cognitive Development in Offspring of Hypothyroid Women.

Children born to women who had hypothyroidism during pregnancy may be at risk for subsequent neurocognitive impairments if their mothers were inadequately treated early in pregnancy before the fetal thyroid is fully functional. Previous studies show reduced IQ as well as effects on visuomotor and attention abilities. In order to identify the core deficits associated with an insufficient maternal TH supply at different stages of pregnancy, we followed three cohorts of children born to hypothyroid women (HYPO) and assessed them with clinical, experimental, and electrophysiological instruments. As infants, HYPO showed poorer attention, sensorimotor skills, and recognition memory than controls (C) and had abnormal contrast and color vision abilities compared with C. At age 5, HYPO differed from C in IQ and episodic memory. Maternal thyroid hormone levels in early gestation were correlated with attention, visuomotor skills, and contrast sensitivity and in the third trimester with IQ, memory, and lack of impulsivity. These results suggest that TH is needed early in pregnancy for substrates of attention and visual processing (retina, thalamus, occipital cortex, caudate) and later in pregnancy for substrates of memory and executive function skills (hippocampus, frontal lobes).

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

V. HINTON, D. BELLINGER, L. KUHN & M. DURKIN. Cognitive Development in Children with Transient Hypothyroxinemia of Prematurity.

Infants born very prematurely commonly experience transient low thyroxine levels in the first weeks after birth. Preterm birth removes infants from their maternally supplied thyroid hormone before their own thyroid actively produces hormone. Absence of thyroid hormone on the brain during this relatively brief developmental window of time may have detrimental long-term consequences. Children born prior to 29 weeks gestational age are most vulnerable. Animal studies have shown that mild and transient maternal hypothyroidism during fetal corticogenesis can disrupt the cytoarchitecture of rat brain. Studies of cohorts of premature infants have shown a strong link between transient hypothyroxenemia of prematurity (THP) and an increased risk of disabling cerebral palsy and decreased mental-development scores at age two. Data will be presented examining the long-term effects of THP on cognitive development in six to seven year-old children who were enrolled in the Developmental Epidemiology Network, an extensive hospital-based cohort of children born at very low birthweight. After controlling for maternal education, birthweight, and visual evidence of brain involvement on cerebral ultrasound (including white matter damage, intraventricular hemorrhage, and ventriculomegaly) children with THP showed selective impairment on tests of attention and visual memory, with relatively intact verbal skills.

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

L. KOIISTRA & V. POP. Attention and Motor Problems in Early-Treated Congenital Hypothyroidism.

Early detection and medication do not entirely prevent cerebral dysfunction in children with congenital hypothyroidism (CH) who obtain IQ levels below expectation and are at risk for persistent neuropsychological impairment. One of the advantages of studying their deficits concerns the specific hypotheses that can be generated about the relationship between early (fetal) brain development, timing of thyroid hormone (TH) insufficiency, and functional deficits that emerge over time. Prompted by evidence from laboratory animals indicating that TH insufficiency affects selective aspects of attention and motor control, we initially evaluated skills in these two domains and found children with CH were indeed more inattentive and clumsy than normal. Next in a series of studies, we investigated whether (a) inattentiveness was associated with selective aspects of attentional processing (i.e., sustain and inhibit) and (b) motor clumsiness was attributable to a cerebellar timing deficit in children with early-treated CH. Our findings showed that their symptoms of inattention were related to an alerting deficit rather than to an executive function deficit and that force control rather than timing control may be instrumental in causing their motor clumsiness. These findings suggest that anterior attention (i.e., right frontal) networks and a cerebellar-frontal network may be vulnerable in CH.

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

S. HEPWORTH & J.F. ROVET. Memory Functioning in Early-Treated Congenital Hypothyroidism.

Memory is a multifaceted skill implicating multiple brain systems. Children with early-treated congenital hypothyroidism (CH) show deficient memory skills in rote memory, place and relational learning,

episodic recall, novelty detection, and everyday memory, whereas their working memory, semantic memory, and face recognition are unaffected. In light of animal studies showing the hippocampus is particularly vulnerable to an early loss of thyroid hormone, we examined the performance of children with CH on tasks that purportedly invoke the hippocampus versus those that do not. Findings from clinical and experimental studies reveal that children with CH show a reduced P300 ERP peaks to new and repeated stimuli, deficits in short-term but not working memory, episodic but not semantic recall deficits. In addition, the CH group was outperformed by controls on two working memory tasks (item recognition, n-back) only when the memory load was increased. These results support the view that hippocampal development is affected by CH, whereas frontal lobe development is affected only if CH extends into late infancy. Thus, the hippocampus appears to need thyroid hormone before the frontal lobes, consistent with the animal research.

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

J.F. ROVET. Models of Thyroid Hormone Influence on the Developing Brain.

Symposium Description : Hormones are necessary for brain development. Thyroid hormone (TH) is especially relevant because it regulates critical genes that underlie major neurodevelopmental events. Its loss is typically associated with significant brain damage. Research on animals has described the regional and temporal specificity of TH actions within the brain. Although similar effects are less clear in humans, the combined findings from three human conditions of maternal hypothyroidism, preterm birth, and congenital hypothyroidism (CH) may help to pinpoint when, where, and how TH is needed in the human brain. Because fetal thyroid development is protracted, the maternal thyroid supply is the sole source of TH in the brain during early pregnancy. If the mother has hypothyroidism in pregnancy, early fetal brain needs for TH will be unmet. Rovet will highlight findings on several cohorts of such children followed from birth with particular regard to their attention and visual processing skills. A child born preterm is severed prematurely from the maternal TH supply and experiences transient neonatal hypothyroxinemia. Hinton will present findings from a large-scale study of preterm children whose TH levels were measured and attention and visual memory abilities were assessed. Finally, congenital hypothyroidism is a pediatric condition leading to insufficient TH in infancy until treatment takes effect. Koiistra will emphasize the effects on attention and motor systems while Hepworth will examine specific memory deficits. Stern, as discussant, will integrate findings across conditions with a view to identifying exactly when different neural systems need TH.

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

Poster Session 12 /9:00–10:30 a.m.

Emotion

G.A. MOLLET, K. HOLLAND, J. KOFALT & D.W. HARRISON. Differences In Hand Grip Strength as a Function of Hostility, Sex, and Stress.

Objective: Differences in cerebral asymmetry were examined as a function of sex and hostility through measurement of hand grip strength

before and after stress. It was hypothesized that men would display heightened cerebral asymmetry as evidenced by increased strength at the right hand. Further, it was thought that after stress high hostiles would exhibit relative activation of the right brain and a relative increase in left hand grip strength.

Participants and Methods : Twenty-eight right-handed participants were classified as high hostile (women = 7, men = 7) and as low hostile (women = 7, men = 7) by scores on the Cook-Medley Hostility Scale. Right- and left-hand grip strength was individually tested with an adult hand dynamometer while participants were seated. Participants then listened to 45 seconds of white noise played at 90 dB (stress phase). A second grip strength measurement was taken after the stress phase.

Results : A group x sex x hand ($F(1, 24) = 4.20, p = .05$) interaction indicated decreased asymmetry in high hostile men and increased asymmetry in high hostile women relative to their low hostile counterparts. A second group x sex x condition ($F(1, 24) = 5.48, p = .03$) interaction indicated that stress produced increased grip strength in low hostile men.

Conclusions : The current results suggest that low hostile men exhibit the highest degree of cerebral asymmetry. Heightened asymmetry may have contributed to the increased response to stress in low hostile men. Further, the results suggest that hostility produces differential behavior in men and women.

Correspondence: *Gina A. Mollet, M.S., Psychology, Virginia Tech, Psychology Department, Blacksburg, VA 24061. E-mail: gmollet@vt.edu*

R.B. PERNA & M. DORIA. Brain Injury: Incidence of Depression and Suicidality.

Objective: Post brain injury depression complicates recovery, rehabilitation, and community integration. Incidence rates of depression and suicidal thinking are much higher after brain injury. This study sought to assess the incidence of depression in 52 individuals consecutively admitted to a comprehensive outpatient brain injury program. At admission, all participants completed an evaluation (clinical interview, BDI-2, BAI, and neuropsychological measures).

Participants and Methods : Participants, 29 of 52 (55.7%) met the DSM-IV criteria for depression. Incidence rates this high is consistent with other studies of post injury depression. Only 44% of the sample (23 of 52) currently had depression, suggesting that a subset of individuals had their depression successfully treated and no longer suffered from depression. Suicidal thinking following brain injury is reportedly as high as 23% (Simpson and Tate, 2002). In this sample, 26.9% (14 of 52) had suicidal ideation.

Results : Suicidal thinking following brain injury is reportedly as high as 23% (Simpson and Tate, 2002). In this sample, 26.9% (14 of 52) had suicidal ideation. Pre-injury depression (which occurred in 64.2% of those who were suicidal) was the strongest predictor of post injury suicidal thinking. Regarding neuropathology and localization, 46% of individuals who had post injury depression had brain-imaging demonstrating frontal lobe pathology. Diffuse and multifocal pathology was found in 24% of the depressed individuals. Of those who were depressed, 20.4% had sustained concussions.

Conclusions : Data suggest that any brain injury, even concussion, is a significant risk for depression and those people with pathology in the frontal lobe are at increased risk for depression. It is unclear if the high rate of suicidal thinking is attributable to the high rate of depression or if pre-injury depression or other factors explain the risk of suicidality after brain injury.

Correspondence: *robert B. perna, Ph.D., Neuropsychology, Westside neurorehabilitation, 618 Main St., Lewiston, ME, ME 04240. E-mail: Dr.perna@juno.com*

S. WEINER, K.B. FROMING, A. WISNIEWSKI, W. FROMING & M. DAHDAH. The Comprehensive Affect Testing System: Effects of Age on Performance.

Objective: Significant deficits in the ability to recognize emotions in others have been noted in a wide variety of disorders, ranging from the

psychiatric to the neurologic. Emotions are vital to social interaction and in some cases even survival, yet there are currently few standardized neuropsychological measures in common use to assess emotion perception abilities. This study examined the effects of age on performance on the Comprehensive Affect Testing System (CATS), a new assessment battery designed to measure perception of emotion across three channels of communication, including facial affect, emotional prosody, and semantic content (lexical). It was hypothesized that age would be associated with a decline in performance on all three channels, and that the greatest decline would be seen for cross-modal tasks.

Participants and Methods : Data was gathered on 60 healthy adult volunteers between the ages of 20 and 79. Regression analyses were conducted to determine the amount of variance in performance that was explained by age; gender, IQ, and fluid ability were examined as covariates.

Results : Age was associated with a significant decline in performance on facial matching tasks, prosody tasks, and cross-modal tasks, but not on the facial discrimination task, facial identification tasks, or the lexical task. Post-hoc analyses found significant age effects for recognition of negative but not positive facial and lexical stimuli. There was no interaction between prosody performance and emotion type. Significant age effects were independent of IQ and fluid ability.

Conclusions : The results suggest that certain emotion perception abilities decline as part of the normal aging process. The findings underscore the importance of using normative data when emotion processing is being assessed, which are lacking in most emotion batteries currently available. The findings also provide evidence that emotion processing is a separate construct from traditional measures of intelligence.

Correspondence: Sarah Weiner, Ph.D., NYU Medical Center, 32-13 37th Street, Astoria, NY 11103. E-mail: sueiner@pgsp.edu

R. WALTERS, G.A. MOLLET & D.W. HARRISON. High Hostile Men: Increased Error Rate for Nonverbal Fluency.

Objective: To test of a right hemispheric model of hostility, high and low hostile men completed verbal (Control Oral Word Association Test [COWAT]) and nonverbal (Ruff Figural Fluency Test [RUFF]) fluency measures to assess left and right hemispheric functioning respectively.

Participants and Methods : 12 High and 12 Low Hostile right handed men completed both types of fluency. While the COWAT (verbal fluency) required the participant to orally generate words, the RUFF (nonverbal fluency) required the participant to draw spatial designs. Both measures were timed, and errors mainly consisted of a repetition of previous words or designs.

Results : Analysis of Variance (ANOVA) results indicate a significant interaction between the hostile groups for the nonverbal fluency rate, $F(1,22) = 4.90, p > .03$. The high hostile men made significantly more errors on the nonverbal fluency ($M = 19.5$) when compared to the low hostile men ($M = 8.3$), however no significant effects were found for the number of designs for the nonverbal fluency as both groups generated an equal amount of correctly scored designs ($M = 53$ for both groups). No significant interactions for verbal fluency were found.

Conclusions : Previously, individuals with right hemisphere lesions have demonstrated poor performance on the RUFF, and the significantly high error rate of high hostiles implicates this group for right hemispheric dysfunction. Further, it is postulated that high hostile men have right frontal lobe weakness as they were unable to create, organize, and alternate spatial designs under a time constraint.

Correspondence: Robert Walters, M.S., Virginia Tech, 855 S. Grant Street, Christiansburg, VA 24073. E-mail: rowalte2@vt.edu

U.S. SPRINGER & D. BOWERS. Differences in psychophysiological reactivity while viewing static vs dynamic facial affect.

Objective: Recent studies suggest that many neurologic and psychiatric disorders are associated with impairments in accurately interpreting

facial expressions. These studies have typically used photographic stimuli, yet cognitive and neurobiological research suggest that the perception of moving expressions is distinct from static face perception. This study sought to elucidate differences in physiological reactivity during the perception of static vs dynamic facial expressions, as well as examine patterns of reactivity across specific expressions. We hypothesized that viewing dynamic faces would be associated with greater physiological reactivity, and viewing anger vs other expressions would be associated with elevated startle eyeblink responses.

Participants and Methods : Forty young adults viewed two slideshows consisting entirely of static or dynamic facial expressions: anger, fear, happiness, and neutrality. Measures included the startle eyeblink reflex, skin conductance response, and self reported indices.

Results : Data were analyzed using repeated measures ANOVA. The participants exhibited larger startle eyeblink responses while viewing dynamic vs static facial expressions. Differences in SCR approached significance ($p = .059$), such that dynamic faces tended to induce greater responses than static ones. Additionally, the startle reflex was significantly greater ($p < .05$) for angry expressions, and comparably smaller for the fearful, neutral, and happy expressions, regardless of display mode.

Conclusions : The results support greater psychophysiological reactivity in young adults while viewing moving vs static expressions. Additionally, angry expressions induced higher startle responses relative to other expressions, including fear. We concluded that angry expressions, representing personally directed threat, induce a greater motivational propensity to withdraw or escape. These findings highlight an important distinction between initial stimulus processing (i.e., expressions of fear or anger) and motivated behavior.

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

M. HARCIAREK & R.A. JENKINS. Factors that Modify the Performance of Right Hemisphere Stroke Patients on the Facial Affect Recognition Test.

Objective: Recognition of emotional facial expression is often impaired after right hemisphere ischemic stroke (RHS). However, little is known about the specific factors that may influence the ability of RHS patients to correctly identify visually presented emotional stimuli. The aim of the present study was to characterize the relationship between left hemispatial neglect (LHN), post-stroke depression, and recognition of emotional facial expression.

Participants and Methods : The Facial Affect Recognition Test by Ekman & Friesen (1976) was administered to 30 RHS patients and 31 demographically matched normal controls. In order to assess depression and hemispatial neglect, the Hospital Anxiety and Depression Scale by Zigmond & Snaith (1983), and a Shape Cancellation Task by Mesulam (Lezak, 1995) were administered.

Results : Statistical analyses revealed that all RHS patients were impaired on the Facial Affect Recognition Test. Additionally, a significant negative correlation between the severity of LHN and the total number of correctly identified emotional faces emerged. Interestingly, the severity of LHN did not correlate with the time needed to complete the Facial Affect Recognition Test, whereas the severity of depression did. However, no significant relationship was found between the severity of depression and the number of correctly identified emotional faces. Moreover, regardless of depression, lack of LHN was associated with significantly better RHS patients' performance on the Facial Affect Recognition Test.

Conclusions : These results are consistent with previous studies demonstrating impaired recognition of facial expression among RHS patients. Our study also suggests that there is a unique relationship between LHN, depression, and recognition of facial expression.

Correspondence: Russell A. Jenkins, M.A., Psychology, University of Houston, Heyne Bldg, Room 126, Houston, TX 77204-5022. E-mail: rajenkins@uh.edu

M. GIANNAKOU, V.P. BOZIKAS, B.D. FANTIE, K. FOKAS, A. KARAVATOS & M.H. KOSMIDIS. The Impact of Social Context on Facial Perception in Schizophrenia and Bipolar Disorder.

Objective: Most studies of emotion perception in psychiatric patients have been limited to the identification of emotional facial expressions from still photographs. We sought to extend these findings and approximate more closely the context within which one normally perceives the emotional expressions of others.

Participants and Methods : We administered Fantie's Affective Cartoon Test (FACT) to 35 patients with schizophrenia, 19 euthymic patients with bipolar disorder, and 41 healthy controls. In this computerized test, comprising 57 drawings of everyday scenarios in which the protagonist's face is missing, participants had to decode and interpret scenes, and choose a facial expression that best fit the missing face. There were three types of situations: "Nonsocial" (depicting one person), "Social-Congruent" (depicting more than one person, where the protagonist should display the same emotion as the others in the scene) and "Social-Noncongruent" (where the protagonist should have a different expression than the others).

Results : Both patient groups performed more poorly than healthy controls, particularly when perceiving scenes related to sadness, anger, and fear. They also performed more poorly than controls in "Nonsocial" and "Congruent" conditions, but not the "Noncongruent" condition.

Conclusions : Patients with schizophrenia and euthymic patients with bipolar disorder showed a deficit in matching facial expressions to everyday scenarios, especially for negative emotions. Moreover, they did not always benefit from social context, suggesting difficulties in utilizing available contextual information. These findings are consistent with previous studies using only still face photographs and expand our knowledge by indicating the differential impact of social context on emotion perception between patients and healthy controls.

Correspondence: *Mary H. Kosmidis, Ph.D., Department of Psychology, Aristotle University of Thessaloniki, University Campus, Thessaloniki 54124, Greece. E-mail: kosmidis@psy.auth.gr*

M. MCKINNON, P. DAVIDSON, S. UL-HAQ, P. SENGDY, M. MOSCOVITCH, T. CHOW, S. BLACK, M. FREEDMAN & B. LEVINE. Emotion enhances autobiographical recollection in older adults and patients with frontotemporal dementia.

Objective: We investigated the hypotheses that emotion facilitates recollection of episodic memory, and that emotion attenuates impairments of autobiographical recollection associated with aging (Levine et al., 2002) and with frontal lobe damage (Levine, 2004).

Participants and Methods : We compared the performance of frontotemporal dementia (FTD) patients, older adults, and young adults on the Autobiographical Interview (Levine et al., 2002). Participants were asked to recall three personal memories from 2001: 1) a highly negative personal event (e.g., witnessing the attempted suicide of a friend); 2) September 11th; and 3) a neutral everyday event (e.g., a family dinner). Memories were scored for the amount of episodic and semantic information they contained.

Results : Preliminary analyses suggest age- and dementia-related differences in recollection of episodic details were attenuated for the emotional memories. Both older adults and the FTD patients show impaired recollection relative to younger adults for all three memories. Recollection was not affected as severely, however, for the personal negative event in the FTD patients and for the personal negative event and September 11th in the older adults.

Conclusions : Contradictory results in previous studies of aging, emotion, and autobiographical memory may be due to individual differences in the emotional intensity and personal significance of recollected memories, or to a failure to examine episodic and semantic details separately.

Correspondence: *Margaret McKinnon, Ph.D., Rotman Research Institute, Baycrest Centre for Geriatric Care, 3560 Bathurst Street, Toronto, ON M6A 2E1, Canada. E-mail: mmckinnon@rotman-baycrest.on.ca*

G. CASTILLO-PARRA, F. OSTROSKY-SOLIS, H. NICOLINI & C. DE LA FUENTE. Emotional Information Processing In Major Depression: Increased Sensitivity To Negative Or To Positive Events?

Objective: Depressive states are classically associated to increased sensitivity to negative events. However this does not account for altered processing of positive stimuli in depressed patients (Nandrino et al., 2004). The purpose of the present study was to evaluate the effects of the pharmacological treatment on emotional processing (positive and negative stimuli) evaluated through event-related potentials (ERPs).

Participants and Methods : A sample of nine patients with major depression disorder (MDD) and nine control subjects were registered before and after six weeks of treatment. 210 color pictures selected from the International Affective Picture System (Lang et al., 1999) were presented 70 unpleasant, 70 neutral and 70 pleasant pictures appear with equal probability in a random sequence.

Results : In all subjects emotional pictures (pleasant and unpleasant) evoked a larger late positive potential (LPP) than neutral materials mainly in centroparietal areas of both hemispheres. Although, unlike normal controls, the pretreated MDD group did not generate differences in the amplitude of the LPP between pleasant and unpleasant stimuli. After clinical improvement, the depressive group did show differences in the processing between emotional conditions. However the differences were due to a change in the processing of the positive stimuli in left frontotemporal regions.

Conclusions : Unlike previous reports, ERPs data suggest that patients with severe depression respond abnormally to pleasant stimuli and that pharmacological treatment has its effects through the regulation of the positive and not the negative.

Correspondence: *Feggy Ostrosky-Solis, UNAM, Av. Copilco-Universidad 3004, Distrito Federal 04510, Mexico. E-mail: feggy@prodigy.net.mx*

M.A. PROSJE, A.Y. STRINGER, E.L. COOLEY & K. MILLER. Emotional Intelligence Following Unilateral Temporal Lobectomy or Amygdalohippocampectomy.

Objective: Emotional intelligence (EI), the ability to perceive, understand, and manage emotions (Mayer & Salovey, 1997), has not been explored in relation to the brain. Given the role of the limbic system in emotion (Gainotti, 2000), temporal lobe epilepsy (TLE) surgery patients allow exploration of the brain/EI relationship. From prior emotion research, we predicted lower EI after right-sided surgery and after anterior 2/3 temporal lobectomy (TL) compared to a limited amygdalohippocampectomy (AH).

Participants and Methods : We studied 25 TLE patients (mean age = 36.52; 60% female, 76% right-handed) who underwent left (n=13) or right (n=12) sided surgery, either TL (n=13) or AH (n=12). There were no group differences in age, education, IQ, or seizure frequency. EI was measured with the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) (Mayer et al., 2003), a standardized measure normed on a sample of 5000.

Results : Surgery groups were contrasted using ANOVA. As hypothesized, TL patients were poorer in managing emotions ($F=5.836, p=.024$). However, left-sided surgery impaired EI more than right ($F=13.67, p=.001$). VIQ correlated with the Understanding Emotions score ($r = .693, p < .01$) and PIQ correlated with both Understanding ($r = .524, p < .05$) and Using ($r = .425, p < .05$) Emotion scores.

Conclusions : This is the first demonstration of an EI/brain relationship and of an EI/IQ correlation. Greater impairment following TL suggests an important role for temporal cortex in managing emotions. While further research is needed to characterize the EI/brain relationship, greater impairment following TL supports the use of the more selective AH procedure.

Correspondence: *Michelle A. Prosjje, M.A., Center for Rehabilitation Medicine, Emory University, 1441 Clifton Road, NE, Atlanta, GA 30322. E-mail: michelle@prosjje.com*

W.D. KILLGORE & D.A. YURGELUN-TODD. Neural Correlates of Emotional Intelligence in Adolescent Children.

Objective: The concept of emotional intelligence (EQ) has gained considerable interest in recent years and involves several capacities, including the ability to perceive, understand, respond to, and regulate emotions, and flexible coping and interpersonal problem solving. Although a large literature is emerging with regard to EQ in adults, the developmental basis of these capacities during adolescence has gone virtually unexplored.

Participants and Methods : Therefore, we used functional magnetic resonance imaging (fMRI) to examine the relationship between EQ, as measured by the Bar-On Emotional Quotient Inventory, Youth Version (EQ-i:YV) and cerebral responses to facial expressions of fear in 16 adolescent children. Data were acquired on a 1.5 Tesla GE LX MRI scanner, motion corrected, and analyzed in SPM99 (height threshold $p < .005$, extent $k=10$ voxels).

Results : Higher scores on Total EQ were associated with significantly increased BOLD activity in four relatively small regions including the right occipital lobe, left cerebellum, and left superior parietal lobe. In contrast, Total EQ was negatively correlated with BOLD activity in numerous relatively large and diverse regions, including subcortical structures and extensive areas of unlabeled white matter.

Conclusions : Overall, these data suggest that children with the greatest activity in these regions during an emotional perception task tended to have the lowest EQ scores. Higher EQ was related to decreased activity in key regions of the somatic marker circuitry proposed by Antonio Damasio and colleagues (i.e., ventromedial prefrontal cortex, amygdala, insula) and previously implicated in adult EQ. Findings suggest that EQ in adolescents involves reduced activity within the somatic marker circuitry.

Correspondence: *William D. Killgore, Ph.D., Behavioral Biology, Walter Reed Army Institute of Research, Division of Psychiatry and Neuroscience, 503 Robert Grant Avenue, Silver Spring, MD 20910. E-mail: william.killgore@na.amedd.army.mil*

W.D. KILLGORE & D.A. YURGELUN-TODD. Social Anxiety Predicts Amygdala Activation in Adolescents Viewing Fearful Faces.

Objective: The amygdala is critically involved in the processing of anxiety in adults, but little is known about the neurogenesis of trait-anxiety during adolescence, a developmental period that involves rapid changes in physical, cognitive, emotional, and social functioning. The worries expressed by children at this stage are often more heavily focused on social and interpersonal issues (e.g., peer acceptance/rejection) than at other developmental periods.

Participants and Methods : We therefore used functional magnetic resonance imaging (fMRI) to examine the relationship between self-reported anxieties on the Multidimensional Anxiety Scale for Children (MASC) and the responsiveness of the amygdala to facial expressions of fear and happiness in 16 adolescent children. Functional imaging data were acquired on a 1.5 Tesla GE LX MRI scanner and were corrected for motion and analyzed using the general linear model in SPM99. Amygdala regions of interest were constructed and the statistical height threshold was set to $p < .005$, with a spatial extent of $k=10$ voxels.

Results : The results showed that during fear perception, amygdala activity positively correlated with several social dimensions of anxiety including peer rejection, humiliation, performing in public, and being separated from loved ones, but was not correlated with most measured non-social dimensions of anxiety. Amygdala responses during happy face presentations only correlated positively with tension/restlessness.

Conclusions : During adolescence, amygdala activity appears to be more strongly related to social/interpersonal than non-social dimensions of anxiety. This suggests that the responsiveness of the amygdala may change with development and appears to be particularly sensitized to social and interpersonal themes during adolescence.

Correspondence: *William D. Killgore, Ph.D., Behavioral Biology, Walter Reed Army Institute of Research, Division of Psychiatry and Neuroscience, 503 Robert Grant Avenue, Silver Spring, MD 20910. E-mail: william.killgore@na.amedd.army.mil*

J.C. BOROD, S.A. YECKER, A.M. BRICKMAN, C.R. MORENO, M. SLIWINSKI, M.M. HALFACRE, C. CRIDER, S. ASSURAS, N.S. FOLDI, H.A. DEMAREE, J. BARRY, K. FINLEY & J. WELKOWITZ. The Effect of Emotional Valence on Facial Expression across the Adult Life Span.

Objective: Research on valence has examined how age impacts emotional experience and perception. Older, relative to younger, adults process negative stimuli less effectively than positive stimuli (e.g., Mather et al., 2004), consistent with theories that positive experience increases with age and that right-hemisphere functions (e.g., negative emotions) are more sensitive to aging than left-hemisphere functions (e.g., positive emotions). This study extended the examination of this issue to emotional expression.

Participants and Methods : Participants were 30 young (21-39 years), 30 middle-aged (40-59 years), and 30 older (60-81 years) healthy women, who were photographed while posing positive (happiness, pleasant surprise) and negative (sadness, disgust) facial expressions. Expressions were rated by trained judges for intensity, accuracy, and confidence.

Results : Two-way ANOVAs (Age Group x Valence) were conducted for each variable. Significant Age main effects ($p < .001$) occurred for accuracy and confidence, with the older group rated significantly ($p \leq .01$) lower than each younger group. There were also significant Valence main effects ($p < .001$), with positive expressions rated more accurately, confidently, and intensely than negative ones. One interaction contrast was significant (i.e., intensity: $p = .02$), with older adults exhibiting an effect compared to both younger groups — they expressed positive expressions less intensely and negative ones more intensely than younger participants.

Conclusions : Although participants showed age-related deficits producing facial emotion, enhanced positive expression with age did not occur, suggesting that expression is mediated differently than other modes. Interestingly, there is evidence (Labouvie-Vief, 2003) that negative emotions are more complex than positive emotions and may thus be processed less well by older than younger adults.

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*

M. VAN 'T WOUT, A. ALEMAN & R.S. KAHN. Social-emotional processing in schizophrenia and first-degree relatives of patients.

Objective: Schizophrenia is a severe psychiatric disorder that has often been associated with deficits in cognitive functioning, such as memory and attention. More recently a growing body of research also recognizes the social and emotion disturbances in schizophrenia. In fact, Bleuler (1911) considered emotional disturbances to be fundamental of schizophrenia. Additionally, social-emotional disturbances emerge even years before the onset of psychosis. However, the study of social-emotional processing deficits in patients might suffer from confounding factors, such as the use of medication. The investigation of social processing in siblings of patients might validate the results observed in schizophrenia and possibly reveal a biological liability to the disorder.

Participants and Methods : 30 Patients with schizophrenia, 32 healthy siblings of patients and 44 healthy control subjects were compared on measures of expression and experience of emotions (BVAQ) and perception of social cues (trustworthiness evaluation and social distance judgment). The three groups were matched on demographic variables.

Results : Patients with schizophrenia reported more difficulties in the expression of emotions ($p < 0.01$), but increased experience of emotions compared to controls ($p = 0.01$). Additionally, patients gave higher trust ratings ($p < 0.05$) and were not influenced by the induced biological motion ($p < 0.05$). Interestingly, the ratings of siblings on all these measures were intermediate between patients and control subjects.

Conclusions : We suggest that schizophrenia is associated with problems in the processing of social cues. Moreover, these social disturbances seem present although to a lesser extent in first-degree relatives of patients and might possibly be regarded as a genetic liability to the disorder.

Correspondence: *Mascha van 't Wout, Helmholtz Research Institute, Heidelberglaan 2, Utrecht 3584 CS, Netherlands. E-mail: m.vantwout@fss.uu.nl*

G. SELKE, A. MIKOS, U.S. SPRINGER, M.S. OKUN, W.K. GOODMAN & D. BOWERS. Enhanced Startle Modulation to Contamination Pictures in Obsessive-Compulsive Disorder: A Case Study.

Objective: Affective modulation of the startle reflex (AMSR) is a valuable tool for measuring emotional reactivity. Normal adults show smaller startle reflex responses to pleasant stimuli and larger startle responses to unpleasant stimuli. Enhanced startle to unpleasant stimuli is also influenced by content type (i.e., threat > sad pictures). Accumulating evidence suggests atypical startle responsiveness to affective stimuli in anxiety disorders. However, little research has specifically examined AMSR in patients with Obsessive-Compulsive Disorder. The case study examined startle reactivity to pleasant, neutral, and unpleasant (direct threat, blood contamination, non-blood contamination) picture stimuli in a contamination preoccupied OCD patient, predicting greatest potentiated startle to contamination pictures.

Participants and Methods : We evaluated a 34 year-old female patient with a 10 year history of intractable OCD. Her symptomatology involved preoccupation with contamination by bodily fluids, especially blood. Approximately 6 months prior to the evaluation, the patient underwent deep brain stimulation surgery for treatment of her OCD, with leads implanted bilaterally in the anterior limbs of the internal capsule in the region of the nucleus accumbens. The patient was evaluated three times off DBS. She was presented with a 100dB acoustic startle probe while viewing pleasant, unpleasant, and neutral pictures. The primary dependent measure was startle eyeblink magnitude

Results : Results revealed a pattern of aversion enhanced startle (unpleasant > pleasant), with contamination pictures eliciting greater startle responses than direct threat pictures.

Conclusions : The findings suggest that OCD patients with contamination preoccupations may show greatest startle reactivity to content specific to their contamination. The case study raises the possibility of using AMSR to evaluate treatment response.

Correspondence: *Gregg Selke, Ph.D., Clinical and Health Psychology, University of Florida, 3601 NW 19th Place, Gainesville, FL 32605. E-mail: gselke@hp.ufl.edu*

N.T. SANTORELLI & D.L. ROBINS. Perception of Emotional Cues from Facial Expression and Affective Prosody.

Objective: Real-world perception of emotion results from the integration of multiple cues, most notably facial expression and affective prosody. The use of incongruent emotional stimuli presents an opportunity to study the interaction between sensory modalities. It was hypothesized that for some conditions one emotion would be more salient, but for other conditions, a blending of the presented emotions would occur, akin to an “emotional McGurk effect.”

Participants and Methods : Thirty-nine participants were exposed to novel audio-visual stimuli (Robins & Schultz, 2004) including angry,

fearful, happy, and neutral presentations. Eighty stimuli contain matching emotions and 240 contain incongruent emotional cues (e.g., happy face, angry voice). Stimuli were presented on a computer; participants were asked to identify the emotion portrayed, using a forced-choice format.

Results : Matching emotion trials elicited a significant number of correct responses for all four emotions. Sign tests indicated that for most incongruent conditions, participants demonstrated bias toward facial rather than auditory emotion. The neutral face - angry voice condition resulted in a bias toward an auditory response, whereas the neutral face - happy voice condition was not significantly biased toward either modality. Despite these findings, specific incongruent conditions (e.g., fearful face - happy voice) did show evidence of blending.

Conclusions : The bias toward faces suggests that facial expressions have greater salience than tone of voice. Future research should explore an evolutionary model of facial expression as a means for behavioral adaptation. Blending was seen in specific incongruent conditions; future studies should examine the possibility of an “emotional McGurk effect” in particular combinations of emotions.

Correspondence: *Noelle T. Santorelli, BA, Psychology, Georgia State University, 1064 Fairway Estates, Atlanta, GA 30319. E-mail: nluongoturini1@student.gsu.edu*

D.C. JACKSON, C.A. JACKSON, G.M. BEGUHN, L.L. GREISCHAR & R.J. DAVIDSON. Frontal EEG Asymmetry Predicts Instructed and Uninstructed Regulation of Negative Emotion.

Objective: Deficits in emotion regulation are characteristic of many psychiatric and neurological disorders. Recent studies have shown that humans can successfully enhance, maintain, and suppress negative emotion in the laboratory. Furthermore, relative left-sided baseline frontal EEG alpha asymmetry has been shown to be associated with one form of uninstructed emotion regulation: fast recovery from an emotional challenge. In the current study, we sought to extend these findings utilizing a multi-day, within-subjects design.

Participants and Methods : On Day One, eight one-minute baseline EEG trials were recorded. EEG sensors were then removed and corrugator EMG activity was recorded while participants ($N = 40$) passively viewed unpleasant and neutral pictures. On Day Two, corrugator EMG activity was recorded while participants were instructed to enhance, maintain, or suppress their emotional responses to unpleasant pictures.

Results : We hypothesized that relative left-sided frontal EEG asymmetry would be associated with fast recovery following picture offset on Day One (uninstructed emotion regulation), and with ability to voluntarily suppress emotion on Day Two (instructed emotion regulation) as measured by corrugator EMG. In addition, we predicted that relative right-sided frontal EEG asymmetry would be correlated with ability to voluntarily enhance negative emotion. As predicted, relative left-sided lateral frontal EEG asymmetry was inversely correlated with corrugator EMG activity immediately following picture offset. Relative right-sided frontal pole EEG asymmetry was associated with ability to enhance negative emotion.

Conclusions : These findings are discussed in terms of elucidating the abnormalities in regulatory cortical processes that may contribute to various forms of psychiatric and neurological pathology.

Correspondence: *Daren C. Jackson, Ph. D., Psychology, University of Wyoming, 1000 E. University Ave., Department of Psychology, Laramie, WY 82071. E-mail: daren@uwoyo.edu*

L. KIRSCH-DARROW, I. KELLISON, A. MIKOS & D. BOWERS. Case Study: Apathy in the Absence of Cognitive Frontal Lobe Deficits.

Objective: Apathy is a mood disturbance involving symptoms such as loss of interest, lack of effort, and flattened affect. Recent research

has pointed to a relationship between apathy and cognitive deficits of frontal lobe function, and apathy is often associated with dementia. In this case report, we describe a patient with radiation necrosis involving the bifrontal regions who was profoundly apathetic while maintaining normal performance on cognitive tests of frontal lobe functioning.

Participants and Methods : The patient is a 55 year-old male business executive who, prior to illness, successfully managed his own company. He developed throat cancer and underwent radiation therapy for carcinoma in his right maxillary sinus and left tonsil. He subsequently developed radiation necrosis with encephalacia of the right anterior temporal lobe and bilateral mesial frontal lobes. He underwent neuropsychological evaluation to assess his behavioral and cognitive profile.

Results : Patient met criteria for a syndrome of apathy (ex. lack of motivation, social withdrawal, flat affect). Neuropsychological testing indicated average intellect in the context of intact performance on Wisconsin Card sort and other executive tasks. Recent memory for verbal and visual materials was excellent. The primary neurocognitive deficits were slowed processing speed and impaired performance on face discrimination tasks. The patient had excellent insight into his apathy syndrome.

Conclusions : Although previous studies associate apathy with poor cognitive test performance, our patient performed well on tests of frontal lobe functioning. This suggests that apathy is not always linked to cognitive-executive deficits. The role of mesial frontal and anterior cingulate system in the genesis of apathy will be discussed.

Correspondence: *Lindsey Kirsch-Darrow, M.S., University of Florida, 2238 NW 1st Ave, Gainesville, FL 32603. E-mail: lkirsch@phhp.ufl.edu*

M.M. HALFACRE, J.C. BOROD, L.H. PICK, D. KRCH & C. GRUBER. Emotional and Nonemotional Lexical Expression in Parkinson's Disease.

Objective: Whereas deficits in facial and prosodic emotional expression in Parkinson's Disease (PD) have been well-established, it is not known whether deficits exist in the lexical/verbal expression of emotion. Further, there is evidence from the facial and prosodic emotion literature that PD patients appear to exhibit more negative affect than healthy controls. The current study was conducted to fill the gap in the literature regarding lexical emotional expression in PD.

Participants and Methods : Twelve PD and 12 demographically matched healthy control participants (50% women per group) produced three monologues (happiness, sadness, and anger) about emotional experiences and one nonemotional monologue from the New York Emotion Battery (Borod, Welkowitz, & Obler, 1992). Trained raters evaluated the monologues for emotional intensity, amount of positive and negative emotion, category accuracy, and rater confidence.

Results : PD participants were rated as significantly more intense than controls in their lexical emotional expression, regardless of monologue type. Although control participants did not differ in the accuracy with which they expressed emotional and nonemotional monologues, the PD participants showed significantly less accuracy for the nonemotional than the emotional monologue. There were no significant group differences on the variables of negative emotion, positive emotion, or rater confidence. Supplementary analyses demonstrated significant gender differences in the expression of emotion, such that women were judged to express emotion with greater intensity and accuracy than men.

Conclusions : Results suggest the absence of a deficit in lexical emotional expression in these PD patients, a finding with clinical implications for treating other types of emotion deficits in PD.

Correspondence: *Michelle M. Halfacre, B.S., Psychology, Queens College and The Graduate Center of the City University of New York, 65-30 Kissena Blvd, NSB-E31S, Flushing, NY 11367. E-mail: TLubomski@aol.com*

Psychopathology/Neuropsychiatry/Other

D.E. FLECK, P.K. SHEAR, R.A. KOWATCH & S.M. STRAKOWSKI. Cognitive Performance in Bipolar Disorder: A Processing Efficiency Account.

Objective: Bipolar disorder is characterized by clinically significant impairment of attention and memory. It is unclear whether these represent formal cognitive deficits (an inability to perform accurately) or decreased processing efficiency (e.g., psychomotor slowing). We hypothesized that patterns of sustained attention and recognition performance in bipolar disorder were consistent with processing efficiency theory. This theory predicts that heightened mood states reduce the processing capacity of working memory available to perform cognitive tasks and increase on-task effort or strategy use to achieve adequate performance.

Participants and Methods : Twenty-five manic bipolar, 23 euthymic bipolar, and 28 healthy comparison participants were group matched for demographics and compared on a continuous performance task and verbal recognition memory test. Participants were also administered a variety of symptom-rating scales.

Results : Only the manic group demonstrated significant deficits in sustained attention and recognition accuracy. However, both the manic and euthymic groups slowed reaction time in an attempt to maintain high performance accuracy (i.e., increased effort by trading speed for accuracy). When reaction time was statistically controlled to equate the groups on effort/strategy use, the manic group continued to demonstrate a sustained attention deficit.

Conclusions : Consistent with processing efficiency theory, these findings suggest that bipolar patients sustain attention and recognize verbal information through relatively greater effortful control at the expense of processing efficiency. Manic symptoms may reduce the capacity for control and impair attention and memory. Problems with processing efficiency are viewed as primary trait characteristics of bipolar disorder that may be overlooked by traditional error-based assessments. The predictions of processing efficiency theory with respect to bipolar disorder are discussed.

Correspondence: *David E. Fleck, Ph.D., Psychiatry, University of Cincinnati, 231 Albert Sabin Way, Cincinnati, OH 45267-0559. E-mail: jfleckde@email.uc.edu*

C. LIOSSI & R. WOOD. Neuropsychological and Neurobehavioural Correlates of Aggression Following Traumatic Brain Injury.

Objective: This study aimed to establish the neuropsychological and neurobehavioural profile of individuals who develop aggression following traumatic brain injury.

Participants and Methods : In a prospective cohort design 134 brain injured individuals who exhibited aggression were compared to 153 individuals who had sustained injuries of equal severity but were not aggressive. Patients were administered an extensive battery of neuropsychological tests including: all subtests of the Wechsler Adult Intelligence Scale (3rd edition), the Wechsler Memory Scale, the National Adult Reading Test Revised, the Hayling and Brixton Tests, The Trail Making Test, The Speed and Capacity of Language-Processing Test, and one test (i.e., Zoo Map) from the BADS battery.

Results : In the aggressive group specific deficits were identified in verbal memory and visoperceptual skills. Compared to normative data this group had impaired executive-attention function.

Conclusions : It is tentatively suggested that significant impairment in verbal memory and visuospatial abilities against a background of diminished executive-attention functioning is associated with the development of aggression after brain injury, especially when other risk factors such as low premorbid IQ, low socioeconomic status and male gender are present.

Correspondence: *Christina Lioffi, DP_{psych}, Psychology, University of Southampton, Highfield, Southampton SO17 1BJ, United Kingdom. E-mail: c.liossi@swansea.ac.uk*

S.K. MILLER, J. BOBHOLZ, R. RISINGER & L. SCHWARTZ. A Post-Neurosurgical Case of Phantom Boarder Symptom Without Dementia.

Objective: Phantom boarder symptom is classically defined as the belief that unknown people are present in one's home. It is frequently cited in the literature as a misidentification symptom that can accompany dementia, and several studies have shown a positive relationship between psychotic symptoms and severity of dementia.

Participants and Methods : We recently evaluated a 45-year-old patient who presented to our clinic status post fenestration of a large left frontal-temporal arachnoid cyst with mass effect. Approximately three-weeks post-surgery, the patient began "seeing ghosts," both inside and outside of his home. The encounters occur frequently (often multiple times per hour), are vivid, and include auditory, visual, and tactile modalities. The hallucinations occur during the day and can also wake him from sleep at night.

Results : Unlike other cases reported in the literature, the patient showed no dementia on neuropsychological exam. In fact, other than relative weaknesses on tests with a high demand on attention/processing speed (impaired to low average ranges), scores across most tests of intellectual functioning, memory, language, visuospatial skills, and executive functioning were within normal limits (average to high average). At the time of our evaluation, psychotropic medication had not relieved his psychiatric symptoms, and his hallucinations were sufficiently disabling that he was unable to drive or return to work. Alternative treatments have since been initiated.

Conclusions : To the best of our knowledge this case is rare in that phantom boarder symptom is present without dementia. In addition, we have yet to find a published case of phantom boarder that involves such elaborate, tri-modal hallucinations.

Correspondence: Sarah K. Miller, Ph.D., Medical College of Wisconsin, 9200 W. Wisconsin Ave, Milwaukee, WI 53226-3596. E-mail: smiller@neuroscience.mcw.edu

A.J. GIULIANO, B. JANIS, L.J. SEIDMAN & J.A. FRAZIER. Attention and Working Memory in Pediatric Bipolar Disorder.

Objective: Abnormalities in cognition are increasingly recognized as important characteristics of bipolar disorder (BPD) in adults. However, there is limited information regarding the nature and severity of cognitive impairment in pediatric BPD, and its relationship to complicating clinical variables such as diagnostic comorbidity (e.g., attention-deficit hyperactivity disorder/ADHD) or heterogeneity (e.g., with or without psychosis subtypes). The purpose of this study was to compare the performance of outpatient, inter-episode BPD-only, BPD+psychosis, BPD+ADHD, and normal controls (NCs) on measures of attention, working memory, and processing speed.

Participants and Methods : Seventy-four youth with BPD (28 BPD-only, age 11.54 (3.7); 20 BPD+psychosis, age 12.4 (2.5); 26 BPD+ADHD, age 9.92 (3.3)) and 51 matched NCs (age 10.9(2.9)) were recruited to participate in an imaging study and underwent semi-structured clinical and standard cognitive assessments. Cognitive measures included subtests from the WISC/WAIS-III, WRAT-3, Stroop, and auditory CPT.

Results : Results of multiple, planned one-way ANOVAs documented that each BPD group performed significantly below the mean of the NC group across all measures, yielding an average moderate effect size. In contrast, the BPD subgroups showed no significant differences in performance across nearly all measures.

Conclusions : These results suggest that impairments in attention, working memory and processing speed in pediatric BPD are similar to those

found in adults, and likely core features of BPD and not simply epiphenomena of diagnostic heterogeneity. Such deficits may also constitute either vulnerability markers for BPD or persistent characteristics of the disorder that can inform neuroimaging research and prevention research related to functional-academic outcome.

Correspondence: Anthony J. Giuliano, PhD, Psychiatry, Harvard Medical School, Cambridge Health Alliance Neuropsychiatric Research Program, 10 President's Landing, First Floor, Medford, MA 02155. E-mail: ajgiulia@bidmc.harvard.edu

P.G. FRISINA, J.C. BOROD, H. TENENBAUM, N.S. FOLDI & C. CRIDER. The Efficacy and Side-Effect Profile of Antidepressants in Parkinson's Disease Patients: A Meta-Analysis.

Objective: This study examined the effects of antidepressants in Parkinson's disease (PD). Treatment effectiveness is critical because depression is prevalent and generally found in about half of individuals diagnosed with PD. However, only a small percent of these patients receive treatment for their depression. One reason why many patients remain untreated is that it is unclear whether antidepressants are safe and effective for this population. Thus, a meta-analysis was employed to determine the magnitude and significance of antidepressants therapeutic effect and their side effects in PD.

Participants and Methods : After performing a literature search through databases (e.g., PsychInfo, Pubmed), citations within papers, conference proceedings, and contacting authors regarding unpublished work, 17 studies qualified for inclusion, meeting the following criteria: having at least one quantitative measure of depression, employing a randomized placebo-controlled trial, and using a known antidepressant drug.

Results : Findings revealed that tricyclic antidepressants (TCAs; $d=.55$, $p=.01$) had a greater antidepressant effect relative to selective serotonin reuptake inhibitors (SSRIs; $d=.21$, $p=.08$), $Qb(1)=5.51$, $p<.05$. Interestingly, SSRIs produced a robust effect on patients with moderate ($d=.44$, $p<.05$), as opposed to major ($d=.09$, $p=.30$), depression, $Qb(1)=4.59$, $p<.05$. Selegeline was the only monoamine-oxidase inhibitor that met the above inclusion criteria but did not reduce depression ($d=.08$, $p=.15$). Whereas TCAs produced a significant side-effect profile ($d=-.27$, $p<.05$), adverse events were negligible with SSRIs ($d=.00$, $p=.50$) and selegeline ($d=-.07$, $p=.11$).

Conclusions : Collectively, the decision to choose among antidepressants should be monitored on an individual basis, weighing the benefits of improving depressive symptomatology together with the risk of creating and tolerating side effects.

Correspondence: Pasquale G. Frisina, Ph.D, Psychology, Iona College, 715 North Avenue, New Rochelle, NY 10801. E-mail: pfrisina2002@yahoo.com

M.J. BORGOS, L.A. RABIN, N.C. KOVEN, R.M. ROTH, L.A. FLASHMAN & A.J. SAYKIN. Assessment of Practical Judgment in a Mixed Neuropsychiatric Sample Using the TOP-J.

Objective: Judgment is an important aspect of cognitive and real-world functioning that is commonly assessed during neuropsychological evaluations with psychiatric patients. Despite the significance of this cognitive domain, few statistically sound and clinically useful tests of judgment are available. Instead, standardized measures of executive functioning (e.g., Wisconsin Card Sorting Test) often are used as a proxy for assessing everyday judgment.

Participants and Methods : The Test of Practical Judgment (TOP-J) is a newly developed, 15-item open-ended response test with standardized scoring, evaluating judgment within four content domains: safety, medical, social/ethical, and financial. The current study examined TOP-J performance in a mixed sample of adult psychiatric inpatients and outpatients. Participants ($n = 15$) ranged in age from 21 to 50, with diag-

noses of schizophrenia, schizoaffective disorder, and bipolar disorder. Comparison of the inpatient and outpatient psychiatric groups revealed no differences in age, education, gender, or TOP-J score. Therefore groups were collapsed for further analyses. A comparison group of healthy controls (n = 15) was matched on gender, age, and education.

Results : Study results indicated that the psychiatric group attained a significantly lower TOP-J total score than the control group ($p < .05$).

Conclusions : Although initially developed for an older adult population, preliminary results suggest that the TOP-J also may be clinically useful for younger psychiatric patients. Knowledge gained about everyday judgment skills may inform decisions about psychiatric patients' treatment, functional and cognitive competence, and discharge planning. Correspondence: *Marlana J. Borgos, Ph.D., Psychiatry, 468 Kingstown Road, Unit 4, Wakefield, RI 02879. E-mail: mborgos@gmail.com*

N.S. KOVEN, R.M. ROTH, L.A. FLASHMAN, J.J. RANDOLPH, H.P. PIXLEY, S.M. RICKETTS, H.A. WISHART & A.J. SAYKIN. Relationship between Symptom Severity and fMRI Activation During Executive Control in Bipolar I Disorder.

Objective: Bipolar disorder (BPD) is characterized in part by problems with inhibition and mood regulation, consistent with aspects of executive dyscontrol observed on cognitive tests. Few studies, however, have examined whether neural substrates of executive control are differentially associated with manic and depressive symptoms. We recently reported abnormal frontostriatal activation during a counting Stroop task in BPD relative to healthy controls. In the present study, we investigated whether symptom severity in BPD is associated with differential patterns of brain activation during this task.

Participants and Methods : 11 medicated adults with BPD and 11 demographically matched controls completed a modified version of the counting Stroop task on a 1.5T scanner. fMRI data related to executive control (incongruent > congruent contrast) were analyzed using a random effects model in SPM ($p < 0.005$, $k > 25$). Symptom severity in the patient group was assessed using the Hamilton Depression Rating Scale and the Young Mania Rating Scale.

Results : Behaviorally, symptom severity was not correlated with reaction time or error rates during the counting Stroop. On fMRI, mood symptoms were associated with activity within hypothesized neural circuitry. Most notably, mania was positively correlated with increased activation of the right caudate and inversely correlated with the right anterior cingulate gyrus, while depression was positively correlated with the left anterior cingulate and negatively correlated with the right anterior cingulate.

Conclusions : These findings indicate that manic and depressive symptoms in BPD are related to different patterns of activation within frontostriatal circuitry.

Correspondence: *Nancy S. Koven, Ph.D., Department of Psychiatry, Dartmouth-Hitchcock Medical Center, One Medical Center Drive, Lebanon, NH 03756-001. E-mail: Nancy.S.Koven@dartmouth.edu*

A. AYCICEGI & W.M. DINN. Schizotypal Personality and Executive Dysfunction in a Turkish Sample.

Objective: Investigators have found that schizotypal personality disorder is associated with executive function and spatial working memory deficits. A number of research groups have also found that university students obtaining high scores on measures of schizotypal personality exhibit impaired performance on tasks that tap executive function skills. In the present study, we explored the relation between schizotypal symptoms and executive dysfunction.

Participants and Methods : Four hundred and eighteen students attending Istanbul University completed the Schizotypal Personality Questionnaire-B (SPQ-B) (Turkish translation). The SPQ-B is a psychometrically sound self-report measure of schizotypal personality features. The maximum score on the SPQ-B is 22. Students obtaining elevated

SPQ-B scores were assigned to the high symptom group (n = 28) (range = 13 - 19) (mean = 16.89), while students obtaining low scores were assigned to the comparison group (n = 19) (range = 0 - 4) (mean = 3.15). Participants (n = 47) then completed self-report measures of executive dysfunction, behavioral disinhibition, and depressive symptoms.

Results : Analysis revealed that students obtaining elevated scores on the SPQ-B obtained significantly higher scores on measures of executive dysfunction, disinhibition, and depression relative to comparison subjects. Group differences were highly significant ($ps < .004$). Analysis of covariance (ANCOVA) revealed that group differences on the executive dysfunction measure remained significant after controlling for the presence of depressive symptoms ($p < .01$). However, group differences on the behavioral disinhibition subscale were no longer significant ($p > .19$).

Conclusions : Findings support the contention that executive dysfunction is associated with schizotypal personality.

Correspondence: *Ayşe Aycicegi, Ph.D., Psychology, İstanbul University, Edebiyat Fakültesi, Psikoloji Bölümü, İstanbul 34452, Turkey. E-mail: aycicegi@istanbul.edu.tr*

C. MILLIKIN & L. TREPANIER. Delusions Following Basal Ganglia Infarcts: A Report of Six Cases.

Objective: To describe 6 cases of adults who presented with acute onset of delusions following basal ganglia infarcts secondary to cerebrovascular disease (5 cases) or anoxic brain injury (1 case).

Participants and Methods : The patients included 4 women and 2 men, ranging in age from 55 to 88. Focal basal ganglia lesions were identified on CT scans. Similarities and differences across cases were examined with respect to neuropsychological assessment results, type of delusions, and associated behavioral symptoms.

Results : Level of performance varied considerably, with some patients demonstrating subtle impairment and others showing more global cognitive changes. The neuropsychological profile was characterized by perseveration, decreased verbal fluency, variable memory difficulties, and impaired fine motor dexterity and/or motor sequencing (e.g., difficulty performing bimanual alternating hand movements). All patients demonstrated limited awareness of cognitive changes. The delusions were typically persecutory in content (religious in 2 cases). One patient also had visual hallucinations. The common characteristics of these 6 cases will be discussed in the context of the complex neuroanatomical connections linking the basal ganglia with the cerebral cortex.

Conclusions : Infarcts in the basal ganglia are common and may be asymptomatic. However, it is important to recognize the possibility of delusions and subtle cognitive changes in patients with basal ganglia lesions. Future research is needed to identify specific neuroanatomical correlates of psychosis following infarcts in the basal ganglia and other brain regions.

Correspondence: *Colleen Millikin, Ph.D., Deer Lodge Centre, 2109 Portage Avenue, Winnipeg, MB R3J 0L3, Canada. E-mail: cmillikin@deerlodge.mb.ca*

A.R. GROFF, W. DINN, C. HARRIS, M. TOMPSON, M. RICHARDSON & H. THOMPSON-BRENNER. Frontal Lobe Function and Eating Pathology: Evidence of a Neurocognitive Risk Factor in the Development of Eating Disorders.

Objective: Recent evidence suggests a relationship between cognitive deficits and eating pathology. Data delineating specific deficits are too few and inconsistent to summarize meaningfully. The aim of the present study is to test a frontal lobe hypothesis of eating pathology and to examine whether impairments in frontal lobe functioning may serve as a neurocognitive risk factor for the development of eating disorders.

Participants and Methods : Performances on a battery of neuropsychological tests were compared between 51 non-treatment-seeking women with significant eating pathology but who did not meet DSM-IV criteria for an eating disorder, and 51 matched controls with little or no reported eating pathology.

Results : Results indicated that the two groups differed significantly across neuropsychological indices of frontal lobe function (Behavioral Disinhibition, Strategy Implementation, Vigilance, Divided Attention, and Executive Function). The two groups did not differ on general cognitive measures. Performance scores on tests of frontal functions were differentially correlated with severity of eating pathology. Regression analysis revealed that when established risk factors for eating pathology were held constant, indices of frontal functioning significantly predicted eating pathology scores.

Conclusions : Women with subthreshold levels of eating pathology perform significantly worse than matched controls on tests sensitive to frontal lobe functioning but do not perform differently on general cognitive measures. Results also suggest that there may be a linear relationship between certain deficits in frontal functioning and severity of eating pathology even in a sub-clinical sample. Overall, results suggest that specific deficits in frontal functioning may serve as a neurocognitive risk factor for the development of eating pathology.

Correspondence: April R. Groff, M.A., Boston University, 1766 Sand Hill Rd., #30S, Palo Alto, CA 94304. E-mail: agroff@bu.edu

L.J. JULIAN, R. MACKIN, D. CAHN-WEINER, J.H. KRAMER, B.R. REED, D. MUNGAS & H.C. CHUI. Apathy and Minor Late-life Depression: Neuropsychological and MRI Correlates.

Objective: The presence of apathy in the context of late-life depression (LLD) may be indicative of a specific subtype of LLD precipitated by underlying neurodegenerative processes. This investigation evaluated the presence vs. absence of apathy in relation to cognitive and brain MRI markers in a cohort of non-demented older adults.

Participants and Methods : Participants included 164 individuals enrolled in a multi-center study of aging and cerebrovascular disease (mean age 74.1 ± 7.6 , 57% male), classified into three groups: 1) minor depression + apathy, 2) minor depression (according to DSM-IV research guidelines), and 3) no depression using a standardized interview assessment. Cognitive measures included Dementia Rating Scale, phonemic fluency (PF), semantic fluency, Memory Assessment Scales (MAS) and the Boston Naming Test. MRI measures included volume of white matter signal hyperintensities (WMSH) and number of lacunes in white matter and basal ganglia structures.

Results : Eighteen percent ($n=27$) met criteria for minor depression, with 33% of those with minor depression also reporting apathy ($n=13$). ANOVAs with post-hoc comparisons revealed significant differences between groups 1 and 3 on MAS immediate and delayed recall ($ps < .05$), and trend level significant differences between groups 1 and 3 on DRS Initiation/ Perseveration ($p=.08$) and PF ($p=.08$). Group differences were also noted on measures of WMSHs and Lacunes (all $ps < .05$).

Conclusions : The presence of apathy in the context of minor LLD appears to be associated with decreased cognitive functioning and increased brain markers of cerebrovascular disease. Future investigations clarifying subtypes of LLD and the prognostic utility of symptoms of apathy are warranted.

Correspondence: Laura J. Julian, Ph.D., Medicine, University of California San Francisco, 4150 Clement Street, (116S - Building 9R), San Francisco, CA 94121. E-mail: ljulian@itsa.ucsf.edu

Psychopathology: Anxiety/Stress

G. JOHNSEN & A.E. ASBJORSEN. Learning Strategies in Patients with PTSD.

Objective: Impaired memory functioning in PTSD patients is well documented. Some studies report that the impaired memory performance

is related to problems with encoding, but the use of encoding and learning strategies in patients with PTSD is less understood. The primary goal of this study was to examine the use of clustering strategies in verbal memory among patients with PTSD and assess how strategy use is related to symptomatology.

Participants and Methods : The samples consisted of refugees exposed to war and political violence that fulfilled the DSM-IV criteria for PTSD ($n=21$), and a control sample ($N=18$) with similar exposure but without PTSD. Assessments instruments for PTSD included Clinical-Administered PTSD Scale, Impact of Event Scale-Revised and the Montgomery and Asberg Depression Rating Scale. The California Verbal Learning Test was administered to examine differences in learning strategies and memory.

Results : The PTSD-sample was impaired in overall memory performance ($p < .01$). The semantic clustering score was low in both groups, but the serial cluster score was selectively impaired in the PTSD group ($p < .02$) and they reported more items from the recency region of the list. In addition intrusions were significantly increased in the PTSD group. Multiple regression analysis showed that estimated intelligence and depression gave important contributions to the explained variance of strategy scores.

Conclusions : The data support an assumption of changed learning strategies in patients with PTSD. However, the memory impairment and the use of ineffective learning strategies may not be related to PTSD symptoms as such, but to depressive symptoms and also general intellectual functioning. The results have implications for remedial work with patients with PTSD.

Correspondence: Arve E. Asbjornsen, Ph. D., Department of Psychosocial Sciences, University of Bergen, Christiesgt 12, Bergen N-5015, Norway. E-mail: arve.asbjornsen@psysp.uib.no

Psychopathology: Depression

B.W. JASPER, R.O. HOPKINS & L.K. WEAVER. A Longitudinal Study of Psychological Symptoms and Personality Profiles Following Carbon Monoxide Poisoning: Short-form MMPI and SCL-90-R.

Objective: Carbon monoxide (CO) poisoning may result in cognitive sequelae yet information is limited regarding psychological and behavioral symptoms. The purpose of this study was to compare Faschingbauer Abbreviated Minnesota Multiphasic Personality Inventory (FAM) and Symptom Checklist-90-Revised (SCL-90-R) profiles in CO poisoned patients. We compared profiles for mode of poisoning (accidental vs. suicide-attempt) and cognitive sequelae (cognitive sequelae vs. no cognitive sequelae).

Participants and Methods : FAM and SCL-90-R profiles in 93 CO poisoned patients at 6 weeks, 6 and 12 months. Profile analyses were used to compare the FAM and SCL-90-R scores by subgroups (mode of poisoning and cognitive sequelae) over time.

Results : The mean COHb was $25.1\% \pm 9.7\%$, 45% lost consciousness, 31% attempted suicide, and 32% had cognitive sequelae. There were significant interactions by the mode of poisoning and FAM subscales [$F(9,59) = 3.84$, $p = 0.007$] and SCL-90-R subscales [$F(8,61) = 3.68$, $p = 0.002$]. Post hoc analysis showed the suicide-attempt subgroup had significantly higher scores reflecting emotional and behavioral symptoms. There were significant interactions for the cognitive sequelae subgroups and FAM subscales [$F(9,59) = 3.84$, $p = 0.007$] and SCL-90-R subscales [$F(8,61) = 3.68$, $p = 0.002$]. The cognitive sequelae subgroup had significantly higher scores reflecting somatic and cognitive complaints, and higher emotional and behavioral symptoms compared to those without cognitive sequelae.

Conclusions : Patients with accidental CO poisoning and no cognitive sequelae had better emotional and behavioral outcomes compared to those that attempted suicide or with cognitive sequelae.

Correspondence: *Bruce W. Jasper, Ph.D., Psychology, Memphis VA Medical Center, 1030 Jefferson Ave., Memphis, TN 38104. E-mail: bbuwij@juno.com*

K.D. BECK, S. FRANKS & J. COVERT. Impact of Depression on Performance on the Behavioral Dyscontrol Scale in a Heterogeneous Clinical Population.

Objective: Performance on the Behavioral Dyscontrol Scale (BDS) has been previously unrelated to depression, despite research indicating lower than expected motor/executive functioning abilities in depressed patients. The BDS was developed to measure executive functioning, and has been derived into 3 separate factors (Motor Programming, Fluid Intelligence, Environmental Independence). This study sought to identify effects of depression on performance on the BDS in a sample of cognitively impaired patients, and in patients with and without cognitive impairment.

Participants and Methods : Participants included 194 patients referred for neuropsychological evaluation. Patients were divided into groups based on presence of depression diagnosis at time of evaluation. Independent samples t-tests were performed to evaluate differences in BDS scores. Patients were further categorized into depressed patients with and without cognitive impairment, and independent t-tests were performed to examine differences between groups.

Results : Results showed no significant differences ($p < .05$) between the depressed ($M = 12.68$, $S.D. = 4.7$) and non-depressed ($M = 13.27$, $S.D. = 4.3$) groups on the BDS total score or any BDS factor. Significant differences were found between depressed impaired ($M = 15.45$, $S.D. = 3.9$) and depressed non-impaired ($M = 12.21$, $S.D. = 4.7$) groups on the BDS total score, $t(73) = 2.15$, $p = .035$, as well as on F1 and F2 [$t(77) = 2.28$, $p = .025$; $t(23.4) = 4.43$, $p < .001$] with the non-impaired group scoring higher. No significant differences were found for F3.

Conclusions : Results indicate depression in cognitively impaired persons does not significantly affect executive functioning as measured by the BDS. Depression alone (without cognitive impairment) also does not appear to affect performance on the BDS in general, with the exception of F3, which did not distinguish between non-impaired depressed persons and cognitively impaired depressed persons. More research is needed to confirm the impact of depression on the BDS.

Correspondence: *Kelley D. Beck, University of North Texas, 1514 Allen Dr., Cedar Hill, TX 75104. E-mail: bkbecks@sbcglobal.net*

M. BASSO, T. WARD, B. BAUGHMAN, D. COMBS & R. PURDIE. Memory Impairment and Performance Effort in Inpatient Depressives.

Objective: Despite research which reveals brain abnormalities and cognitive impairment in depression (e.g., Burt et al., 1995), some investigators assert that cognitive deficits are due to inadequate effort (e.g., Green et al., 2001). Data supporting this assertion come from outpatients being evaluated for disability. Yet, meta-analyses demonstrate that inpatients are more likely than outpatients to be amnesic. Additionally, compensation-seeking individuals have an incentive to perform poorly on neuropsychological tests. Towards this end, the present study examined memory and performance effort in non-compensation-seeking depressed inpatients.

Participants and Methods : As part of a routine diagnostic examination, 12 inpatients with SCID-based diagnoses of major depression or adjustment disorder with depressed mood were administered the California Verbal Learning Test (CVLT) and a measure of performance effort (Word Memory Test: WMT). Patients were not seeking disability status for mental illness. They had no current neurological disease, and their primary diagnosis involved depression.

Results : Patients with CVLT total recall T-score falling at or below the 5th percentile were classified as impaired. Patient effort was classified according to the WMT manual. A cross-tabulation of scores revealed that 92% of the patients had memory impairment. Of these, only 27% showed evidence of sub-optimal effort on the WMT.

Conclusions : Most patients with depression performed poorly on the CVLT, with only a small minority manifesting sub-optimal effort. As such, assertions that depression-related forgetfulness is entirely due to poor effort are unfounded. Nonetheless, it is important to screen for poor effort even in depressed inpatients who are not seeking compensation.

Correspondence: *Michael Basso, Ph.D., Psychology, University of Tulsa, 600 South College Avenue, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

P.J. SEIGNOUREL, V.M. DOTSON, D. STIGGE-KAUFMAN, B.J. DANIELS & R.M. BAUER. Enhanced Explicit Memory for Negative Words in Depression: Efficient Processing or Response Bias?

Objective: Previous research suggests that depressed individuals, compared to never-depressed individuals, show better recall of negative, self-referent information. We used a recognition memory paradigm and a signal detection approach to determine whether these biases represent more efficient processing or response bias. We also sought to determine the relationship between memory biases and neuropsychological performance in depression.

Participants and Methods : 23 depressed and 9 never-depressed individuals completed a recognition memory test with negative and positive adjectives individually rated as characteristic or not characteristic of themselves. Discriminability and response bias (c) were computed for each category. Participants also completed the California Verbal Learning Test (CVLT-II) and the Wisconsin Card Sorting Test (WCST) as estimates of verbal memory and executive functioning, respectively.

Results : For the characteristic adjectives, there was a significant interaction between valence and group for response bias, $F(1,28)=5.50$, $p<.05$, with greater bias (i.e., more yes responses) for negative adjectives in the depressed group, and greater bias for positive adjectives in the never-depressed group. No such interaction was observed for discriminability, or for the non-characteristic adjectives. Within the depressed group, total false positive rate tended to correlate positively with WCST total errors, $r(22)=.41$, $p=.06$.

Conclusions : Our results do not support the hypothesis that depressed individuals show more efficient processing of negative, self-referent adjectives. Rather, they suggest that, in depression, these adjectives are subject to a response bias, resulting in higher overall yes responses on recognition, including false positive responses. Depressed individuals with poor executive functioning skills may be at higher risk for such distortion of negative information. Correspondence: *Paul J. Seignourel, Ph.D., Clinical and Health Psychology, University of Florida, P.O. BOX 100165, Gainesville, FL 32610-0165. E-mail: pseignou@phhp.ufl.edu*

I.J. TORRES, V.G. BOUDREAU, W.G. HONER & L.N. YATHAM. Neuropsychological Functioning in First Episode Bipolar Disorder.

Objective: Although euthymic patients with bipolar disorder demonstrate cognitive impairment, there is virtually no data on whether cognitive deficits are present early in the course of illness. If present, such deficits could reflect dysfunctional neurodevelopmental or disease processes that have culminated in neuropsychological impairment at clinical disease onset.

Participants and Methods : To help clarify the source of cognitive impairment in bipolar disorder, we present preliminary neuropsychological data on a well-characterized sample of bipolar patients tested in the euthymic state following a first manic or hypomanic episode ($n = 12$), as well as age- and premorbid IQ- matched healthy controls ($n = 4$). Participants were administered a test battery including subtests from the Cambridge Neuropsychological Test Automated Battery (CANTAB, CeNes Cognition, 1998) assessing premorbid and current IQ, attention, memory, visual-spatial ability, and multiple aspects of executive functioning.

Results : Patients demonstrated a pattern of selective cognitive deficits. The most significant and sizeable effects (hedges corrected effect sizes) were noted in sustained attention and select executive functioning involving attentional/mental shifting capacity. Moderate size effects were also noted in memory functioning.

Conclusions : These results suggest that the previously identified cognitive impairments in euthymic bipolar patients may not be due exclusively to disease progression, prolonged treatment effects, or illness burden (e.g. number of episodes, duration of illness). Rather, significant cognitive impairments appear evident very early in the course of illness. Further longitudinal study may help determine whether these deficits reflect neurodevelopmental abnormalities, disease-related changes present at the time of illness onset, or continuing cognitive recovery from the first manic episode. Correspondence: *Ivan J. Torres, PhD, Psychology; Simon Fraser University; 8888 University Drive, Burnaby, BC V5A 1S6, Canada. E-mail: itorres@sfu.ca*

S. LEFING, B. LEAHY & C. LAM. Evaluating the Beck Depression Inventory-II for Use in Individuals with Movement Disorders.

Objective: The usefulness of somatic symptoms on the Beck Depression Inventory-II is questionable for individuals with movement disorders, as physical features of illness may resemble physical symptoms of depression. It is hypothesized that cognitive symptoms will differ between depressed and non-depressed, while somatic symptoms will not, and that three components will be identified, one representing illness.

Participants and Methods : Fifty-four individuals receiving outpatient treatment at a movement disorders clinic were included in the study. Patients were diagnosed with Parkinson's Disease or Parkinsonism, or had symptoms of other hypokinetic or hyperkinetic disorders. Items of the BDI-II were analyzed using principal components analysis with Promax rotation and item analysis.

Results : Forty-one percent of the sample was found to be at least mildly depressed. Two factors, Somatic-Affective and Cognitive, were identified and explained 48.81% of the variance. High internal consistency was found based on Cronbach Alphas of total and component scores ($>.85$). Corrected item-total correlations were moderate, except for loss of interest in sex which was low. Significant differences were found between depressed and non-depressed in component scores ($p < .001$). Corrected-alpha *t*-tests for somatic items yielded significant differences between groups for all items ($p < .004$) except crying, punishment feelings, indecisiveness, and irritability, and for cognitive items, with significant differences for all items ($p < .005$) except sadness, suicidal thoughts/ wishes, and loss of interest in sex, which had high means for both groups.

Conclusions : Support is given for use of the Beck Depression Inventory-II in individuals with movement disorders. Affective and cognitive items less useful in detecting depression may reflect low occurrence of these symptoms. Loss of interest in sex may be highly endorsed due to age and illness-related factors. Since this item had poor reliability, it should be considered for exclusion in this population.

Correspondence: *Stacey Lefing, Clinical Psychology, Illinois Institute of Technology, 1210 W. Cornelia Ave, Chicago, IL 60657. E-mail: slefing@yahoo.com*

K.M. MILLER, D. BOWERS, H. FERNANDEZ, C. JACOBSON, K. FOOTE & M. OKUN. Patterns of Depressed Mood Symptoms in Parkinson's Disease, Dystonia, and Essential Tremor.

Objective: Recent research has suggested that depression in Parkinson's Disease (PD) may result from the underlying neuroanatomical degeneration as opposed to a reaction to the disability associated with having the disease. However, past studies have not specifically compared PD patients to other movement-disorders groups. The objective of the current study was to determine whether patients with PD display higher

levels of depression symptoms on the Beck Depression Inventory (BDI) and Visual Analog Mood Scales (VAMS) compared to patients with other movement disorders (dystonia and essential tremor). We hypothesized that if depression symptoms in PD are the result of affected basal ganglia and associated circuitry, PD patients would endorse more depression symptoms on the BDI than essential tremor and dystonia patients. We also hypothesized they would have lower levels of happiness and higher levels of sadness on the VAMS.

Participants and Methods : The VAMS and BDI were administered to 351 PD patients, 90 dystonia patients, and 59 essential tremor patients.

Results : Data were analyzed using Repeated Measures ANCOVAs covarying for age and symptom duration. No significant between-groups difference was found on the BDI (between-groups mean = 9.69). On the VAMS, PD patients endorsed significantly more sadness and tiredness than essential tremor patients only.

Conclusions : This study is the first to examine depression symptoms across several movement-disorders groups, and suggests that increased depression symptoms are not unique to PD; rather, they appear to be common in other basal ganglia disorders. Future studies may benefit from examining whether non-motor neural circuitry is similarly affected in these three groups.

Correspondence: *Kimberly M. Miller, M.S. Clinical Psychology, Clinical & Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610-0165. E-mail: kmiller@hp.ufl.edu*

T.J. STORY, G.G. POTTER, D.K. ATTIX, K.A. WELSH-BOHMER & D.C. STEFFENS. Distinctions in the Relationship Between Late-Life Depression and Neurocognitive Function.

Objective: Individuals who first become depressed in late life demonstrate greater neurocognitive impairment than individuals with early-onset depression (EOD). Depression severity is also associated with greater neurocognitive impairment deficits among older adults, but the neuropsychological performance of individuals with early- and late-onset depression (LOD) may differ as a function of severity of depressive symptomatology.

Participants and Methods : The current sample was composed of 110 female and 67 male older patients ($M = 69$, $SD = 6.9$) enrolled for depression treatment in the Clinical Mental Health Research Center at Duke University. Participants completed a structured diagnostic assessment at study entry, along with neuropsychological testing. Participants with onset of their first depressive episode after age 55 were defined as LOD. LOD individuals were significantly older ($t [111] = 2.46$, $p < .05$) than individuals with EOD. Women were disproportionately represented in the EOD group, and men in the LOD group ($X^2 = 4.47$, $p < .05$). Groups did not differ with respect to education level or severity of depression at baseline.

Results : Separate ANCOVAs of neuropsychological variables revealed that individuals in the LOD group performed significantly worse than the EOD group on measures of delayed word-list recall, delayed prose recall, information processing speed, and cognitive flexibility. For each of these neuropsychological variables, covarying depression severity increased effect sizes associated with age of depression onset.

Conclusions : These results suggest that depression severity may mask underlying neurocognitive differences in EOD and LOD, and that age and gender differences may further complicate the relationship between late-life depression and cognitive function.

Correspondence: *Tyler J. Story, Ph.D., Neurology and Psychiatry, Duke University, Morreene Road Clinic, Box 3333, Durham, NC 27710. E-mail: tyler.story@duke.edu*

M.S. MARQUART, L. BUTTROSS & W. RUWE. The Effect of Patient Depression on Accuracy of Collateral Informant and Patient Ratings of Executive Functioning.

Objective: Examined the accuracy of patient and collateral ratings of the patient's executive functioning under various levels of patient depression to test if patient's depression can affect their self-appraisals, as well as other's appraisals of their executive ability.

Participants and Methods : 97 patients referred for evaluation of neurocognitive functioning in the presence of known or suspected neurological disease were administered a flexible battery of tests. Difference z-scores were calculated for patients to test if raters overestimated or underestimated patient's actual ability. In addition, Positive Predictive Values (PPVs) provided an index of the frequency with which ratings were likely to be accurate when stating that executive impairment is present, Test Efficiency Value (TEVs) provided an index overall index of the degree to which the test is accurate, and Negative Predictive Value (NPVs) provided an index of the frequency with which ratings were likely to be accurate when stating that executive impairment is NOT present.

Results : There were no significant differences between the overall accuracy (impaired or non-impaired) of collateral informant and patient ratings. However, when data is divided into levels of accuracy (underestimate, accurate, or overestimate), collateral informants underestimated patient executive performance, whereas patients overestimated their performance, irrespective of depression. Overall accuracy rates were similar between collateral (TEV = 52.3%) and patient ratings (TEV = 50.9%), with relatively poor accuracy for both, whether or not the rater endorsed the presence of an executive impairment (PPVs = 46.7% and 50.0%, respectively; NPVs = 65.0% and 51.2%). This did not vary as a function of depression.

Conclusions : Results suggest that both collateral informant ratings and patient ratings of executive ability should be used cautiously, as they did not add a significant amount of accurate information to diagnostic decision making in this mixed clinical sample.

Correspondence: *Melissa S. Marquart, Ph.D., Neuropsychology, Bay-Care Clinic, 12901 N. MacArthur Blvd; Apt 26, Oklahoma City, OK 73142. E-mail: marquartmel@hotmail.com*

R.K. BHALLA, M.A. BUTTERS, A.E. BEGLEY, B.A. SCHODERBEK, C.F. REYNOLDS & J.T. BECKER. Persistence of Executive and Memory Functioning in Early- vs. Late-Onset Major Depression.

Objective: Cognitive impairment during both the depressed and remitted states of late-life depression (LLD) is common. Evidence suggests that late-onset depression (LOD) is associated with disproportionate executive dysfunction while early-onset depression (EOD) is associated with episodic memory deficits. The purpose of this study was to examine whether EOD and LOD are associated with different cognitive profiles during the depressed and remitted states of LLD.

Participants and Methods : We examined longitudinal performance in executive functioning (EF) and memory ability (each domain comprised of multiple individual measures) in 56 non-demented subjects age 60 or older, who initially presented with an episode of non-psychotic unipolar major depression. Eighteen subjects had EOD (first depressive episode < 60) and 38 had LOD (first depressive episode ≥60). Subjects were assessed in a depressed state and one year later, when remitted.

Results : Repeated measures MANOVA comparing the two groups revealed no significant group differences or interaction on either domain. A significant time effect on both domains revealed better performance during the remitted state. Individually, subjects were further classified as cognitively intact or impaired at each time point. McNemar's exact tests revealed no differences between the proportion of EOD and LOD patients classified as impaired at one year on either domain.

Conclusions : Although age of onset may play a role in defining some LLD phenotypes, EOD and LOD subjects did not differ in EF or memory during either the depressed or remitted states. Examining the role of other correlates of LLD is required to further elucidate cognitive profiles associated with differing depressive phenotypes.

Correspondence: *Rishi K. Bhalla, PhD, Geriatric Psychiatry, Western Psychiatric Institute and Clinic, 1 Maple Ave., Riverside, RI 02915. E-mail: bhallark@upmc.edu*

Psychopathology: Schizophrenia

V.M. LEAVITT, S. MOLHOLM, W. RITTER, M. SHPANER, D.C. JAVITT & J.J. FOXE. Source Localization of Early Auditory Evoked Potentials in Schizophrenia Patients: Evidence for Disruption of the Dorsal Auditory Pathway.

Objective: There is growing evidence of functionally distinct auditory pathways that govern sound object recognition and sound localization, the so-called what and where paths. Dual Trends Theory, as proposed by Christensen and Bilder (2000), forwards the thesis that pathology in the brains of patients is organized along the lines of a dorsal/ventral distinction and that furthermore, patients with schizophrenia will demonstrate deficits at all cytoarchitectonic levels of the dorsal trend. Our previous work in the visual system appears to support this assertion in that we have shown more severe deficits in the dorsal visual stream than in the ventral (e.g. Foxe et al., 2005). Here, we investigated putative dorsal/ventral dissociations in the auditory system of schizophrenia patients.

Participants and Methods : We used dipole source-analysis to estimate the intracranial generators that showed the greatest difference between 21 patients and 15 controls during simple sensory processing of 1000Hz tones. That is, we assessed where in auditory cortex the earliest deficits occurred in schizophrenia. We identified significant differences between patients and controls from as early as 8 ms. We reasoned that if the earliest differences fell anterior to the auditory core region, this would implicate the ventral auditory stream, and if these differences fell posterior and superior to Heschl's gyrus, this would implicate generators in the dorsal auditory stream.

Results : We localized the generators of these early differences with 91.5% of the variance explained. We found stable generators that were distinctly more superior and posterior to Heschl's gyrus, a trajectory that we would expect to see for components in the dorsal stream.

Conclusions : Our findings suggest that the earliest differences between patients and controls can be explained by a trend that seems to favor the dorsal stream.

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Correspondence: *Victoria M. Leavitt, B.Sc., Cognitive Neurophysiology Laboratory, Nathan Kline Institute, 140 Old Orangeburg Road, Orangeburg, NY 10962. E-mail: vleavitt@nki.rfmh.org*

M.J. BOCHICCHIO & M.M. KURTZ. The Relationship of Neurocognitive Skills, Facial Affect Recognition, and Social Skills in Outpatients with Schizophrenia.

Objective: Few studies have investigated the relationship of neurocognitive test performance and facial affect recognition to social skills in patients with schizophrenia and most studies to date have been limited by inpatient samples and by an absence of performance-based instruments for measuring social skills.

Participants and Methods : We administered several neurocognitive tests, two measures of facial affect recognition, and a newly developed, performance-based measure of social skills for use with patients with severe mental illness (Social Skills Performance Assessment; SSPA) to 25 medicated, stabilized outpatients with schizophrenia.

Results : Preliminary analyses revealed that measures of sustained visual vigilance (Penn Continuous Performance Test; PCPT) and verbal learning (Hopkins Verbal Learning Test; HVL) were related to identification of happy faces (Penn Emotion Acuity Test; PEAT), while a test of executive functioning (Penn Conditional Exclusion Test; PCET) was related to differentiation of happy faces (Emotion Differentiation Task; EMODIFF). No neurocognitive measures were related to identification or differentiation of sad faces. Both sustained visual vigilance (PCPT)

and recognition of happy faces (PEAT) were correlated with social skill performance. In contrast, identification and differentiation of sad faces were not related to social skills. Social skill performance was related to employment status and duration of illness, but not to any other demographic or illness variables.

Conclusions : These findings support prior research by Silver et al. (2002), which suggests that there may be separate processes for identifying happy and sad emotions. The implications of these findings for rehabilitation of social skills deficits in patients with schizophrenia will be discussed.

Correspondence: *Melissa J. Bochicchio, M.A., Schizophrenia Rehabilitation Program, Institute of Living, 40 Owen St., Apt. D6, Hartford, CT 06105. E-mail: mjbochicchio@yahoo.com*

S.T. MOELTER, J. RAGLAND, T. NIENOW, P.J. MOBERG, R.E. GUR & B.I. TURETSKY. Formal Thought Disorder and N400 Repetition Effects During List-Learning in Schizophrenia.

Objective: The neurocognitive mechanisms that modulate semantic memory impairment and symptoms of formal thought disorder in schizophrenia remain unclear. We hypothesized that formal thought disorder is associated with reduced ability to generate semantic expectancy effects during a list-learning test.

Participants and Methods : We measured brain event-related potentials (ERPs) associated with selective attention (N100) and semantic expectancy (N400) during auditory presentation of the California Verbal Learning Test. Participants were healthy adults ($n = 28$) and schizophrenia patients with symptoms of formal thought disorder (FTD) ($n = 12$) or without symptoms of FTD (NTD) ($n = 16$).

Results : The two patient groups showed comparable encoding and retrieval deficits relative to controls. ERP analyses revealed a general deficit of selective attention in schizophrenia compared to controls, as measured by N100 amplitude at trial one and trial five, but no difference in N100 between patient groups. In contrast, an interaction between learning trial and group showed that the FTD participants did not produce normal N400 repetition priming effects across the learning trials; controls and NTD patients recognized the semantic context of the list quickly (i.e., larger initial N400 amplitudes) and showed reduced N400 amplitudes with list repetition. Patients with FTD did not recognize the semantic characteristics of the word list during the early trials (i.e., smaller initial N400 amplitudes) and showed greater semantic unexpectancy during later trials (i.e., larger N400 amplitudes).

Conclusions : Despite equally impaired memory and selective attention, FTD and NTD schizophrenia patients showed different patterns of N400 amplitude. These results suggest that poor integration and use of semantic knowledge is associated with FTD in schizophrenia.

Correspondence: *Stephen T. Moelter, Ph.D., Social Sciences, University of the Sciences in Philadelphia, Kline Hall, 600 South 43rd Street, Philadelphia, PA 19104. E-mail: s.moelte@usip.edu*

N. DONINGER, P.D. NEWMAN, M.J. FINTON, D.S. LEHRER & M.S. BUCHSBAUM. Neuropsychological Functioning in Neuroleptically Naive Individuals with First-Episode Psychosis.

Objective: Several findings implicate a schizophrenia-associated neuropsychological profile characterized by deficits in attention, executive functioning, and memory; however, comparatively fewer studies have investigated cognitive functioning before treatment with psychoactive medications.

Participants and Methods : The current study compared neuropsychological functioning among neuroleptically-naive individuals ($n=15$) with schizophrenia (median length of illness = 26 weeks) and healthy individuals ($n=14$) matched on age, education, gender, and estimated verbal IQ. Attention, language, executive functioning, perceptual motor processing, motor speed, and psychiatric symptomatology were assessed. Performance on the California Verbal Learning Test (CVLT-II) forced choice recognition paradigm suggested cooperative test-taking behavior among participants.

Results : Small sample sizes limited statistical power to detecting large group differences. Poorer performance among participants with schizophrenia on measures of verbal learning, short-, and long-term memory (CVLT-II) was related to reduced utilization of semantic clustering strategies. Additional deficits were evident on measures of cognitive processing speed (Trail Making Test), working memory (Letter-Number Sequencing), and executive functioning (Wisconsin Card Sorting Test). The groups performed similarly on measures of phonemic verbal fluency, motor speed, and perceptual motor processing. Neurocognitive deficits observed among individuals with schizophrenia were unrelated to severity of current psychiatric symptomatology assessed by the Brief Psychiatric Rating Scale.

Conclusions : These findings replicate previous research suggesting intrinsic deficits in executive functioning, learning, and memory related to poor organizational strategies. Neuropsychological deficits are present from illness onset, exist independently from the potential confounding effects of psychotropic medications, and appear to be unrelated to the degree of psychiatric symptom disturbance.

Correspondence: *Nicholas Doninger, Ph.D., Wallace-Kettering Neuroscience Institute, Kettering Memorial Hospital, 3533 Southern Blvd., Suite 5200, Kettering, OH 45429. E-mail: nicholas.doninger@kmcnetwork.org*

J.A. THYSEN & A. MEDALIA. The relationship Between the Brief Assessment of Cognition in Schizophrenia (BACS) and Functional Outcome.

Objective: Given the interest in functional outcome in schizophrenia, it is important to understand the ecological validity of cognitive measures that are used to assess schizophrenics. This investigation sought to determine if performance on a recently developed measure of cognition in schizophrenia, correlates with performance on a proxy measure of functional outcome. The BACS (Brief Assessment of Cognition in Schizophrenia), targets 6 areas of cognition: verbal memory, attention, motor skills, verbal fluency, processing speed, and executive functioning. Previous research would predict that overall performance on the BACS, as well as performance on the memory, attention and problem solving subscales, would significantly correlate with performance on the Independent Living Scale - Problem Solving (ILS-PS), a proxy measure of functional outcome that assesses problem solving needed for daily living.

Participants and Methods : Forty outpatient adults with schizophrenia were administered the BACS and ILS-PS.

Results : The BACS total score was significantly correlated with the ability to solve problems encountered in everyday living. The BACS measures of attention, verbal memory, and executive functioning were found to be significantly correlated to problem solving skills needed in everyday life, whereas correlations between daily problem solving and motor skills, verbal fluency, and processing speed were not significant.

Conclusions : This research supports the ecological validity of the BACS. Cognitive impairment on the BACS was found to be significantly associated with impairment in the everyday problem solving skills needed for independent living.

Correspondence: *Julie A. Thyssen, M.A., Psychiatry and Behavioral Sciences, Albert Einstein College of Medicine, Montefiore Medical Center of Yeshiva University, 111 East 210th Street, Klau 2, Bronx, NY 10467. E-mail: jthyssen@aol.com*

S. REMILLARD, E. POURCHER & H. COHEN. The Longterm Effects of Neuroleptics on Verbal Memory, Attention, and Symptomatology in Schizophrenia.

Objective: In this longitudinal study, we assessed the differential effects of risperidone and haloperidol on aspects of cognition and symptomatology in schizophrenia (SZ).

Participants and Methods : The performance of 28 SZ participants, randomly assigned to risperidone or haloperidol, was compared to that of healthy controls. The CVLT, the d2 Cancellation test, and the Positive and Negative Syndromes Scale were administered at baseline, 3, 6, and 12 months.

Results : Relative to controls, SZ participants showed a marked impairment in verbal memory and processing speed at each assessment period. There was no differential effect between both types of medication on verbal memory performance. With respect to attention, control subjects and haloperidol patients showed a gradual improvement over time, suggesting a practice effect. However, risperidone was found to be more effective than haloperidol in the reduction of psychiatric symptoms and the improvement in symptom severity was not associated with cognitive performance.

Conclusions : Our findings suggest that mechanisms other than dopamine-serotonin antagonism are contributing to the verbal learning and attentional processing speed impairments seen in SZ. The differential efficacy of risperidone over psychiatric symptoms and cognitive performance strongly suggests that the cognitive deficits observed are, to some extent, the result of brain abnormalities independent of those that produce the major psychopathology manifestations seen in SZ.

Correspondence: *Henri Cohen, Université du Québec à Montréal, C.P. 8888, Succ. Centre-Ville, Montréal, QC H3C 3PS, Canada. E-mail: henri.cohen@uqam.ca*

D.I. SITZER, E.W. TWAMLEY, B.W. PALMER, H.K. ROBERT & J.V. DILIP. Cognition and Driving Status in Schizophrenia Patients.

Objective: Drivers with schizophrenia report more accidents per mile driven and perform worse on driving simulators than do healthy drivers. The same types of cognitive impairments found in schizophrenia have been linked to poor driving in other disorders. However, the relationship between cognition and driving in schizophrenia has received little empirical attention. We predicted that better attention and executive functioning and fewer negative symptoms would be related to current driver's license possession and driving within the past 6 days.

Participants and Methods : 344 outpatients with schizophrenia (n=260) or schizoaffective disorder (n=84) (65% male, mean age=52, mean education=12 years) completed the Mattis Dementia Rating Scale (DRS), the Positive and Negative Syndrome Scale, and the Hamilton Depression Rating Scale. Logistic regression analyses predicting driver's license possession and driving within the past 6 days were computed, each with diagnostic and demographic factors entered first and symptom severity and cognitive variables entered second.

Results : 20% of participants had a current driver's license and 12% drove within the past 6 days. Significant predictors of driver's license possession were schizoaffective diagnosis, more education, and higher DRS Initiation/Perseveration and Construction scores (all OR>1, all 95% CI>1), but not age, gender, ethnic minority status, socioeconomic status, illness duration, psychiatric symptom severity, or DRS Attention, Conceptualization, or Memory scores. None of these variables predicted driving within the past 6 days.

Conclusions : Patients with schizoaffective disorder (vs. schizophrenia), higher levels of education, and better executive functioning and visuospatial ability were more likely to possess a current driver's license; however, none of these variables predicted recent driving.

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*

G. NAYAK SAVLA, B.W. PALMER, D.J. MOORE, D.V. JESTE & J.P. LACRO. Rates of Significant Discrepancies Between Crystallized Verbal Knowledge and Other Cognitive Abilities among Schizophrenia Patients.

Objective: To evaluate the rates of significant discrepancies between crystallized verbal functioning and other cognitive abilities among patients with schizophrenia.

Participants and Methods : Participants were 60 middle-aged and older outpatients with schizophrenia or schizoaffective disorder who completed the Wechsler Adult Intelligence Scale, 3rd edition (WAIS-III) and the Wechsler Memory Scale, 3rd edition (WMS-III) as part of a larger study. The WAIS-III/WMS-III Index scores were calculated for each participant. We conducted discrepancy analyses to identify the proportion of participants for whom Verbal Comprehension Index (VCI; as a measure of crystallized verbal knowledge) was significantly higher than the other ability areas, i.e., Perceptual Organization Index (POI), Working Memory Index (WMI), Processing Speed Index (PSI), Auditory Memory Index (AMI) and Visual Memory Index (VMI). We then compared the proportion of statistically significant discrepancies in the current sample to those reported by Hawkins & Tulskey (2003) for the standardization sample.

Results : The proportion of patients with schizophrenia who had significantly discrepant scores were as follows: VCI > POI=50.3%, VCI > WMI=45.7%, VCI > PSI=66.7%, VCI > AMI=57%, and VCI > VMI=81.7%. These proportions were all significantly higher than those in the WAIS-III/WMS-III standardization sample (Hawkins & Tulskey, 2003), χ^2 values=6.4 to 131.3, df=1, all ps <.001.

Conclusions : Lower performance in an array of cognitive abilities, relative to VCI (as a measure of crystallized verbal knowledge) was quite common among patients with schizophrenia.

Correspondence: *Gauri N. Savla, M.A., Psychiatry, University of California, San Diego, VA San Diego Healthcare System 116A-1, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: gnyak@rapop.ucsd.edu*

P. NEWMAN, N.A. DONINGER, M.J. FINTON, D.S. LEHRER, B.T. CHRISTIAN, T.K. NARAYANAN, B. SHI, J. MANTIL, E. KEMETHER, J. MUKHERJEE & M.S. BUCHSBAUM. Neuropsychological Correlates of Thalamic D2/D3 Receptor Availability Detected with [F-18] Fallypride Among Neuroleptic Naive Individuals with Schizophrenia and Healthy Controls.

Objective: To obtain and compare PET measurements of thalamic D2/D3 receptor binding (using the high affinity dopamine receptor ligand [F-18]fallypride) with neuropsychological performances in a group with schizophrenia and a group of healthy controls.

Participants and Methods : PET measurements and neuropsychological performances were obtained in a group of 10 never medicated patients with schizophrenia and 12 healthy controls. The fallypride binding potential (BP) images were coregistered to their individual MRI. The medial dorsal nucleus (MDN) and pulvinar were traced on coregistered MRI for detailed assessment of BP in these regions. These areas were examined in relation to performance on tests of executive function and new learning based on evidence of their projections to the frontal and temporal lobes respectively.

Results : Significant differences were revealed between the two groups on both the cognitive measures and the thalamic D2/D3 receptor binding potentials. Collapsing the two groups together, significant correlations were observed between MDN [F-18]fallypride binding potential and performance on executive function measures (e.g., left MDN BP and Wisconsin Card Sort perseverations., $r=-.675$) and between pulvinar binding potentials and new verbal learning (e.g., left pulvinar BP and California Verbal Learning Test-2 total, $r=.579$). Many of the correlations remained significant when the two groups were analyzed separately.

Conclusions : These findings provide preliminary evidence of a relationship between dopaminergic activity in the thalamus and cognitive ability and also support the concept that perseverative behavior in general is associated with increased dopaminergic activity. Of interest, these relationships were found in the healthy controls as well as in patients with schizophrenia.

Correspondence: *Paul Newman, PhD, Wallace-Kettering Neuroscience Institute, Kettering Medical Center, 3533 Southern Blvd., Suite 5200, Kettering, OH 45429. E-mail: paul.newman@kmcnetwork.org*

R. RICHARDSON, J. CHOI & A. MEDALIA. Cognitive Predictors of Functional Outcome in Schizophrenia and Affective Disorders.

Objective: Increasing evidence indicates that cognitive impairments are a stable characteristic of schizophrenia and certain affective disorders, particularly in the areas of attention, memory, and executive functioning. It is widely believed that these impairments impact on psychosocial functioning, making them a critical target area for treatments that remediate cognitive functions for the purpose of improving day-to-day functioning. The relevance of cognitive skills to functional outcome has been widely researched in schizophrenia, however few studies have looked at this issue with regard to affective disorders.

Participants and Methods : This study employed a proxy measure of psychosocial functioning (the Independent Living Scale-problem solving subscale) along with measures of IQ, memory, executive functions, and processing speed, in order to determine what cognitive factors impact on functional outcome. Participants were 52 psychiatric outpatients diagnosed with schizophrenia spectrum disorders ($n=28$), or affective disorders with psychotic features ($n=24$).

Results : Analysis of variance showed that schizophrenia patients performed significantly worse on the ILS-PS than patients with affective disorders indicating less capacity for independent living $F(1,51) = 5.465, p=.02$. Multiple regression analysis found that performance on the ILS-PS for both diagnostic groups was mediated by verbal memory ($\beta=.30, p=.02$) and executive functioning ($\beta=.38, p<.01$). None of the IQ or neuropsychological measures discriminated between diagnostic groups.

Conclusions : Results indicate an important role for memory and executive functions in the functional outcome of affective disorders as well as schizophrenia.

Correspondence: *Randall Richardson, Ph.D., Psychiatry, Montefiore Medical Center, Albert Einstein College of Medicine, 111 East 210 St., Klau-2, Bronx, NY 10467. E-mail: richr662@newschool.edu*

C.T. HEY, S.M. HYNES, R.L. REESE, M.L. BENJAMIN, S. ARNDT, S.K. SCHULTZ, N.C. ANDREASEN & D.J. MOSER. Cognitive and Psychiatric Factors Associated with Capacity for Informed Consent in Schizophrenia Research.

Objective: Although most patients with schizophrenia can provide informed consent for research participation, such individuals often show suboptimal understanding of consent form information. We examined the cognitive and psychiatric factors associated with the ability to understand a research protocol.

Participants and Methods : Participants were 68 individuals with schizophrenia. Understanding of consent form information was assessed using a hypothetical research scenario and the MacArthur Competence Assessment Tool for Clinical Research. A neuropsychological battery and symptom rating scales were also administered. Statistical analyses included partial correlations and multiple regression models.

Results : Results indicated that, together, global cognitive ability and estimated premorbid functioning were associated with ability to understand consent form information (Adjusted R-Square $=.27, p < .001$). Among the other cognitive domains, immediate memory was uniquely associated with understanding, after controlling for global cognitive ability and premorbid functioning ($r = .38, p < .005$). Negative and disorganized symptoms of schizophrenia were associated with understanding ($r = -.51, p < .001$; $r = -.35, p < .01$), while positive symptoms (hallucinations, delusions) were not. Cognitive functioning and severity of schizophrenia symptoms remained uniquely associated with ability to understand consent form information when entered together into a multiple regression model.

Conclusions : These findings suggest that cognitive functioning (particularly immediate memory) and negative symptoms of schizophrenia are uniquely associated with ability to understand consent form information, and have important implications regarding the assessment and remediation of decisional capacity in individuals with psychotic disorders.

Correspondence: *David J. Moser, Ph.D., Psychiatry, University of Iowa, Dept. of Psychiatry, MEB 1-328, Iowa City, IA 52242. E-mail: david-moser@uiowa.edu*

J.M. FOLEY & C. GOLDEN. Nature and Extent of Neuropsychological Compromise in Older Seriously Mentally Ill Populations.

Objective: Prior research has inconsistently demonstrated a specific pattern of frontal-temporal involvement in adult patients with Serious Mental Illness (SMI). This study examined this phenomenon in geriatric schizophrenic and schizoaffective patients when compared to geriatric normal controls.

Participants and Methods : Thirty-eight geriatric SMI patients and 100 geriatric normal controls were studied. Mean age for SMI was 60.95($SD=5.69$) and mean age for normal controls was 71.41($SD=9.61$). Mean education for SMI was 11.90 ($SD=2.47$), and mean education for normal controls was 13.71($SD=2.59$). In both groups, most subjects were Caucasian, female, and right-handed. Participants were administered measures assessing executive functioning, including the Trails Making B, COWAT, and the Stroop, and measures assessing general intellectual, memory and naming abilities, including WAIS-III, WMS-III and BNT. Significant differences in age and education were found between groups.

Results : Sequential age- and education-controlled ANCOVAs were conducted to compare the groups on the above six measures of cognitive functioning. Statistically significant differences were found between the SMI group and normal controls on all measures at $\alpha=.01$, with the exception of the BNT. Differences were specifically found on COWAT $F(1,134)=12.10, p=.00$, WAIS-III FSIQ $F(1, 134)=40.79, p=.00$, WMS-III GMI $F(1,129)=66.27, p=.00$, Stroop Color-Word $F(1,133)=22.43, p=.00$, and Trails B $F(1,131)=40.48, p=.00$.

Conclusions : Results suggest that geriatric individuals with SMI display global neuropsychological impairment in contrast to some previous adult studies that have argued for a specific pattern of frontal-temporal involvement. Findings therefore argue for generalized atrophy and extend research to older adult populations and to psychotic patients with comorbid mood disturbance.

Correspondence: *Jessica M. Foley, MS, Center for Psychological Studies, Nova Southeastern University, 1040 Seminole Dr #1052, Fort Lauderdale, FL 33304. E-mail: jfoley@nova.edu*

G.W. SHAVER, B.A. MARCOPULOS, J. MANLEY & C.H. KENNEDY. Effort and Cognition in Persistently Psychiatrically Disabled Patients.

Objective: Recent research suggests poor mental effort is a core feature of schizophrenia. The aim of this study was to examine the effect of effort, using the Test of Memory Malingering (TOMM), on neuropsychological test performance in a group of persistently psychiatrically disabled patients.

Participants and Methods : Performance of 115 consecutively referred inpatients, who were administered neuropsychological batteries in a state hospital, was analyzed retrospectively. Sixty-four of these patients were diagnosed with a schizophrenia spectrum disorder (SCZ), and 51 were diagnosed with a nonpsychotic persistent mental illness (PMI). Test batteries varied but generally included measures of attention (WAIS-III Digit Span), verbal memory (CVLT-II), and executive functioning (Trails A & B).

Results : Using ANCOVA, TOMM scores accounted for a significant amount of variance in test performance on Digit Span and all subtests of the CVLT-II (η^2 ranged from .133 to .248), but not Trails A or B performance. Notably, only six individuals (5%) scored below the TOMM cut-off. There was no significant difference in failure rates between SCZ and PMI groups. With the exception of CVLT-II recognition, SCZ and PMI groups did not significantly differ on neuropsychological test performance. No group differences were observed in gender, age, education, age of onset, or forensic involvement.

Conclusions : Results suggest that lower levels of effort may be a central feature of persistent psychiatric illness (regardless of the presence/absence of schizophrenia) and this may impact neuropsychological test performance, resulting in underestimates of ability levels in this population.

Correspondence: *George W. Shaver, Psy.D., Psychiatric Medicine, University of Virginia Health System, Box 800203, Charlottesville, VA 22908-0203. E-mail: gws2w@virginia.edu*

W.S. STONE, A.H. ROE, S.V. FARAONE, M.T. TSUANG & L.J. SEIDMAN. The Consortium on the Genetics of Schizophrenia (COGS): Preliminary Findings of Learning and Memory on the California Verbal Learning Test, Second Edition (CVLT-II) in Subjects with Schizophrenia, Their Relatives, and Healthy Controls in a Multisite Study.

Objective: COGS is a 7-site (Harvard, Mt. Sinai, U. Penn., UCHSC, UCLA, UCSD, U. Wash.) consortium studying schizophrenia genetics using multiple endophenotypes, including verbal learning and memory, which is measured with the CVLT-II. Probands (PRO), relatives (REL) and normal comparison subjects (NCS) are assessed carefully using structured clinical and neuropsychological instruments.

Participants and Methods : Five months of consortium-wide training and quality assurance efforts preceded 18 months of data collection. Administration of the CVLT-II and DNA collection were completed on 637 subjects across the 7 COGS sites (PRO=142, REL=376 and NCS=119; Male (M)=317, Female (F)=320). REL were divided into parents and siblings (SIB). For consistency in age, only siblings (SIB=162) were compared to PRO and NCS. Data were analyzed using MANCOVAs, with demographic variables as covariates.

Results : NCS learned more words and showed better retention than did PRO (all $p < 0.05$). However, NCS did not differ from SIB on any measure. Narrowly defined NCS (no history of non-psychotic Axis I disorders, substance dependence, significant drug abuse, psychotropic medication, or ECT) did not differ from broadly defined NCS in performance. In addition, F consistently performed better than M (all $p < 0.05$).

Conclusions : These findings show the feasibility of testing across 7 sites, and of using the newer version of the CVLT to assess verbal learning and memory in schizophrenia. The absence of significant differences between NCS and SIB was unexpected, however, and raises questions about the utility of CVLT performance as an endophenotype for schizophrenia. Additional analyses of all COGS endophenotypes and diagnostic classifications are ongoing. Supported by MH 65571.

Correspondence: *William Stone, Harvard University, 25 Shattuck St., Boston, MA 02115. E-mail: wstone@bidmc.harvard.edu*

Poster Session 13 /11:00 a.m.–12:30 p.m.

Agnosia/Disordered Representations

S. CERCY & J.R. COLE. A Case of Reduplicative Paramnesia Associated with Basal Frontal Meningioma.

Objective: Describe clinical features of reduplicative paramnesia and discuss implications for models of RP.

Participants and Methods : A 59-year-old, college-educated man with basal frontal meningioma underwent pre- and post-resection neuropsychological evaluation. An experiment was designed to assess recognition for visual stimuli of individuals or physical locations varying along 2 dimensions, familiarity and emotional valence.

Results : A patient developed gradually worsening depression 3 years prior to examination. Neurological examination was nonfocal; his MMSE score was 30/30. Cognitive evaluation revealed deficits of processing and motor speed; bilateral visual errors were elicited on confrontation

testing. MRI revealed a large olfactory groove meningioma exerting severe bifrontal mass effect with extension to the right amygdala and adjacent anterior temporal cortex. Follow-up neuropsychological evaluation showed interval declines most prominently affecting visual cognition and visual memory.

The most striking clinical phenomenon elicited was delusional misidentification of the patient's physical location, reduplicative paramnesia (RP), which in retrospective had been present prior to surgery. Delusional ideation did not extend to reduplication of individuals, Capgras syndrome (CS). Overall accuracy for the content of experimental visual stimuli was low (49%), indicative of generalized visuo-perceptual disturbance. Within that context, recognition accuracy for high- versus low-emotional valence stimuli was comparable, whereas recognition for places (58.3%) was worse than for people (71.4%). Moreover, he showed greater difficulty identifying unfamiliar (57.1%) versus familiar (78.6%) stimuli overall ($\chi^2 = 37.0$, $df = 7$, $p < .001$).

Conclusions : RP and CS have both been associated with focal lesions of the right frontal region. We review arguments and discuss implications regarding necessary and sufficient conditions associated with RP and CS.

Correspondence: *Steven Cercy, Ph.D., Mental Health/Psychology (11M), New York VAMC, Room 2656, 423 E 23rd Street, New York, NY 10010. E-mail: steven.cercy@med.va.gov*

J.P. KEENAN, C. SHELBY & V. BARRIOS. The neurological correlates of the self.

Research into the neural correlates of the self have existed for centuries. Recent advances in both neuroimaging and clinical neuroscience have expanded our knowledge as to how the brain creates the self. Using technologies such as fMRI and TMS, the literature is expanding exponentially in terms of the self and the brain. Clinical investigations have expanded as well. Understanding Agnosia, Anosognosia, and Confabulation is key to elucidating the neural correlates of the self. A review of the literature suggests that self-awareness is linked (behaviorally and neurologically) to the monitoring of other mental states, and that disorders of self-monitoring may also result in deficits of Theory of Mind (being able to monitor the thoughts of others). The literature also suggests that networks associated with self-monitoring in normals are linked with networks involved in Theory of Mind, including deception and mental state attribution. The convergence (and divergence) of the clinical and experimental literature suggests that networks including the anterior cingulate and right fronto-parietal may be involved in the monitoring of self and other.

Correspondence: *Julian P. Keenan, PhD, Psychology, Montclair State University, 219 Dickson Hall, Upper Montclair, NJ 07043. E-mail: selfawareness@prodigy.net*

K.J. KELLY, E. MURRAY & J.P. KEENAN. Using Transcranial Magnetic Stimulation to Create Disorders of Self.

Transcranial Magnetic Stimulation (TMS) provides a bridge between traditional neuroimaging and clinical neuroscience. By using TMS to create 'virtual lesions', one is able to briefly disrupt functioning in a circumscribed (<2cm) region of the cortex. The information provided by TMS is particularly useful when examining higher-order cognitive processing such as self-awareness. Here we describe a series of experiments where TMS was employed to disrupt the self. First, TMS was employed in a virtual lesion manner to disrupt first and third person perspective. It was found that early (150msec) TMS delivered to frontal regions disrupted the ability to take first-person perspective. TMS was then employed to determine hemispheric differences in self and other monitoring. It was found that the right hemisphere was more consistent

and had less of a differentiation in terms of deceptive and truthful statements. Finally, TMS was employed to examine self-deception to examine the possibility that self- and other-deception occupy similar cortical roots. These studies are examined in terms of both anosognosia and confabulation and they suggest that TMS may be a useful tool in modeling these disorders.

Correspondence: *Julian P. Keenan, PhD, Psychology, Montclair State University, 219 Dickson Hall, Upper Montclair, NJ 07043. E-mail: selfawareness@prodigy.net*

T. NIJBOER, M.J. VAN DER SMAET, M.J. VAN ZANDVOORT & E.H. DE HAAN. Colour Information and Scene Identification in Colour Agnosia.

Objective: Colour information has been shown to improve object as well as scene recognition, but only for objects and scenes for which colour is diagnostic. The present experiments were designed to examine the role of colour information in scene identification, in a patient with colour agnosia.

Participants and Methods : In an identification task, the patient as well as age matched controls had to name scene images (coast, desert, forest, city, market, room) that were presented in six different formats (colour, inverted colour, greyscale, inverted greyscale, black-and-white, spatial rotation).

Results : The controls showed shorter reaction times for natural scenes that were appropriately coloured, whereas reaction times for the patient did not differ between formats. Neither patient nor controls showed any differences in reaction times for the non-natural scenes. Overall, the patient was much slower on the natural than the non-natural scenes.

Conclusions : For natural scenes, colour cues are most important for scene identification, whereas texture and contour cues are less informative. The reverse holds for non-natural scenes (Tanaka, Pressnell, 1999, Perc Psychophys). Apparently, the colour agnostic patient only uses texture and contour cues, hence his impaired performance for natural scenes. Based on these results, one would expect the recognition of non-natural scenes to be impaired compared to natural scenes in form agnosia. Interestingly, this is apparent from the study of Steeves et al (see their figure 4, J Cogn Neurosci, 2004)

These findings demonstrate the limitations in visual perception in patients whose sensory colour perception is intact but higher order colour perception is impaired, as in colour agnosia.

Correspondence: *Tanja Nijboer, Psychological Laboratory, Utrecht University, Heidelberglaan 2, Utrecht 3584CS, Netherlands. E-mail: t.c.w.nijboer@fs.uu.nl*

Apraxia/Motor Sequencing

K. CHIPMAN & E. HAMPSON. A Female Advantage in the Accuracy of Gesture Production by Preschool Children.

Objective: The limb praxis system is a neural system involved in the production of skilled hand and arm movements. Research with adults has demonstrated a sex difference in the neuroanatomical organization and function of the praxis system. The present study investigated whether a sex difference in function might emerge earlier in life, i.e., during childhood development.

Participants and Methods : Boys ($n = 31$) and girls ($n = 33$) ages three to five years were compared on two gesture production tasks designed to recruit the praxis system. Movement errors on both tasks were counted and classified into 'praxic' (movement selection) and 'nonpraxic' (movement execution) categories using a detailed videotape analysis.

Results : Girls committed fewer praxic errors than boys when producing non-representational gestures, either singly or in series of increasing length. Girls also made fewer praxic errors than boys when pro-

ducing common, everyday gestures to verbal command or imitation. In none of the conditions did the female advantage in accuracy generalize to nonpraxic error categories. In fact, girls made just as many, if not more, executory errors than boys, regardless of the type of gesture to be produced. The findings were not explained by a female advantage in cognitive development (intellectual ability, gestural memory span, visual perception, or sustained attention).

Conclusions : The current study supports the hypothesis of a sex difference in limb praxic function that is present from an early age. It raises the possibility that the sex difference in function may be mediated by the actions of prenatal hormones on the developing praxis system.

Correspondence: *Karen Chipman, PhD, Nova Scotia Hospital, Purdy Bldg, Rm. 256b, 300 Pleasant Street, Dartmouth, NS B2Y3Z9, Canada. E-mail: karen.chipman@cldha.nshealth.ca*

K.B. QUENCER & K. HEILMAN. Limb Kinetic Apraxia in Parkinson's Disease.

Objective: Although the presence of ideomotor apraxia in a good proportion of patients with Parkinson's Disease (PD) has been reported (Sharpe 1983, Goldenberg 1986, Grossman 1991 and Leiguarda 1997), the existence of limb-kinetic apraxia (LKA) in PD, defined as the loss of hand and finger dexterity, resulting from the inability to connect, isolate and coordinate individual finger movements (Kleist 1907), has been denied (Zadikoff 2005). Because the basal ganglia is integral for kinematics of movements and the timing of action sequences (Leiguarda 2001) and because of PD patient's complaints about difficulties with activities of daily living such as buttoning shirts, we want to learn if LKA is associated with PD.

Participants and Methods : Patients with idiopathic PD on medication and non-PD matched controls were asked to perform a finger tapping task, a coin rotation task and a pegboard task, the latter two measuring two forms of deftness (coordination of independent finger movements and spatial precision) and the former task measuring speed of movements.

Results : The primary measure of bradykinesia, the finger tapping task was not significantly different between groups (11% difference, $p = 0.188$), but the measures of deftness (coin rotation—41.8% lower in PD subjects, two tailed $p = 0.000365$; pegboard—40.3% difference, $p = 0.00331$) were severely deficient.

Conclusions : Patients with PD do have LKA. We hypothesize that this LKA might be due to basal ganglia-frontal lobe dysfunction or acquired by disuse.

Correspondence: *Keith B. Quencer, Neurology, University of Florida College of Medicine, 2001 SW 16th St., Apartment E27, Gainesville, FL 32608. E-mail: kbq2@ufl.edu*

S. AHMETI, K. KELLY, M.A. SPRINGER, C.M. SPOFFORD, K.J. MUNIZ & A.M. BARRETT. Test Re-test Reliability of the Florida Action Recall Test-Revised (FAST-R).

Objective: Limb apraxia is disorder of learned skilled purposive movement, not attributable to elementary motor or sensory dysfunction. It may occur in between 28- 82% of people with disorders ranging from left hemisphere stroke to Parkinson's disease. Accurate assessment and treatment of this condition is important, as it adversely affects daily function. Unfortunately, an obstacle in assessing limb apraxia is a lack of available instruments with well developed psychometric parameters. The Gesture to Command subtest of the Florida Apraxia Battery (FAST-R; Rothi, et al. 1993) is commonly used to assess limb apraxia and consists of 30 gesture-to-command items. Subjects are asked to pantomime an action or the use of a tool (e.g. "show me how you salute"). Investigators using the FAST-R to analyze behavioral changes over time re-

quire established test-retest reliability in order to assess whether an observed change in performance exceeds that which may occur without underlying change in the skill being tested. We wished to obtain initial information on test-retest reliability for the FAST-R in aged healthy people, and people with probable Alzheimer Disease (pAD).

Participants and Methods : We administered the FAST-R to 33 aged adults (13 diagnosed with probable Alzheimer Disease, pAD, 20 healthy controls). Each individual was tested initially, and retested following a 6-to-8 week interval, absent any intervening treatments.

Results : Subjects with pAD performed poorly in comparison with controls (pAD, $M = 16.77$ of 30 items; Controls, $M = 23.08$; $F = (1,31) = 17.01, p = .000$). Test-retest reliability was established with a correlation coefficient of .85 ($p = .00$).

Conclusions : This confirmation of overall test-retest reliability of the FAST-R has implications for its use as a potential outcome measure in assessing people with neurodegenerative conditions, and in assessing the effects of potential treatments.

Correspondence: *Shpresa ahmeti, BA, Stroke Rehabilitation Research, Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: sahmeti@kmrrec.org*

D.B. EFROS, A. KNIGHT, C.A. MORELLI, A.L. HOLLINGSWORTH, C.W. GARVAN, L.J. GONZALEZ-ROTHI & K.M. HEILMAN. Assessment Methods for the Diagnosis of Ideomotor Limb Apraxia.

Objective: There are at least 2 methods of learning if a patient has ideomotor apraxia (IMA), determining if they make any type of spatial error (posture, movement, orientation) as assessed by the 'Florida Apraxia Screening Test-Revised' (FAST-R) or focusing on one critical element of the learned gesture, as determined by the 'Brief Apraxia Screening Test' (BAST). We compared novice clinicians' accuracy in detecting IMA when using these two methods before and after training.

Participants and Methods : Participants were UF graduate SLP students, with no prior training in IMA assessment. Twenty participants used the FAST-R method (Group A) and 19 the BAST method (Group B) to score a videotape of 24 correctly or incorrectly performed pantomimes. Participants next received training on IMA via a 60 minute lecture, and then re-scored the videotape.

Results : Group A had a pre-training mean correct score of 15.80 (SD = 3.17) and 21.90 (SD = 1.45) on post-training. Group B's scores were 19.05 (SD = 2.37) and 20.89 (SD = 1.76), respectively. On pre-training, Group B performed more accurately than Group A ($p < 0.05$). After training, however, these groups' accuracy did not significantly differ and both groups demonstrated statistically significant improvements in their judgments following training in identifying errors ($p < .05$).

Conclusions : For untrained clinicians, the BAST appears to be more accurate than the FAST-R, but for trained clinicians there are no differences. These findings provide support for the efficacy of training novice clinicians to recognize apraxic errors.

Correspondence: *David B. Efros, M.S., University of Florida, P.O. Box 14734, Gainesville, FL 32604-4734. E-mail: efros@ufl.edu*

Behavioral Neurology

A.J. ISOMURA, H. UTSUMI, A. HASEGAWA & Y. OHNO. Cognitive Impairments in Patients with Essential Tremor.

Objective: Essential Tremor (ET) was once considered as an isolated movement disorder. However, recent studies have reported that patients with ET experience not only disturbance in movement but also cognitive impairments. These studies have further indicated that frontal and subcortical system might be involved in ET pathology. The aim of this study was to investigate cognitive impairments among patients with ET in Japan.

Participants and Methods : 16 patients who were diagnosed with ET and 17 individuals without any neurological disorders (normal controls) were administered a comprehensive neuropsychological battery. These two groups did not differ in age, years of education, and scores of Mini Mental State Exam (MMSE). It was hypothesized that ET patients would exhibit greater impairments in some areas of cognition, especially executive function.

Results : These two groups significantly differ in their performance on Logical Memory I and II of the WMS-R and Digit Symbol of the WAIS-R. Further, there was a tendency for the ET group to perform poorer than the normal control group on the Trail Making Test: Part A and the Animal Naming Test.

Conclusions : In sum, the result reveals that Japanese patients with ET encounter cognitive declines. This particular study indicates that ET patients experience verbal memory, psychomotor speed, and executive dysfunction. The results may further suggest that pathology of ET involves in frontal-subcortical system. In addition, patients with ET experience mild cognitive deficits that are not sensitive to the MMSE. Cognitive declines ET patients experience are mild compared to other neurological disorders, thus it is important that these patients undergo a formal assessment of cognition. Directions of future studies are also discussed.

Correspondence: *Angelica J. Isomura, Ph.D., AIU/CSPP, Kyuei Bldg. 3-7-3, Higashi-azabu Minato-ku, Tokyo 106-0044, Japan. E-mail: angelica4932@hotmail.com*

T. ZANDI. Use of Neurobehavioral Measurements in Management of Behavioral Disturbances of Dementia Residents in Long Term Care.

Objective: Neuropsychiatric behavioral issues are frequent in patients with dementia. In up to 90% of affected individuals some form of psychosis occurs at some point in patients with Alzheimer's disease (AD) and other behavioral changes, such as agitation, aggression, and depression. These conditions are typically the prerequisite for occurrence of catastrophic behaviors. In this project a composite score of number of neurobehavioral instruments were used for predicting the potential behavioral problem of dementia residents of a local nursing home

Participants and Methods : 30 residents of a local nursing home ranging in age from 67-83 participated in this study. Two distinct and separate teams of investigators collected data for this study. The first group reviewed the residents charts and recorded independently the behavioral disturbances, falls and prescriptions that included antipsychotic medications. The second group administered the following instruments that together formulate 6 dimensions of the safety net: 1- Cognition, 2- Activity and Functioning, 3- Neurobehavioral Activities 4-Mood and Affect, 5- Delirium and, 6- Neuropsychiatry measured.

Results : The results of this study indicated that 1- there were a significant correlation between the composite score obtained and the behavioral disturbances reported within one month prior to assessment. 2- 92% of the residents with behavioral disturbances were on one or more antipsychotic medications regardless of their cognitive score. 3- Residents approaching behavioral problems were identified and non-medical interventions were implemented that defused their problems

Conclusions : Findings from this study suggested that behavioral disturbances might be prevented if the safety net database is obtained. The residents whose cognitive score did not predict their behavioral disturbances responded better to medication treatment than the dementia residents with fairly low score on mental status.

Correspondence: *Taher Zandi, Ph.D, Mood and Memory center, State University of New York- Plattsburgh, 101 broad street. ADAC, SUNY-Plattsburgh, Plattsburgh, NY 12901. E-mail: taher.zandi@plattsburgh.edu*

S. ANTANI, P. ESLINGER, G. MCCAWLEY, V. TROIANI, P. MOORE & M. GROSSMAN. Social Feature Knowledge in Non-Aphasic Frontotemporal Dementia.

Objective: Naturalistic observations emphasize a social disorder in Frontotemporal Dementia (FTD). This study investigated experimentally the role of executive resources during judgments of social scenarios in FTD patients with altered personality and impaired social conduct.

Participants and Methods : We assessed 12 FTD social-disorder patients (FTD-SOC) and 23 healthy age- and education-matched seniors (ELD-CTL). Patients judged the acceptability of social situations and scofflaws, such as “Going through a red light at 2am”, on a 5-point scale (1=Definitely-No through 5=Definitely-Yes) under either Rule instructions that depend on working memory and selective attention (“Should everyone do this all of the time?”) or Similarity instructions (“Is this generally ok?”). Core scenarios were biased negatively (e.g., “...when a policeman is at the intersection”) or positively (e.g., “...when rushing your child to the emergency room”).

Results : FTD-SOC found Negative-bias scenarios more acceptable than controls across both instruction conditions ($t(41)=1.7$; $p=0.09$). Moreover, ELD-CTL found Positive-bias stimuli significantly less acceptable under Rule-based instructions relative to the same scenarios under Similarity instructions ($t(21)=2.0$; $p<0.05$), but FTD-SOC were insensitive under Rule vs. Similarity instructions for Positive-bias scenarios ($t=1.27$; n.s.).

Conclusions : FTD-SOC were relatively less sensitive to negative social biases than ELD-CTL, signaling degraded knowledge of negative social features. This is consistent with insensitivity to negative valence associated with disease to the orbital frontal-anterior temporal/amygdala circuit. Furthermore, FTD-SOC patients also were insensitive to social Rules, suggesting social inflexibility due in part to limited working memory and selective attention.

Correspondence: *Shweta Antani, B.A., Neurology, University of Pennsylvania, 3400 Spruce Street, HUP - 3 West Gates, Philadelphia, PA 19104. E-mail: santani@mail.med.upenn.edu*

R.H. HAMILTON, J.T. SHENTON & H. COSLETT. A Case of an Acquired Deficit of Audiovisual Integration of Speech.

Objective: To characterize the first reported case of a patient (AWF) who has acquired a deficit of audiovisual speech integration.

Participants and Methods : Experiment 1: AWF and controls viewed an actor speaking words for which the visual and auditory components were offset by nine possible interstimulus intervals (ISIs) ranging from -400 milliseconds (sound 400 milliseconds before vision) to 400 ms. Subjects indicated which sensory modality occurred first. AWF performed 7 blocks consisting of 135 randomized trials (15 per ISI). Experiment 2: This experiment was identical to experiment 1 except that the stimuli displayed were video clips in which inanimate objects were used to produce sounds.

Results : Experiment 1: Separate regression analyses were conducted for ISIs ≤ 0 and ISIs ≥ 0 for AWF and controls. For ISIs ≥ 0 , the 95% confidence interval of the slope of AWF's performance (slope=4.93; 95% CI 3.21 to 6.65) was outside that of control subjects (slope=-3.66; 95% CI=-4.72 to -2.00), indicating a significant difference between AWF and controls in temporal order judgments for cases in which vision preceded sound. Experiment 2: Identical regression analyses revealed no significant differences in performance between AWF and controls.

Conclusions : AWF exhibits a language specific impairment in binding visual and auditory information. The implications of this finding will be discussed.

Correspondence: *Roy H. Hamilton, MD, MS, Neurology, University of Pennsylvania, 3 Gates Building, 3400 Spruce Street, Philadelphia, PA 19104. E-mail: royhhamilton@yahoo.com*

C.H. HALPERN, R. CLARK, M. WORK, S. ANTANI, G. MCCAWLEY, P. MOORE, J. GEE & M. GROSSMAN. Vanishing Small Numbers in Corticobasal Degeneration: Correlation with High-Resolution MRI.

Objective: Small and large numbers may be processed by distinct cognitive mechanisms. Subitization is rapid quantification of smaller arrays of objects (up to 4) with no change in reaction time (RT) as array size increases. Counting is serial incrementation of larger arrays (>4) with linear increases in RT as numerosity increases. We sought evidence for this distinction from corticobasal degeneration (CBD), which is associated with acalculia. We also examined neural correlates of this deficit with voxel-based morphometry (VBM).

Participants and Methods : We evaluated accuracy and RT for matching dot arrays and numerals involving smaller (2-4) and larger (5-9) cardinalities in CBD (n=16), frontotemporal dementia (FTD; n=23), Alzheimer's disease (AD; n=8), and age-matched controls (n=15). Performance was correlated with cortical atrophy using VBM analyses of high resolution structural MRI in 5 CBD patients.

Results : For smaller arrays, only CBD were less accurate than controls, FTD

and AD. They showed slower RTs judging smaller arrays that also progressively increased across the subitizing range. This impairment correlated with gray matter atrophy in parietal cortex. All patient groups were slowed judging larger arrays relative to controls, although CBD were the most impaired and demonstrated the slowest RTs across the counting range.

Conclusions : Only CBD were inaccurate for smaller arrays and required longer RTs as array size increased across the subitizing range, associated with parietal disease. This impairment pattern suggests limited subitizing in CBD and supports a neural distinction between smaller and larger numbers.

Correspondence: *Casey H. Halpern, BA, Neurology, University of Pennsylvania, 3 W Gates, Hospital of the University of Pennsylvania, Philadelphia, PA 19104. E-mail: chalpern@mail.med.upenn.edu*

B.H. LEE, S. SEO, E. KIM, K. CHOI, M. SUH, K. LEE & D. NA. The frequency of neglect dyslexia in acute hemispatial neglect patients with and without visual field defect: A stroke population study.

Objective: Neglect dyslexia refers to the reading deficit that patients omit or misread words on the left side of a page or beginning letters of single words. Our study involving a large sample of acute right hemisphere stroke was to investigate 1) the frequency of neglect dyslexia (ND), 2) whether ND correlates to other symptoms of hemispatial neglect, and 3) the effect of visual field defect (VFD) on ND.

Participants and Methods : We recruited 124 consecutive patients with acute right hemisphere stroke. Within 90 days poststroke, all patients underwent a neglect test battery including the ND test which consisted of 25 words with variable lengths. We considered ND present if the patient misread or omitted the left portion of the word in three or more of the 25 words.

Results : Of the 124 patient, 74 had left neglect and, after excluding 10 illiterate patients, 17/64 (26.6%) showed ND. The severity of left neglect was much greater in patients with ND than those without ND ($p<0.001$). Correlation between ND score and the total neglect score was moderate ($r=0.52$) whereas other neglect test scores correlated highly with the total score ($r=0.77-0.93$). Also, the correlation between ND and other neglect test scores were not high ($r=0.39-0.56$). Of the 17 ND patients, patients with VFD (7/17) had significantly greater ND scores than those without VFD (10/17) ($p=0.02$), although the two groups did not differ in age, sex, education, time after stroke, and the total neglect score.

Conclusions : These results suggest that 1) ND usually occurs only in patients with severe neglect, 2) ND has only weak correlations with other neglect tests and the total neglect score, 3) whereas VFD seldom influences the general neglect severity, it does affect ND, indicating that VFD is one of the strong modulators of ND.

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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*

P. BEHL, K. LANCTOT, D. STREINER & S. BLACK. Effects of Cholinesterase Inhibitors on Cognition and Function in AD: A Two Year Study Comparing Treated and Untreated Patients in the Sunnybrook Dementia Cohort.

Objective: To assess global and selective cognitive and functional treatment effects of Cholinesterase inhibitors over two years in a cohort matched to untreated controls in the same longitudinal observational study.

Participants and Methods : Patients (Untreated=40, Treated=40) meeting NINCDS-ADRDA criteria for mild or moderate probable AD seen at a university memory clinic underwent standardized neuropsychological and functional assessments at baseline and two year follow-up (Mean = 30.5 months). Groups were matched on education and baseline MMSE.

Results : There were no significant differences between the two groups in the prevalence of comorbid illnesses, concomitant medication use, and vascular risk factors. Separate repeated measures MANOVAs on the MMSE, Mattis Dementia Rating Scale (DRS) total score, as well as its 5 subscores, tests of memory (CVLT), language (Boston naming), visuospatial (Rey copy, Line Orientation) and executive functioning (FAS Fluency, Wisconsin CST), and activities of daily living (Disability Assessment for Dementia Scale) revealed significant group by time interactions ($p=0.02$; $p=0.041$; $p=0.037$) (Bonferroni corrected). Post-hoc comparisons showed significantly less decline in treated patients in MMSE, total DRS and conceptualization subscore, and CVLT acquisition score. Less decline was seen in instrumental and basic activities of daily living and overall scores of initiation and planning and organization but not performance.

Conclusions : Treated patients declined more slowly in global cognition, concept formation skills, list learning, and activities of daily living over two years, with large effect sizes (0.8-1.1). Results suggest that the most durable effects of cholinergic enhancement in AD over a longer period of time involve executive function abilities.

Correspondence: *Pearl Behl, PhD candidate, Cognitive Neurology, University of Toronto, 160 russell jarvis drive, markham, ON L3S 4E5, Canada. E-mail: pearl.behl@utoronto.ca*

Cognitive Intervention/Rehabilitation

K.M. YOUSE & C.A. COELHO. Treatment for Attentional Deficits and Conversational Discourse Following Closed-Head Injury.

Objective: Persisting deficits in conversational skills are a contributing factor to poor psychosocial adjustment and social isolation following closed-head injury (CHI). Therefore, conversational discourse may be more clinically relevant for the CHI population with regard to long-term outcomes than other genres of discourse. Effective communication skills require the integrity of a number of cognitive abilities that are frequently disrupted following CHI. Chronic cognitive deficits contribute to long-term dysfunction and have also been correlated with poor outcome in individuals with CHI. However, there is a paucity of empirical information regarding the role that underlying cognitive abilities may play in the conversational discourse deficits observed in individuals with CHI. Although treatment studies have suggested that training of specific skills does not generalize to functional tasks, no treatment study to date has utilized performance on a functional communicative task, such as conversational discourse, as an outcome measure. The present study in-

vestigated whether improvements in a specific cognitive ability, attention, would facilitate conversational discourse for individuals with CHI. It was hypothesized that attention training would provide the greater benefit by improving attention as well as conversational discourse while social skills training would improve only conversation.

Participants and Methods : A single subject multiple treatments comparison design was employed. Two individuals with CHI participated in two treatments, one attention-based and one social skills-based.

Results : Treatment effect sizes suggest that both treatments were active; however, participant performances were variable throughout the study reducing the magnitude of change observed.

Conclusions : Continued research regarding the treatment of cognitive deficits as a means to improve conversational discourse performance in individuals with CHI is needed. Implications for clinical practice and future research are discussed.

Correspondence: *Kathleen M. Youse, Ph.D., College of Health Sciences, University of Kentucky, Division of Communication Disorders, 900 South Limestone Street, Room 120-J, Lexington, KY 40536. E-mail: kathleen.youse@uky.edu*

D. WILKINSON, P. KO, R. MCCLINCHEY & W. MILBERG. Identification and Treatment of a Patient with Impaired Face Recognition but Relatively Intact Object Recognition.

Objective: We describe a set of studies that were first aimed at understanding the source of impairment in unilateral patient, R.C., who appears able to recognize objects but not faces, and were then aimed at testing the effectiveness of a new treatment designed for remediating hemispheric disorders of vision.

Participants and Methods : We first administered a face inversion task to test if R.C.'s deficit stems from a problem in apprehending configural information. Subsequent experiments then examined whether he is able to make fine-grained within-category decisions and apprehend visual curvature, both of which are sometimes disrupted in prosopagnosia.

In a second set of studies, we tried to remediate his face processing impairment by means of galvanic vestibular stimulation (GVS). We administered a two-alternative forced choice match-to-sample task in which the patient had to choose which of two faces matched a sample face presented directly above, while bipolar, transcutaneous current was applied to the left and right vestibular nerves at a level below the patient's sensory threshold.

Results : We found that the patient suffers from a selective perceptual problem that disrupts his ability to combine the individual parts of a face into a coherent whole, but leaves intact his ability to integrate parts within objects. We were also able to show that after two brief sessions of GVS, his perceptual face matching performance improved beyond the chance-level observed pre-stimulation.

Conclusions : Together these data provide preliminary evidence that (1) a deficit in configural processing is sufficient to induce a recognition deficit that is greater for faces than objects, and (2) this deficit can be reduced by GVS which raises the intriguing possibility that other unilateral visual disorders may also respond in such a manner.

Correspondence: *David Wilkinson, Psychiatry, Harvard Medical School, GRECC (1S2 JP), 150 S. Huntington Ave., VA Boston Healthcare System, Boston, MA 02130. E-mail: david_wilkinson@hms.harvard.edu*

P. KLONOFF, S. HENDERSON, L.K. DAWSON, J. VORIES WETHE, J. GEHRELS & L.M. WATT. Psychosocial Outcomes One-to-Seven Years After Comprehensive Milieu-Oriented Neurorehabilitation: The Role of Pre-Injury Status.

Objective: This study describes the post-rehabilitation status of 93 brain-injured patients completing a milieu-oriented neurorehabilitation program, evaluating multiple psychosocial domains one-to-seven years post-discharge.

Participants and Methods : The mean age of the sample was 36.9 years, with over 14 years of education. Almost two-thirds were male. Slightly more than half of the participants sustained traumatic brain injuries. Cerebrovascular accidents, brain tumor resection, encephalitis, anoxia and surgery for seizure disorder comprised the other participants. The majority of patients had moderate to severe brain injuries. Pre-injury and post-injury data were collected from patients on: work, income, financial support, driving, marital status, living situation and litigation status. Pre-injury baseline data and their impact on post-injury outcome were examined.

Results : Of the study participants, 74.3% were involved in paid work and/or school, with 86% productive in some capacity at follow-up. Post-injury income decreased substantially compared with pre-injury levels. Pre-injury living status did not differ significantly from post-injury, with 81.1% remaining in a stable relationship or engaged in one at follow-up. Pre-injury driving status related significantly to post-injury driving accident rates, with 73.1% driving at follow-up.

Conclusions : Predictors of return to driving included education and ability to work. Age, education and post-injury driving status related to work status.

Correspondence: *Pamela Klonoff, Ph.D., Center for Transitional NeuroRehabilitation, St. Joseph's Hospital and Medical Center/Barrow Neurological Institute, 222 W. Thomas St, Suite 401, Phoenix, AZ 85013. E-mail: Pamela.Klonoff@chw.edu*

N. BELFOR, J.H. KRAMER, B. REED, D. BARNES, K. YAFFE, L. QUITANIA, S. GLENN, C. DECARLI & B.L. MILLER. A Novel Computerized Cognitive Rehabilitation Training Program Improves Learning and Attention in Patients with Mild Cognitive Impairment (MCI).

Objective: MCI often is a transition between normal aging and dementia, with ~15% of MCI patients converting to Alzheimer's Disease annually. This study reports initial results from a pilot randomized controlled study of patients with MCI in which the treatment group used a novel computerized cognitive rehabilitation program, designed to exercise auditory and language systems to increase accuracy of speech representation, improve signal-to-noise ratios, and train neuromodulatory systems involved in learning and memory.

Participants and Methods : Twenty MCI patients were randomly assigned to treatment or control groups (N=10/10). Both groups trained in home at the computer for 100 minutes/day 5 days/week 4-7 weeks. Treatment group used the program while control group read on-line news and played games. Neuropsychological assessment was administered pre and post intervention. We predicted that the change in scores from post to pre intervention assessment would be greater in the treatment group than in the control group on verbal learning, memory, and attention, but not on expressive language, visuospatial or executive functioning tasks.

Results : Change scores in treatment group were significantly higher than in control group on verbal learning (CVLT-II learning slope $p < 0.03$) and attention (Spatial Span $p < 0.04$). No significant difference in change scores between the groups was found on expressive language (BNT and verbal fluency), visuospatial functioning (RBANS Figure Copy, DKEFs Design Fluency), or executive functioning (DKEFs Trails). Surprisingly, no significant difference in change scores was seen on a memory task (CVLT-II delayed recall).

Conclusions : After 4-7 weeks of intervention treatment group showed improvement on learning and attention tasks, while control group did not, suggesting generalization of training-induced improvements, as the assessment is unrelated to the training exercises. This cognitive rehabilitation program may be useful for the treatment of MCI. Results need to be replicated with larger trial.

Correspondence: *Nataliya Belfor, Ph.D., Psychiatry, University of California San Francisco, 334 Shotwell Street, San Francisco, CA 94110. E-mail: nbelfor@memory.ucsf.edu*

J. BERNABEU, C. GRAU, C. FOURNIER, S. AGUILAR, A. CANYETE, F. MENOR, G. ALMERICH, J. SUAREZ & V. CASTEL. Neuropsychological Rehabilitation in Pediatric Oncology: comparison of neuropsychological profiles after intervention.

Objective: We present the case of an adolescent diagnosed in 2001 with a Non-Hodgkin Burkitt's lymphoma when she was 14 (stage 4, CNS affected). Treatment included systemic and intrathecal chemotherapy and holocranial radiotherapy (24Gy). Imaging studies revealed signal changes in frontal white matter related with therapeutics.

Participants and Methods : The patient was assessed with our neuropsychological assessment protocol composed of multiple cognitive functioning as well as a psychopathological evaluation. In September 2003 she presented a generalized cognitive deterioration.

Rehabilitation was based on her neuropsychological profile, age, expectations and interests of the patient. Specific intervention in academic abilities was decided because of her delay with peers. The intervention has been carried out for 10 months, 2 hours/week and included: techniques and studying habits, academic abilities training (arithmetic, reading comprehension and writing), attention and memory exercises.

Results : Results of 2004 neuropsychological assessment revealed significant changes, between 1 and 2 standard deviations, in the intervention areas. Moreover we obtained 12 to 19 points improvement in IQ.

Conclusions : Rehabilitation in pediatric oncology implies long-term support for our patients. Besides of improving environmental resources (school, family, social services...), we want to develop individualized interventions that allows us to palliate/compensate cancer and treatment sequelae. These first results offer significant and quantitative improvements in the intervention areas and are the first to point out the validity of our work.

Correspondence: *Jordi Bernabeu, Master, Hospital La Fe, Pediatric Oncology Unit, Argda. Blasco Ibañez, 30, Valencia 46010, Spain. E-mail: bernabeu_jor@gva.es*

M. PERDICES, R.L. TATE, S. MCDONALD, L. TOGHER, R. SCHULTZ, K. WINDERS, S. SAVAGE & A. MOSELEY. The Evidence Base Of Neuropsychological Rehabilitation: How Good Is The Research?

Objective: PsycBITE™ is a new web-based resource (www.psycbite.com) indexing published studies from a range of medical and allied health disciplines, that provide empirical evidence of the effectiveness of non-pharmacological rehabilitation interventions for the psychological consequences of acquired brain impairment. The aim of this study is to examine the methodological quality of randomised controlled trials (RCTs) and non-RCTs indexed in PsycBITE™, focusing on five types of intervention: attention therapy, communication therapy, executive therapy, memory therapy and other-cognitive rehabilitation. RCTs and non-RCTs were examined because they are methodological designs that can potentially offer high evidence levels.

Participants and Methods : Studies meeting selection criteria were extracted from 7 generic databases (eg. Medline). They were indexed using 73 terms in 5 domains (problem area, intervention type, neurological group, age group and research design), and rated for methodological quality using the 10-point PEDro Scale.

Results : By August 2005, 1,207 empirical studies were indexed. 398 (33%) were RCTs or non-RCTs, of which 46% were rated for methodological quality. The majority were memory therapies (32%), other-cognitive rehabilitation (28%) and communication therapies (23%). Trials for executive therapies (10%) and attention therapies (7%) were underrepresented. Mean ratings for RCTs were higher than for non-RCTs across all interventions. Mean ratings ranged from 3.3/10 for executive therapies to 3.8/10 for communication therapies.

Conclusions : These results indicate that some types of rehabilitation interventions are relatively under researched. Moreover, the methodological quality of published trials using designs that can, potentially, provide strong levels of evidence for the efficacy of neuropsychological rehabilitation remains modest.

Correspondence: *Michael Perdices, Neurology, Royal North Shore Hospital, Royal North Shore Hospital, St Leonards, NSW 2065, Australia. E-mail: psycbite@med.usyd.edu.au*

P.L. EBERT & H.A. TUOKKO. Multi-faceted Approach to Memory Enhancement in Older Adults.

Objective: Research suggests that simply providing memory compensation strategies may not be enough for successful adaptation and generalization to everyday life (e.g., Stigsdotter Neely, 2000). An alternate approach is to use multi-faceted memory programs that also promote meta-cognitive well-being (e.g., memory efficacy) and a memory-healthy lifestyle. The effectiveness of a multi-faceted memory enhancement program in improving subjective and objective memory functioning in older adults was examined in this study.

Participants and Methods : Thirty-nine adults over 60 years completed a five-session memory enhancement program that included instruction in compensatory strategies, combating negative stereotypes, and memory-healthy lifestyle. Pre- and post-intervention, participants completed the Multifactorial Memory Questionnaire (MMQ; subjective measures; Troyer, 2002) and four everyday memory tasks (e.g., recall of a grocery list, face and name recall, story detail recognition, and strategy application; objective measures). The MMQ was also completed at three-month follow-up. Eighteen waitlist controls completed these measures in the same timeframe as program participants.

Results : Program participants and controls did not differ with regard to age, education, or gender. Program participants demonstrated improvement in both subjective and objective memory functioning. A significant group-by-time interaction for Memory Satisfaction (MMQ sub-scale; $F_{(1,38)}=7.1, p=0.011, \eta^2=0.16$) was observed as was a trend toward a significant interaction for Memory Mistakes (MMQ sub-scale; $F_{(1,38)}=3.4, p=0.070, \eta^2=0.08$). These findings were still present at three-month follow-up. There was also a significant interaction for the total score on all four memory tasks ($F_{(1,39)}=5.1, p=0.029, \eta^2=0.12$).

Conclusions : These findings support the use of multi-faceted programs to enhance both subjective and objective memory functioning in older adults.

Correspondence: *Patricia L. Ebert, M.Sc., Kлару, Baycrest Centre for Geriatric Care, 7 Grackle Trail, Scarborough, ON M1X 2A4, Canada. E-mail: pebert@klaru-baycrest.on.ca*

J.A. MINOW, J.S. DAMON, J.S. ZIMMAN, N.M. JOYCE, R.A. WOOD, B.B. CONNOR, J. APPELMAN, K.N. SCHILLING, H.M. MAHNCKE & M.M. MERZENICH. Use It or Lose It: Can Active Older Adults Benefit from a Novel Brain-Plasticity-Based Computer Training Program?

Objective: The standard of care for maintaining healthy cognition is to remain cognitively active. We have developed a novel brain-plasticity-based training program that has been shown to enhance cognitive function in healthy older individuals in several pilot studies. However, it has been unclear whether older adults that already engage in substantial numbers of cognitively activities can benefit as much as less active individuals from this form of training. The current report addresses this question by comparing cognitive enhancement in participants that engage in differing numbers of cognitively activities.

Participants and Methods : Forty-two older adults (mean age=79; range=63-92) trained for 60 minutes per day, five days per week, totaling approximately 40 hours. Cognitive functioning was assessed pre- and post-training using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Activity level was determined by participant self-report of involvement in nine cognitively stimulating activities (0-9). Participants were grouped as low or high activity based upon a median split.

Results : We found 1) significant improvement post-training on RBANS Total Score for both groups (high activity: $p<0.01$, mean standard score

difference=+5.7; low activity: $p<0.01$, mean standard score difference=+6.2); 2) a significant between-group difference on the Delayed Memory Index change scores, with low activity participants showing greater improvement, ($p<0.05$); and 3) significant differences between the two groups at baseline with the low activity group demonstrating poorer attention as measured by the RBANS Attention Index Score ($p<0.05$).

Conclusions : Active and inactive older adults show cognitive differences at baseline in attention. Both groups, however, showed significant cognitive gains as a result of brain-plasticity-based computer training. Correspondence: *Bonnie B. Connor, PhD, Research & Outcomes, Posit Science, 114 Sansome Street, San Francisco, CA 94104. E-mail: bonnie.connor@positscience.com*

Dementia Alzheimer's Disease

S. PEKKALA. Impaired Repetition of Pseudowords and Words of Foreign Origin as an Indication of Phonological Difficulties in Mild Alzheimer's Disease.

Objective: This case study demonstrates that phonological processing can be impaired in mild Alzheimer's disease (AD), a finding in contrast to the notion that phonology is preserved until late in the course of the disease.

Participants and Methods : A series of language production tasks requiring different types of repetition and naming was conducted with a 76-year-old Finnish-speaking man with mild AD (MMSE = 26) over four testing sessions within nine months.

Results : The results indicated that the subject performed very well when repetition of real words and sentences was required. However, the repetition of 3 - 4 syllable pseudowords (40 - 50 % correct) and inflected words of foreign origin (9 - 46 % correct) was impaired and demonstrated some fluctuation over the testing sessions. The subject tended to substitute the pseudowords with existing lexemes and to simplify the phonological form of the words with foreign origin. His phonological difficulties appeared in the form of additional and missing phonemes and syllables, distortions and dislocations of phonemes and syllables, and incorrect inflectional forms. In the confrontation naming tasks and the fluency tasks, the subject produced a number of semantic errors (e.g., substitutions and circumlocutions) but only a few phonological errors (e.g., paraphasias).

Conclusions : The study indicated that in mild AD, the difficulties in phonological processing tend not to affect the production of real words but the phoneme assembly of pseudowords and more complex words.

Correspondence: *Seija Pekkala, PhD, Department of Speech Sciences, University of Helsinki, P. O. Box 9, Siltavuorenpenger 20 A, University of Helsinki 00014, Finland. E-mail: seija.pekkala@helsinki.fi*

Hemispheric Asymmetry/Laterality/Callosal Studies

V.M. MILLER & C. SHEARS. Emotion vs. Language Processing Across the Hemispheres: Apathy as an Emotional and Semantic Construct.

Objective: We explored processing of emotional (GLOOMY/SAD) vs semantic (DEPART/LEAVE) word pairs across the left (LH) and right (RH) cerebral hemispheres. Neuropsychological data have suggested that focal RH vs LH injury may differentially impair language processes (Beeman & Chiarello, 1998). Based on previous findings (Chiarello, et al., 2001) we expected a RH processing advantage for emotion word pairs and a LH advantage for semantic word pairs.

Participants and Methods : Emotion and semantic word pairs had equal imageability, length and frequency. Regression analysis included

left hemisphere injured, vs right hemisphere injured vs closed head injured participants, $N=25$ who performed a computerized divided-visual-field priming task. Participants judged whether centrally presented prime words were related vs unrelated to a lateralized target word by key-press response.

Results : Analysis by logistic regression demonstrated that all participant variables contributed to the variance of accuracy, regardless of manipulated variable, (visual field, relatedness or word type). Given unequal groups, we found reaction time for survivors of BI, was faster for semantic words than emotion words. Accuracy results indicate that, VF, condition, and type of word, was significant.

Conclusions : While only word type contributed to the model for RT, processing of emotion words appears to be slower regardless of type of injury. Consistent with priming research, a typical LH advantage was found for accuracy for both semantic and emotion related words pairs. Regardless of type or location of injury, results suggest reaction time to be slower when faced with processing emotion related words.

Correspondence: *Vanessa M. Miller, MA, Psychology, University of California, Riverside, 13711 Pecan Place, Moreno Valley, CA 92553. E-mail: vmill002@student.ucr.edu*

K. BRODEUR, M. DANIEL & K. BROCKWOOD. Investigating the Clinical Utility of Logical Memory and Visual Reproduction in Differentiating Lesion Laterality.

Objective: An important aspect of many neuropsychological assessments is the identification of lateralized brain dysfunction. Research has shown that tests of verbal and nonverbal memory are sensitive to left and right hemisphere damage, respectively. This study examines whether scores on the Logical Memory (LM) and Visual Reproduction (VR) subtests of the Wechsler Memory Scale-III (WMS-III) reliably differentiate between subjects with left versus right hemisphere lesions in a clinical population with known lesion laterality.

Participants and Methods : This is an archival study of adult, mostly geriatric stroke patients. Neuropsychological data were collected on 550 patients and transferred to a database. The sample selection criteria included (1) The presence of a unilateral brain lesion, (2) No history of psychiatric or neurological disorder, and (3) No diagnosis of aphasia that interfered with test administration. The sample consisted of a right hemisphere damaged group ($n = 36$) and a left hemisphere damaged group ($n = 26$).

Results : An independent-samples t -test was run to determine if there were significant differences between groups on LM and VR. Group means were in the expected direction but failed to reach statistical significance at the $p < .05$ level.

Conclusions : Results indicate that LM and VR were not differentially sensitive to lesion laterality in this sample. These tests do not appear to have the requisite sensitivity and clinical utility for determining lesion location. However, the lack of a significant difference between groups may be attributable to other characteristics of the sample such as advanced age or pattern of intrahemispheric brain damage.

Correspondence: *Kimberly Brodeur, MS, Professional Psychology, Pacific University, 1511 SW Park Ave, Apt #1105, Portland, OR 97201. E-mail: ckbrodeur@hotmail.com*

C. TECHENTIN, D. VOYER, D.V. MACLEAN & J.D. INGRAM. Word Frequency Effects in the Fused Dichotic Words Task.

Objective: The present study examined the influence of word frequency on laterality effects in the fused dichotic words task (FDWT) developed by Wexler and Halwes (1983).

Participants and Methods : Considering that four words are used as response choices on the FDWT, these words were ranked in terms of their frequency of occurrence on each trial. Twenty one right-handed men and women completed a standard administration of the FDWT. The frequency rank (from one to four) and ear of presentation for the selected response was recorded on each trial.

Results : Results revealed a significant effect of frequency such that the percentage of correct responses generally increased with frequency rank. Although a large overall right ear advantage (REA) was obtained, a significant frequency by ear of presentation interaction indicated that the magnitude of the REA increased with frequency.

Conclusions : These findings suggest that the choice of words used in a dichotic tasks affect the magnitude of laterality effects. Their implications for the role of word frequency in laterality are also discussed.

Correspondence: *Cheryl Techentin, B. Sc., Psychology, University of New Brunswick, Bag Service #45444, Fredericton, NB E3B 6E4, Canada. E-mail: Cheryl.Techentin@unb.ca*

J.G. FINE, M. SEMRUD-CLIKEMAN, T.Z. KEITH, L. STAPLETON & G. HYND. Some Lessons Learned from Comparing MRI Area and Volume Measurements of the Corpus Callosum.

Objective: First, to determine whether area of the corpus callosum at the midsagittal slice is an adequate estimate of corpus callosum volume. Second, to test the expectation that any neuron passing through the midsagittal plane will be present in both the left and right hemispheres of the corpus callosum. Finally, some problems encountered in volumetric measurements.

Participants and Methods : - Sixty-eight subjects nested in 24 families.

- Ages ranging from 6 to 49 years.

- 1.5T structural MRI GE scans.

- Area vs. Volume: Pearson correlation between voxel counts for area and volume adjusted for attenuation using the reliability estimates calculated for the volume/area measurements.

- Right vs. Left: Mixed Repeated Measures ANCOVA, whole-brain volume, gender, age, and IQ controlled.

Results : Area vs. Volume: Correlation of area to volume was .877, $p=.01$.

Right vs. Left: $F=.077$, $p=.783$. No differences in right/left within subjects. Problems encountered: It was possible to measure the volume of the corpus callosum reliably from subject-to-subject during a study of dyslexic readers within families. However, accumulated error over approximately 20 sagittal slices per subject obscured differences in the corpus callosum between family members that were found to be strong when only the area in midsagittal slice was used.

Conclusions : Area is an adequate approximation of volume of the corpus callosum. It is likely that neurons passing through the midsagittal plane are present in both hemispheres and of consistent diameter. It is recommended that the area of the midsagittal slice of the corpus callosum be used in research, with other variables such as whole-brain volume, gender, age, and IQ controlled.

Correspondence: *Jodene G. Fine, M.S., University of Texas at Austin, 613 Rocky River Road, Austin, TX 78746. E-mail: jodene.fine@mail.utexas.edu*

J. LEE & L. BUCHANAN. Age Differences in Hemispheric Asymmetry: An Investigation of Memory Using Dichotic Listening, Tactile, and Visual Hemi-Field Tests.

Objective: We investigated age differences in hemispheric asymmetry by using lateralization tasks in different sensory modalities in order to examine current theories of aging and hemispheric asymmetry. To our knowledge, this is the first study to examine age differences using direct contrast of lateralization of memory in auditory, visual, and tactile modalities.

Participants and Methods : Participants included 45 young and 16 older right-handed adults. In the auditory domain, participants were dichotomically presented with two different word lists simultaneously and asked to pay attention to and memorize only the list presented to one ear. Then, an immediate and a delayed recognition tests were given. The test was repeated with the other ear using new word lists. In the visual

domain, participants were asked to memorize the visual stimuli that were presented either to their left or right visual field. Then, an immediate and a delayed recognition tests were given. In the tactile domain, participants were instructed to feel and memorize textures that were presented to one hand only. 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 : Results showed more lateralization in the older group compared to the younger group on the immediate dichotic listening condition but no difference was found on the delayed condition. There was no difference between the two groups on the visual task. On the tactile task, there was no difference on the immediate condition whereas on the delayed condition a difference was noted.

Conclusions : The present findings partially support the current theories of aging and hemispheric asymmetry.

Correspondence: *Jin Lee, Psychology, University of Windsor, 91 High St. #1S, London, ON N6C4J5, Canada. E-mail: lee12c@uwindsor.ca*

N.R. HORNE, M.W. BONDI & D.C. DELIS. Increased Prevalence of D-KEFS Cognitive Asymmetries in the Very-Old.

Objective: Recent studies have demonstrated that asymmetric cognitive profiles may be more prevalent among individuals at-risk for developing Alzheimer's disease. The Delis-Kaplan Executive Function System (D-KEFS) contains several measures that may elicit lateralized functioning. This study aimed to (1) determine the normative base rates of asymmetric cognitive profiles within the D-KEFS across different age ranges in older adults and (2) examine whether there is an increased prevalence of asymmetric cognitive profiles in the Very-Old (age 80-89). **Participants and Methods :** Older adults of the D-KEFS normative sample (N = 345, ages 60-89) were examined to ascertain normal base rates of asymmetric cognitive profiles within three age groups (60-69, 70-79, and 80-89). Using age-corrected scaled scores to create difference scores for measures of verbal and visuospatial ability, difference scores were defined as asymmetric if they exceeded one standard deviation.

Results : Omnibus chi square analyses showed significant differences across age groups in the frequency of asymmetric cognitive profiles for Verbal Fluency versus Design Fluency ($p = .03$), Card Sorting Test verbal sorts versus perceptual sorts ($p = .02$), and a composite difference score ($p = .04$), with the prevalence of asymmetry generally increasing with age. Follow-up pairwise analyses revealed the greatest differences when comparing the 60-69 and 80-89 age groups, suggesting that the frequency of asymmetric cognitive profiles increases with advancing age.

Conclusions : There appears to be an increased prevalence of asymmetric cognitive profiles in the Very-Old. Knowledge of normative base rates of asymmetric cognitive profiles will facilitate further investigations of early detection of Alzheimer's disease in the Very-Old.

Correspondence: *Nikki R. Horne, BA, Psychology, SDSU/UCSD Joint Doctoral Program in Clinical Psychology, 3350 La Jolla Village Drive, Bondi Lab 116B, San Diego, CA 92161. E-mail: nhorne@ucsd.edu*

R.E. PROPPER, J. PIERCE, N. BELLARADO, M. GEISLER & S. CHRISTMAN. Frontal EEG Gamma Frequency Coherence Decreases Following Bilateral Visual Stimulation.

Objective: Behaviorally inferred interhemispheric interaction is associated with superior episodic memory on real-world and laboratory-based tests (e.g.: Christman, Garvey, Propper, & Phaneuf, 2003). Christman et al. hypothesized that they manipulated interhemispheric interaction by having participants view either centrally presented or alternating left-right visual stimulation (bilateral stimulation). Bilateral, compared to central, stimulation was associated with superior episodic memory. Here, we directly examine the hypothesis that the bilateral stimulation used by Christman et al. is associated with increased hemispheric communication, using EEG measures of interhemispheric interaction.

Participants and Methods : 18, right-handed, undergraduates (11 women and 7 men) participated. EEG was recorded from Fp1 and Fp2, referenced to mastoids. 30 seconds eyes closed and 30 seconds eyes open preceded (baseline) and followed (recovery) randomly assigned viewing of 30 seconds central, color changing ($n=8$) or left-right alternating ($n=10$) dot stimuli (see Christman et al., 2003).

Results : EEG coherence between Fp1 and Fp2 was calculated for alpha, delta, and gamma frequencies. Coherence during 1 second artifact free epochs was analyzed using a 2 (pre versus post stimuli) x 2 (central versus bilateral stimuli) mixed ANOVA. An interaction, $F(1,16)=6.42$, $p<.05$ in the gamma frequency during eyes open revealed decreased EEG coherence following bilateral ($M=.68$, $SD=.08$), relative to central ($M=.74$, $SD=.04$), stimulation.

Conclusions : Contrary to expectation, bilateral stimulation was associated with decreased interhemispheric interaction. Given previous findings of increased parietal and occipital gamma coherence following visual stimuli extending across the midline (Knyazeva et al., 1999), a decrease in frontal EEG coherence here supports suggestions of top-down regulatory processes during visual processing.

Correspondence: *Ruth E. Propper, Ph.D., Psychology, Merrimack College, 315 Turnpike Street, North Andover, MA 01845. E-mail: ruth.propper@merrimack.edu*

K.O. MUELLER, S.D. MARION, L.K. PAUL & W.S. BROWN. Bimanual Motor Coordination in Individuals with Partial and Complete Callosal Agenesis.

Objective: Previous studies indicated that individuals with complete agenesis of the corpus callosum (ACC) have deficits on tasks requiring coordinated movements of the hands. The computerized Bimanual Coordination Test (cBCT) requires participants to guide a cursor through pathways at various angles — right hand controlling vertical cursor movement, and left hand, horizontal. Individuals with complete ACC have difficulty on the cBCT, particularly for angles requiring parallel hand movements (i.e., both hands moving in the opposite directions with respect to the midline of the body). This study compared performance of individuals with partial and complete ACC.

Participants and Methods : cBCT performance time was compared for 3 groups: ACC (pACC, $N=5$), complete ACC (cACC, $N=12$), and normal controls ($N=25$).

Results : Generally, performance of individuals with pACC was between that of the cACC and control groups. A group-by-angle ANOVA (angles requiring equal vs. unequal hand response speed) revealed no significant interactions or main effect of group between controls and pACC. In contrast, a similar ANOVA comparing cACC to pACC resulted in a significant interaction between group and angle-type ($p<.05$). Individuals with pACC performed similarly to cACC on asymmetric angles, but displayed more normal performance on symmetric angles. Comparing performance on angles requiring parallel versus mirrored hand responses revealed no significant main effect or interactions between cACC and pACC, nor between pACC and controls.

Conclusions : Overall, these results suggest that bimanual coordination in ACC is improved by the partial presence of callosal fibers (pACC). This pattern was particularly marked for responding using coordinated hand movements of equal speed.

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*

S. CHRISTMAN, A. GEERS, K. KOSBAB & P. WEILAND. Placebos and Belief Updating: Strong Right-handers Do Not Show Placebo Effects.

Objective: A growing body of work indicates that persons with mixed hand preference have lower thresholds for the updating of beliefs

than persons with stronger degrees of unilateral hand preference. This is hypothesized to arise from the presence of greater inter-hemispheric interaction in mixed-handers, allowing right hemisphere-based belief updating mechanisms to operate more effectively on left hemisphere-based belief maintenance mechanisms. The current study sought to determine whether this pattern of effects extended to placebo effects, since the basis of placebo effects involves updating one's beliefs based solely on the expectation of placebo-induced changes.

Participants and Methods : Participants (35 mixed-handers and 34 strong right-handers) engaged in simple visual reaction time tasks. Before engaging in these tasks, half of the participants were given a placebo that they were told contained 250 mg of caffeine. Blood pressure and self-reported anxiety levels were recorded at the beginning and end of the experiment; changes in these measures served as the dependent variables.

Results : There were no effects of handedness or placebo condition for the blood pressure variable. A significant handedness X placebo condition interaction ($p=.017$) was obtained, however, for the self-reported anxiety measure. Strong right-handers reported equivalent small increases in anxiety in both the placebo and non-placebo conditions. In contrast, mixed-handers yielded a robust placebo effect, showing a large increase in self-reported anxiety in the placebo condition and a small decrease in anxiety in the non-placebo control condition.

Conclusions : Thus, the placebo effect in the current study was driven almost exclusively by mixed-handers, with strong right-handers displaying virtually no placebo effect.

Correspondence: *Stephen Christman, Ph.D., Psychology, University of Toledo, 2801 W. Bancroft, Toledo, OH 43606. E-mail: stephen.christman@utoledo.edu*

C. ROSA, P. BELIN, J.P. KEENAN & M. LASSONDE. Self-Voice Recognition: Greater Implication of the Right Hemisphere in a Commissurotomy Patient.

Objective: A recent and much debated question in the field of consciousness research is the hemispheric specialization of self-recognition. The majority of recent studies have suggested a greater implication of the right hemisphere in self-related processing in general (Craig et al., 1999; Fink et al., 1996) and in self-face processing in particular (Keenan et al., 1999; Keenan, Freund, Hamilton, Ganis & Pascual-Leone, 2000). Here we investigated functional asymmetries related to self-recognition in the domain of voices (which can be viewed as "auditory faces") in a commissurotomy patient. A right hemisphere advantage for the recognition of self-voice was expected.

Participants and Methods : In Experiment 1, the patient M.L. (complete callosotomy, left-handed, left-hemisphere language) was asked to identify one of three binaurally presented voices (self, familiar or unknown) by responding either with the right or the left hand. In Experiment 2, the patient was monaurally presented with auditory morphs between self-voice and a familiar voice and was instructed to identify the speaker either with the left or the right hand.

Results : Results of the first experiment show that the left hand (right hemisphere) responded better and faster only for the self voice with normal presentation of the stimuli. A better identification of the self-voice with the left hand (right hemisphere) was found once more in the second experiment. Moreover, only the left hand differentiated between the self and the familiar voice in terms of speed of response.

Conclusions : The present results support the hypothesis of greater involvement of the right hemisphere in self-voice processing.

Correspondence: *Christine Rosa, B.Sc., Neuropsychology, University of Montreal, 6705A, Boyer, Montreal, QC H2S 2J6, Canada. E-mail: christine.rosa@umontreal.ca*

M. ONO, W.S. BROWN, L.K. PAUL, S.H. SYMINGTON & R.S. KERN. Theory of Mind in Individuals with Schizophrenia and Agenesis of the Corpus Callosum.

Objective: The ability to represent the mental states of other persons is referred to as Theory of Mind (ToM). Past research has shown that individuals with paranoid schizophrenia have impairments in ToM. Individuals with agenesis of the corpus callosum (ACC) and normal IQs also have been found to have deficits on more complex forms of ToM tasks (Symington et al., 2004). It has been speculated that deficits in ToM among individuals with schizophrenia are related to unusual ideation, while deficits in ACC may be related to disturbances in complex novel problem solving ability and psychosocial skill development.

Participants and Methods : IQ-matched individuals with agenesis of the corpus callosum (ACC, $n=12$), schizophrenia (SC, $n=16$), and normal controls (NC, $n=13$) were compared on 3 ToM measures: The Adult Faux Pas Test, Happe Theory of Mind Stories, and The Awareness of Social Inference Test (TASIT).

Results : On each ToM measure, the ACC group scored worse than the NC group, but better than the SC group. The SC group scored significantly worse than the NC group on all three measures of ToM. However, the ACC group was significantly different from the NC group only on the more difficult subtest of the TASIT.

Conclusions : These findings suggest that schizophrenia is associated with more severe deficits on most all ToM tasks, whereas ACC is associated with less severe levels of impairment, primarily involving highly complex ToM tasks.

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*

M.W. BRIDGMAN, W.S. BROWN, R. ADOLPHS, M.L. SPEZIO & L.K. PAUL. Facial Emotion Recognition in Primary Agenesis of the Corpus Callosum.

Objective: To date, psychosocial deficits in Agenesis of the Corpus Callosum (ACC) have been documented in non-literal language comprehension, humor, theory of mind, and social reasoning. This project presents pilot data examining facial emotion recognition and facial scanning in individuals with ACC.

Participants and Methods : Ekman emotional faces were presented for 1 second to 3 individuals with Primary ACC (IQs > 80) and 3 matched controls. They were assessed for accuracy of emotion naming. Eye-motion data were gathered with the Eye-link II eye-tracking system and analyzed according to examiner-designated facial regions of interest (ROI), frequency of fixations, regions of fixations, and duration of fixations.

Results : Individuals with Primary ACC were less accurate than controls for naming all emotions, especially fear and anger. This performance impairment was mirrored in abnormal eye movements to the faces. Participants with ACC made fewer entries into, fixations within, and dwell time within ROIs for the right eye and the mouth. They also made fewer fixations over the face overall and exhibited longer fractional dwell time on the nose.

Conclusions : These results support the hypothesis that a deficit in the ability to correctly identify emotions from facial expressions contributes to overall psychosocial deficits in persons with ACC. In addition, reduced accuracy of identification appears to result from an abnormal pattern of facial scanning. Understanding the manner in which persons with ACC process facial expressions may lead to interventions improving this process, the accuracy of emotional identification, and psychosocial interactions in general.

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*

J. RAITER, D. WHITMAN, T. PARTRIDGE & V. ZUVERZA-CHAVARRIA. The Time Course of Semantic Priming: A Within Subjects Study.

Objective: This study examined individuals' performance across multiple SOAs (stimulus onset asynchrony) on a semantic priming task to determine whether individuals have similar patterns of activation in the right and left hemispheres of the brain over time. We also attempted to show reciprocal patterns of activation and inhibition between the hemispheres.

Participants and Methods : Ten individuals were administered a lexical decision task with lateralized prime-target pairs that were associated with a dominant or subordinate meaning, or unrelated. Six SOAs varying from 25 ms to 600 ms were used.

Results : Response time to dominant and subordinate words varied significantly with the visual field presentation of the prime and target. Reaction time for related words varied by visual field over SOAs, indicating that activation of the semantic network continues to fluctuate for 600 ms after the presentation of a word. Examination of the pattern of priming for individuals confirmed earlier evidence that there is a cyclic pattern to semantic activation over time.

Conclusions : This suggests that information is shuttled back and forth between hemispheres causing reciprocal activation and inhibition, lending support to our theory that the hemispheres function as a semantic "edge detector" analogous to the edge detectors in the visual cortex. Further analysis indicated that individuals tended to show this general pattern, although the large variances that are found with between subjects designs remained. We discuss what might contribute to the individual variance in semantic priming patterns.

Correspondence: *Jennifer Raiter, MA, Wayne State University, 1457 Victoria Ave, Windsor, ON NSX 1P2, Canada. E-mail: j.raiter@wayne.edu*

S.M. SPINA, L.K. PAUL & W.S. BROWN. MMPI Profiles in Agenesis of the Corpus Callosum.

Objective: Agenesis of the corpus callosum (ACC) is a brain disorder involving congenital absence of the corpus callosum. Many individuals with ACC have normal-range IQs and seem to be "asymptomatic". However, these individuals tend to have deficits in complex cognition often manifest in naive psychosocial functioning. They tend to offer meaningless or out-of-place comments in conversation, have difficulty understanding the subtle aspects of social context, and have difficulty comprehending second order meanings in language (e.g., in jokes, stories, and nonliteral expressions). In order to assess the implications of these deficits for self-appraisal of psychological status in ACC, MMPI scores were examined.

Participants and Methods : MMPI scores were examined in 11 individuals with complete ACC (ages 16-55). It was expected that the L scale would be significantly elevated relative to published norms and would be the highest score for all ACC subjects.

Results : As expected, there was a consistent and significant elevation of scores on the L scale ($M = 64.0 \pm 11.57$, $t = 4.014$, $p = .002$). The L-scale score was 65 or over in 5, and was the highest scale for 4, individuals with ACC. In addition, the F scale ($M = 61.27 \pm 14.67$, $t = 2.545$, $p = .029$) and scale 9 ($M = 61.27 \pm 3.42$, $t = 2.787$, $p = .019$) were significantly elevated. There were no significant differences on any other scale.

Conclusions : The results of this study supported findings of social naivete in people with ACC and raised concerns about the validity of self-report psychological measures when used with high-functioning individuals with ACC.

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*

J.E. DEJONG, C. CHIARELLO, L.K. PAUL & W.S. BROWN. Semantic Priming in Individuals with Callosal Agenesis.

Objective: Agenesis of the Corpus Callosum (ACC) results in deficits in the comprehension of higher-order language, such as non-literal ex-

pressions and humor. Individuals with ACC also have difficulty imagining solutions to novel problems, and less creative people have reduced subordinate priming in the right hemisphere (Atchley, et al., 1999). The present study employed lateralized dominant and subordinate semantic priming (at 750 msec SOA) in order to examine semantic networks in both hemispheres in individuals with ACC.

Participants and Methods : Eleven participants with ACC (ages 17-37, FSIQ 95.2 ± 8 , VIQ 93.4 ± 12) were compared to eighteen matched control participants (ages 18-51, FSIQ 100.1 ± 7 , VIQ 97.7 ± 8). A 4-way ANOVA of vocal reaction times to targets compared: (1) meaning dominance (dominant or subordinate); (2) prime-target relatedness (related or non-related); (3) visual field (LVF or RVF); and (4) group (ACC versus control).

Results : There were the expected main effects and interactions for meaning dominance, relatedness, and VF, although there was no evidence of subordinate priming in either visual field for either group. The only effect involving group was a significant interaction between visual field and group ($p < .05$) — individuals with ACC had longer vocal RTs to targets presented to the LVF/RH compare to the RVF/LH.

Conclusions : There were no differences between groups in semantic priming. However, individuals with ACC showed increased vocal reaction times in to LVF/RH stimuli, suggesting reduced access of LH vocal expressive systems to RH information. Lack of subordinate priming may reflect low levels of creativity in both groups.

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*

G.L. ANDREWS, D.H. BADARUDDIN, A. PORTER & K.J. SCHILMOELLER. Parental Behavioral Observations in Primary ACC: Comparisons to Children with Prenatal Alcohol Exposure and Autism.

The Child Behavioral Checklist (CBCL) and a questionnaire reflecting behavioral symptoms of autism were used to compare parent observations of the behavioral traits of high functioning children with Agenesis of the Corpus Callosum (ACC) and both normal (test norms) and autistic children. Children with ACC ages 2 to 5 were rated as significantly impaired on the Attention Problems scale on the CBCL. Children with ACC aged 6 to 11 were rated as significantly more impaired than the normative population on all 8 of the syndrome scales of the CBCL. In addition, children with ACC were more impaired than autistic children on Somatic Complaints, Social Problems, and Thought Problems scales. Children with ACC were also reported to have similar deficits to autistic children for questions reflecting the DSM diagnostic domains of social interaction and communication, but not in that of repetitive and restricted behaviors. Using a broader age range (2 to 28 years) of participants with ACC, comparisons of behavioral traits were made with an age equivalent group of participants with verified prenatal exposure to alcohol (PEA). Ratings on the CBCL or the Young Adult Behavior Checklist (YABC) indicated that participants with PEA were rated as significantly more impaired on all subscales of the CBCL or YABC than participants with ACC. Participants in this broader aged group with ACC were rated in the clinical range on Social Problems and Attention Problems. Thus, in both surveys individuals with ACC tended to be characterized by problems in attention and social functioning.

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*

G.L. ANDREWS & A. PORTER. The Effects of Caffeine on Response Time, Accuracy and P1: A Gender Difference.

Objective: The affects of caffeine on the performance of visual tasks was investigated. Higher doses of caffeine were expected to increase response time and P1 latency but decrease accuracy.

Participants and Methods : Participants (n=22) were randomly assigned to groups and given caffeine in doses of 200mg or 400mg. No caffeine was given to the control group. Each participant completed a letter and a pattern matching task via a computer.

Results : Caffeine had a gender specific effect for both response time (RT) and accuracy. Moderate doses (200mg) of caffeine decreased RT for males, while higher doses enhanced their performance. Females had slower RTs with higher doses and faster RTs without caffeine. Males performed less accurately with 200mg and unilateral presentations, whereas females performed better with 200mg and bilateral presentations. On the PMT, males were more accurate with 200mg, whereas females had faster RTs with no difference in accuracy. The 200mg group had a higher BFA with females in the 400mg group showing the highest BFA. Caffeine had a significant effect on EPs for P1 when the letters were presented in the left visual field. Those who consumed 200mg had a slower transfer speed between P3 and P4 than those who consumed 400mg.

Conclusions : Moderate levels of caffeine seem to hinder overall RT and accuracy for right visual field presentations. Males appear to react faster with higher levels of caffeine, however accuracy is not affected. Females react faster without caffeine, and slower with high levels of caffeine but make the most accurate decisions with moderate levels of caffeine.

Correspondence: *Glenn L. Andrews, Ph.D., Psychology & Sociology, Northwest Nazarene University, 623 Holly Street, Nampa, ID 83686. E-mail: glandrews@nnu.edu*

R.E. FRYE, J. MCGRAW FISHER, A. COTY, M. ZARELLA, J. LIEDERMAN & E. HALGREN. Hemispheric Differences in Voice Onset Time Coding.

Objective: The influence of consonant-vowel syllable voice onset time (VOT) on the M100 neuromagnetic response has not been well established. Understanding processes related to categorizing and discriminating differences in VOT is especially important since such abilities are abnormal in children with developmental language disorders.

Participants and Methods : Eight normal participants performed a VOT discrimination task during whole-head magnetoencephalography recording. Based on our previously published research the VOT continuum was divided into four sectors: (1) voiced stimuli reliably categorized as /ba/, (2) ambiguously categorized stimuli that represented a boundary region, (3,4) unvoiced stimuli reliably categorized as /pa/ that were further divided into those with relatively shorter and longer VOTs. Three spatial axes were derived from the dipole location data using principal component analysis. A mixed-effects model tested whether M100 characteristics or the dipole location were correlated with the mean VOT of each VOT sector.

Results : The morphology, amplitude and peak latency of the M100 was significantly modulated by VOT, with this modulation being significantly more marked in the left hemisphere as compared to the right hemisphere. The spatial location of the right, but not the left, hemisphere dipole was modulated by VOT with the dipole moving in a posterior-superior direction along the superior temporal plane as VOT increased.

Conclusions : This study suggests that VOT modulates early auditory neural processes differently in the left and right hemispheres. This study suggests that VOT may be represented primarily by a temporal code in the left hemisphere and by a topographical code in the right hemisphere. Correspondence: *Richard E. Frye, M.D., Ph.D., F.A.A.P., Pediatrics, University of Florida, P.O. Box 100296, Gainesville, FL 32610-0296. E-mail: dfryemphd@gmail.com*

M. ROEDER, S.H. MOSTOFSKY, J.C. GIDLEY LARSON, L.E. CUTTING, M.B. DENCKLA & M. MAHONE. Right-Left Time Differences on Neuromotor Examination in Children.

Objective: Age-related change in right- versus left-sided time difference on neuromotor examination may be an important indicator of cere-

bral lateralization. Rapid myelination of the corpus callosum is considered to be related to increased bilateral skill and speed on timed motor tasks. To explore this development, we compared right versus left hand and foot speed differences using the Revised Physical and Neurological Assessment for Subtle Signs (PANESS; Denckla, 1985).

Participants and Methods : A total of 130 typically developing right-handed children (65 boys, 65 girls), ages 7-14 completed the PANESS. Difference scores between right and left timed motor tasks were analyzed. Timed tasks included sequences of 20 toe taps, 10 toe-heel taps, 20 hand pats, 10 hand pronate-supinate, 20 finger taps, and 5 sequences of finger apposition—all performed bilaterally.

Results : A series of six 2 (gender) x 2 (age-group) factorial ANOVAs were performed, using right-left difference scores on the six timed tasks. Right-left time difference decreased significantly with age on toe tapping, heel-toe sequences, finger repetition, and finger sequencing. There were significant gender effects on heel-toe sequences, with boys showing a greater right-left difference than girls. There was also a significant interaction between age and gender for hand pronation-supination, such that the magnitude of the right-left difference was similar for younger, compared with older girls, while the difference was significantly larger for younger, compared to older boys.

Conclusions : Timed motor tasks reflecting interhemispheric connections equalize in improvement during childhood, and for some tasks, the equalization occurs earlier in girls than in boys.

Correspondence: *Mark Mahone, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

P. EISENBERG, S.R. BOGGS & E.B. FENNELL. Callosal Functioning in Children with Cleft Palate.

Objective: Findings of increased incidence of learning difficulties among children with isolated cleft palate (CPO) or cleft lip and palate (CLP) have led to investigations into the cognitive functioning of children in these populations. However, there remains speculation regarding the etiology of these difficulties, with some investigators citing central nervous system causes and others implicating peripheral speech mechanisms. This study aimed to address one hypothesis regarding the cause of learning difficulties among children with isolated cleft palate - dysfunction of the corpus callosum.

Participants and Methods : Participants were 10 children with CPO, 13 children with CLP, and 13 healthy controls from New York and Florida locations. Each participant completed a battery of tests assessing interhemispheric communication, including measures of transfer of spatial and sensory information. Additionally, screenings of intellectual functioning and academic achievement were utilized.

Results : Results yielded evidence for subtle callosal deficits among children with isolated cleft palate, but interhemispheric communication was broadly intact. Additionally, equivocal support for callosal difficulties was found among children with cleft lip and palate. No differences were found between the groups in intellectual functioning. Further, although a trend for increased IQ/achievement discrepancy was found for children with clefts, this discrepancy was not at a clinically significant level.

Conclusions : Although findings of callosal deficits were not of the magnitude hypothesized, the results present many important and interesting directions for future research. Further evaluation into the callosal functioning in children with cleft lip and palate and isolated cleft palate is clearly warranted, and may provide useful insight into the learning difficulties faced by this population.

Correspondence: *Philip Eisenberg, Ph.D., Center for Neuropsychological Services, North Shore University Hospital, 300 Community Dr., Manhasset, NY 11030. E-mail: dr.eisenberg@gmail.com*

Imaging: Structural

K. BRAMLEY, D.F. TATE, J. GUNSTAD, A.L. JEFFERSON, A. D'APRILE, A. POPPAS, D. FORMAN, R. PAUL & R. COHEN. Cortical and Subcortical Lacunar Infarctions and Global Cognitive Function Among Treated Cardiovascular Patients.

Objective: Growing evidence suggests cardiovascular disease (CVD) is associated with reduced cognitive function. These changes are thought to result from morphological changes visualized on magnetic resonance imaging (MRI). Our purpose was to investigate the relationship between small lacunar infarctions visualized on MRI and Dementia Rating Scale (DRS) performance among clinically treated CVD patients.

Participants and Methods : 41 patients were recruited from a cardiovascular clinic, having a mean age of 71.15 ± 7.43 , systolic blood pressure (BP) of 111.32 ± 49.52 , and diastolic BP of 67.34 ± 9.24 . Each patient underwent neuroimaging and cognitive testing. Cognitive testing included the DRS, and analyses were conducted for both DRS total and subscale scores. Lacunar infarctions were quantified in the T-1 weighted images separately for neocortical (centrum semiovale) and subcortical (thalamus and basal ganglia) areas using a threshold method. We investigated the relationship between lesion load for the two brain regions domain scores for the DRS using correlation analyses.

Results : Lesion load in the neocortical region did not relate to the DRS total score or performance on any DRS subscale. Subcortical gray matter lesions did relate significantly to the DRS initiation and perseveration (I/P) subscale ($r = -0.35$, $p = 0.01$), but not to DRS total score.

Conclusions : These results demonstrate a relationship between lesion load in the subcortical region and measures of initiation/perseveration. As nuclei in these areas are known to be involved in the initiation of complex motor programming and of behaviors, future studies are needed to clarify the specific contribution of lesions within different subcortical nuclei for finer functional discrimination.

Correspondence: *Kathryn Bramley, Brown Medical School, 55 Kent Lane, South Windsor, CT 06074. E-mail: kbra713S@postoffice.uri.edu*

M.A. LANCASTER, M.T. MORAN, H. KUWABARA & M.W. HAUT. Sex Differences in White Matter Microstructure.

Objective: While sex differences have been observed in brain volume and metabolite concentration, less is known about differences in white matter microstructure. This study used diffusion tensor imaging (DTI) to investigate the relationship between sex and white matter integrity in the corpus callosum and association areas.

Participants and Methods : Thirty-two (16 male, 16 female) healthy young adults, matched for age ($M = 21.7$ years), education ($M = 15.5$ years) and WAIS-III Full Scale IQ ($M = 121.0$), served as participants. All were scanned using a 3T (GE) MRI system. An axial DTI sequence was obtained measuring diffusion in 25 directions. Regions of interest (ROIs) were manually drawn on T2 images in the genu and splenium of the corpus callosum, frontal and parietal pericallosal areas, and the centrum semiovale bilaterally. SPGR and FLAIR scans were used to assist in landmark identification and to exclude white matter hyperintensities.

Fractional anisotropy (FA) was calculated for each voxel in the brain using the eigenvalue method and an FA map generated. ROIs were superimposed on the FA maps and mean FA values were derived for each region.

Results : Analysis by ANOVA revealed no group differences in age, education, or IQ. However, males showed higher FA values than females in the left and right frontal pericallosal regions $F(1,30) = 12.9$, $p < .05$; $F(1,30) = 20.7$, $p < .05$ and the left and right centrum semiovale $F(1,30) = 11.5$, $p < .05$; $F(1,30) = 5.6$, $p < .05$. There were no differences between groups in the corpus callosum or parietal pericallosal area.

Conclusions : Sex differences were observed in white matter microstructure in frontal pericallosal regions and the centrum semiovale. As the groups had equivalent IQ, this data supports a sex-related difference in the interaction between brain structure and function.

Correspondence: *Marc W. Haut, PhD, Psychiatry, WVTU, Box 9137, Morgantown, WV 26506. E-mail: mhaut@hsc.wvu.edu*

J.E. KANZ, S.D. RAND, T. WARREN, S.J. SWANSON, D.S. SABSE-VITZ, T.A. HAMMEKE, M. RAGAVHAN & J.R. BINDER. Quantitative MRI hippocampal T2 signal intensity asymmetries correlate with intracarotid amobarbital memory asymmetry scores.

Objective: The intracarotid amobarbital procedure (IAP) is used to determine hippocampal functional integrity in temporal lobe epilepsy surgery candidates. Integrity of the hippocampus is also commonly assessed using visual inspection of T2-weighted (T2W) signal intensity on MRI. We examined the relationship between asymmetry scores derived from a quantitative measure of T2W signal and IAP memory and language scores.

Participants and Methods : Fifty-eight unilateral temporal lobe epilepsy patients (29 left, 29 right) who underwent both the IAP and preoperative MRI were included. T2W signal in right and left anterior and posterior hippocampus and uncus was analyzed using a commercial PACS system. MRI measurements were conducted blind to the side of seizure focus. An asymmetry index $[(R-L)/(R+L)]$ was calculated using the mean T2W signal in machine units in each region.

Results : IAP memory asymmetry correlated significantly with T2W signal asymmetry in the hippocampus, but not the uncus. Relatively lower T2W signal values in the anterior ($r = 0.58$, $p < .001$) or posterior ($r = 0.66$, $p < .001$) hippocampus on one side were associated with relatively better memory on IAP on the same side. IAP language function was not significantly correlated with T2W signal asymmetry in any ROI. Both the IAP ($r = -0.59$, $p < .001$) and the anterior ($r = -0.54$, $p < .001$) and posterior ($r = -0.60$, $p < .001$) hippocampal T2W measures were correlated with side of seizure focus.

Conclusions : T2W MRI asymmetries provide a quantitative measure of hippocampal integrity that correlates with measures of hippocampal functional integrity. This measure may provide useful adjunct information for predicting side of seizure focus, seizure outcome, and memory outcome in temporal lobe epilepsy surgery candidates.

Correspondence: *Jason E. Kanz, Ph.D., Neurology, Medical College of Wisconsin, 9200 W. Wisconsin Avenue, Milwaukee, WI 53226. E-mail: jkkanz@neuroscience.mcu.edu*

J.C. ADAIR, R. ACOTHELEY & J.E. KNOEFEL. White Matter Abnormalities Predict Symptom Awareness in Mild Cognitive Impairment (MCI).

Objective: Despite a requirement for memory complaints in current MCI criteria, minimally impaired individuals do not universally acknowledge cognitive symptoms. To identify determinants of symptom awareness, we compared MRI-based abnormal white matter (WM) signal in MCI patients who endorsed cognitive problems to those denying symptoms.

Participants and Methods : Patients were diagnosed as MCI based on normal global cognition (age- and education-adjusted MMSE ≥ 25 th percentile), list learning scores at least 1.5 SD below norms, and no dementia or impaired self-maintenance. Inclusion criteria included Geriatric Depression Scale score (GDS) ≤ 15 . Symptom awareness was defined based on responses to GDS questions 14 (memory problems) and 26 (trouble concentrating): aware patients ($n=32$) responded affirmatively to both questions, unaware patients ($n=31$) responded negatively. Discrepant responders were not analyzed. Scan raters blinded to clinical status graded abnormal WM signal on axial T2 MR images using previously reported visual analog rating methods.

Results : Aware patients were significantly younger than unaware patients. After adjusting for age, between-group contrasts tended towards lower total WM scores in aware patients (aware: 1.06 ± 1.3 , unaware:

1.84±1.4, $p=0.07$). Aware patients showed lower posterior WM scores (0.69±1.0 vs 1.48±1.5, $p=0.03$); no significant group differences existed for anterior WM (0.69±1.0 vs 1.32±1.4). Right hemisphere WM scores were significantly lower in aware patients (0.60±1.1 vs 1.52±1.3, $p=0.008$). Left hemisphere differences were not significant (0.7±1.1 vs 1.19±1.2).

Conclusions : Brain MRI scans show more abnormal WM signal in MCI patients who deny cognitive problems. Like anosognosia for other deficits, scan abnormality most often occurs in right posterior regions.

Correspondence: *John Adair, Neurology, University of New Mexico, ACC 2nd floor, UNMHSC, 2211 Lomas Blvd NE, Albuquerque, NM 87131. E-mail: John.Adair@med.va.gov*

C.J. BECK, R.O. HOPKINS, L.K. WEAVER & E.D. BIGLER. Prevalence of White Matter Hyperintensities in a Healthy Normal Population.

Objective: White matter hyperintensities (WMHs) are unidentified bright objects observed in the white matter on brain MR scans. WMHs are reported to be *normal* findings in the brain and the prevalence increases with age. We assessed the prevalence of WMHs prospectively in healthy normal subjects.

Participants and Methods : The WMHs ratings were obtained in 243 normal subjects ages 16 to 65 years from a normative database (Blatter et al., 1995). Subjects were excluded if they had a history of head injury, neurological disorder, or alcohol or drug abuse. MR scans were rated for the presence of WMH using a 4-point semi-quantitative scale. Periventricular WMHs (PVWMHs) and centrum semi-ovale WMHs (CSWMHs) were assessed.

Results : WMHs occurred in 5.3% (13 of 243) of subjects, and all WMHs were small (rating of 0.5) except for one subject who was 65 years of age and had ratings of 2 on all WMH measures. There were no gender differences for WMHs ($p = 0.764$). Increasing age correlated with presence of WMHs ($r = 0.235$; $p = 0.01$). The median age for the subjects with no WMHs was 34.5 years and the median age for the subjects with WMHs was 57.0 years. Subjects older than 55 years of age had a 10-fold increased prevalence of WMHs compared to subjects ≤ 55 years [odds ratio = 10.01; 95% CI = 3.1 to 32.3; $p \leq 0.001$].

Conclusions : Our findings suggest that WMHs in are uncommon in young healthy subjects but increase in older subjects, especially in those over 55 years of age.

Correspondence: *Ramona O. Hopkins, Ph.D., Psychology, Brigham Young University, 1122 SWKT, Provo, UT 84602. E-mail: mona_hopkins@byu.edu*

J.F. ROVET, M. DESROCHER, M. WILLIAMSON, K. NASH & N. SORENI. Abnormal MRS Profiles in Children with Congenital Hypothyroidism.

Objective: Thyroid hormone (TH) is essential for early brain development, especially the hippocampus. Animals rendered TH-deficient during gestation or early life show reduced volumes, abnormal cytoarchitecture, and disrupted neuronal migration in the hippocampus, as well as weaker learning and memory abilities. Although children with pre- or perinatal TH deficiencies show a number of memory deficits suggestive of abnormal hippocampal formation, direct evidence of hippocampal deficits is lacking. This study aimed to examine hippocampal composition in these patients using magnetic resonance spectroscopy (MRS).

Participants and Methods : Evaluated were 12 children with congenital hypothyroidism (CH) and 17 typically developing children. Children were assessed with a battery of clinical memory tests and scanned using MRS techniques. Voxels were placed over left and right hippocampi and the right frontal lobe.

Results : Preliminary results for 5 CH and 2 controls revealed a significant interaction ($p=.03$) reflecting lower NAA (N-acetyl-aspartate) concentrations in both hippocampi ($p=.005$) but not frontal lobe in CH. Comparisons between hippocampi revealed a significant group effect

($p=.03$) but no interaction with right or left sides. CH scored below C on measures of spatial, episodic, and everyday memory ($p<.05$). Correlations between NAA (a marker of neuronal number) and memory results showed an association between right hippocampus NAA and episodic and relational memory scores and between total hippocampus NAA and everyday memory ($p=.03$). Frontal NAA values were associated only with rote recall of digits ($p=.02$).

Conclusions : The reduced neuronal complement in the hippocampus of children with CH may contribute to their weaker episodic and everyday memory abilities.

Correspondence: *Joanne F. Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada. E-mail: jrovet@sympatico.ca*

S. CORREIA, S. LEE, P. MALLOY, N. MEHTA, S. ZHANG, S. SALLOWAY & D. LAIDLAW. Diffusion-Tensor MRI Tractography Methods For Assessing White Matter Health In Normal And Cognitively Impaired Elderly.

Objective: To examine differences in new DTI metrics and their relationship to executive function in normal and cognitively impaired elderly.

Participants and Methods : Participants were healthy controls (HC, $n=9$), and patients with vascular cognitive impairment (VCI, $n=6$), mild cognitive impairment (MCI, $n=5$), and Alzheimer's disease (AD, $n=7$). Subjects received DTI and cognitive testing. Models of whole-brain white matter were derived in which fibers are represented as streamtubes in accordance with Zhang et al. (2003). Streamtube models were then thresholded for linear anisotropy. Metrics were calculated for each model based on the number and total length of streamtubes normalized for linear anisotropy and intracranial volume (ICV).

Results : After controlling for age, streamtube length metrics in the VCI group were significantly lower vs. the HC and AD groups ($p\leq.05$), and approached significance vs. the MCI group ($.05\leq p\leq.10$). The HC, AD, and MCI groups did not differ significantly from each other. Partial correlations (controlled for age) were significant between all length metrics and measures of executive function and psychomotor processing speed (Trail Making Test parts A & B) but not confrontational naming (Boston Naming Test) in the HC and VCI groups combined. Correlations between length metrics and all three cognitive tests were non-significant in the AD and MCI groups.

Conclusions : These new DTI tractography metrics may serve as robust markers of overall white matter health. The metrics correlate with executive cognitive functions in patients with VCI.

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*

A.J. JAK, W.S. HOUSTON, B.J. NAGEL & M.W. BONDI. Apolipoprotein E Epsilon 4 Allele And Hippocampal Volumes In Non-Demented Older Adults.

Objective: Given varying methodologies and cognitive status across studies, the impact of apolipoprotein E genotype on hippocampal volumes in healthy aging remains unclear. Using a standardized method, we examined hippocampal volumes in a neuropsychologically well-defined, non-demented sample of normally aging older adults. Our aim was to better determine the degree to which APOE genotype impacts hippocampal volume independently of cognitive decline.

Participants and Methods : T1-weighted anatomical MR images were collected. Bilateral hippocampal volumes were determined via manual outlining. Additionally, gray matter, white matter, CSF, and whole brain volumes were obtained using semi-automated procedures. These vol-

umes were examined in cognitively and medically healthy older adults (ages 63-92) who had a least one copy of the APOE ϵ 4 allele (n=18) and those who did not (n=22). The APOE groups did not differ on demographic variables, global cognitive functioning (DRS), or memory (WMS-R Logical Memory, Visual Reproduction, and CVLT; all p's>.05). **Results** : ANCOVAs controlling for whole brain volume indicated no differences in hippocampal or tissue segmentation volumes between the APOE groups (all p's>.05). Repeated measures ANOVA revealed no significant difference in the extent of hippocampal asymmetry observed between the groups. Hippocampal volumes were not significantly associated with global cognitive or memory variables, although within the APOE non- ϵ 4 group, larger hippocampal volumes were significantly correlated with higher scores on a measure of independent living skills (p<.03).

Conclusions : In this well-characterized, healthy, non-demented sample of older adults, APOE ϵ 4 allele status does not significantly impact between-group variation in hippocampal volumes in healthy aging when independent of cognitive decline.

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

L. IGUCHI, D.A. GANSLER, T. VAN DILLEN, A. SHETH ANTONUCCI & C. FULWILER. Dorsolateral Prefrontal Cortex Volume Correlates With Aggression And Impulsivity In Psychiatric Patients.

Objective: To examine whether dorsolateral prefrontal cortex (DLPFC) volume is associated with aggression and impulsivity in psychiatric patients. We hypothesized that: 1/ reduced DLPFC volume will correlate with impulsivity but not aggression, and 2/ reduced DLPFC volume will correlate with nonplanning or cognitive, but not motor, impulsivity.

Participants and Methods : 18 individuals from several psychiatric clinics received head MRI and completed the Buss-Perry Aggression Questionnaire (BPA), the Life History of Aggression-Revised (LHA-R), and the Barratt Impulsiveness Scale-Version 11 (BIS). Image analysis software and a semi-manual tracing procedure was used to render DLPFC gray matter volumes in cm³.

Results : Partial correlation coefficients were calculated for aggression and impulsivity measures and DLPFC volume, controlling for whole brain volume. For the entire sample, right DLPFC volume correlated with the Nonplanning subscale of the BIS ($r = -.51, p \leq .05$) but not with the BPA or the LHA-R. Subsequent analysis revealed distinctive correlations for individuals with and without affective disorders to suggest that diagnosis and laterality may complicate the relationship between DLPFC volume and aggression and impulsivity.

Exploratory analyses compared mean DLPFC and orbitofrontal cortex (OFC) volumes against high and low scores on the LHA-R and the BIS. This comparison suggested: 1/ left prefrontal volume may play a more prominent role in modulating aggression, 2/ right prefrontal volume may play a more prominent role in modulating impulse control, and 3/ reduced right DLPFC volume may be associated with individuals who are both impulsive and aggressive.

Conclusions : Results were consistent with expectation and research linking the DLPFC with impulsivity, and are discussed in light of an earlier study that correlated OFC volume with aggression and motor impulsivity within the same sample. These findings support broadly dissociable prefrontal circuitries involved in regulating aggressive and impulsive behaviors.

Correspondence: Lisa Iguchi, Psychology, Suffolk University, 15 Governors Avenue, #29, Medford, MA 02155. E-mail: lisa.iguchi@suffolk.edu

A.M. BRICKMAN, C. HABECK, E. ZARAHN, J. FLYNN & Y. STERN. Structural MRI Covariance Patterns Associated with Aging and Neuropsychological Function.

Objective: Structural magnetic resonance imaging (MRI) studies have shown dramatic age-associated changes in grey and white matter vol-

ume, but typically use univariate analyses that do not explicitly test the interrelationship among brain regions. The current study employed a multivariate approach to identify covariance patterns of grey and white matter tissue density to distinguish older from younger adults. We examined whether the expression of the age-associated covariance topographies is related to performance on cognitive tests affected by normal aging.

Participants and Methods : Eighty-four young (Mean age = 24.0) and 29 older (mean age = 73.1) participants were scanned with a 1.5T MRI and assessed with a neuropsychological battery. Images were spatially normalized and segmented to produce grey and white matter density maps. A multivariate technique, based on the Subprofile Scaling Model, was used to capture sources of between- and within-group variation to produce a linear combination of principal components that represented a pattern or network that best discriminated between the two age groups.

Results : Grey and white matter covariance patterns that reliably discriminated the two groups were identified (>0.90 specificity and sensitivity). The identified areas were similar to those shown to decline with a univariate approach (i.e., SPM). Age and expression of both grey and white matter were significantly related to performance on tasks of attention, language, memory, and executive function.

Conclusions : The results suggest that identifiable networks of grey and white matter regions systematically decline with age and are linked to age-related cognitive decline.

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

L. DELANO-WOOD, B. SCHWEINSBURG, C.E. WIERENGA, A.J. JAK, D.P. SALMON, L.J. THAL, L.R. FRANK & M.W. BONDI. White Matter Integrity in Nondemented Older Adults At-Risk for Alzheimer's Disease: A Diffusion Tensor Imaging Study.

Objective: Diffusion tensor imaging (DTI) is a magnetic resonance imaging (MRI) technique designed to assess the integrity of white matter in vivo. Using DTI, we examined white matter integrity in corpus callosal regions of interest (ROIs) thought to correspond to anterior (genu) and posterior (splenium) cortical white matter regions. Based on previous studies demonstrating greater posterior fiber tract changes in early Alzheimer's disease (AD), we predicted that posterior white matter compromise would be observed in older adults at genetic risk for AD.

Participants and Methods : Twenty-four normally-aging nondemented participants divided into two groups on the basis of APOE genotype (ϵ 4: n=8; non- ϵ 4: n=16) were comparable on age, education, gender, and cognition. Along with T¹-weighted anatomical MR images, participants received high-angular resolution DTI for estimates of fractional anisotropy (FA). Manually-defined ROIs of the genu and splenium were used in the calculation of FA estimates of white matter integrity.

Results : Group comparisons indicated no differences across APOE status in terms of FA values for the genu and splenium of the corpus callosum. While age was not associated with lower FA values in either callosal region, sex differences were observed with women demonstrating significantly lower FA values in the genu regardless of genotype ($r = -.62, p < 0.01$).

Conclusions : Although previous studies have demonstrated a relationship between AD and reduced posterior white matter integrity, our findings indicate that older adults genetically at risk for AD do not demonstrate compromised white matter integrity of anterior or posterior corpus callosal regions when compared to those who are not genetically at risk. Additionally, in line with previous studies which have showed that women demonstrate higher rates of vascular risk factors compared to men, female gender was associated with significantly reduced white matter integrity of anterior callosal white matter, regardless of APOE genotype.

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

F.G. HILLARY, J. KAOTHRI, H. GENOVA, M. SWAIN, B. BISWAL, W. LIU & J. DELUCA. Using Structural and Functional Imaging Data to Quantify Lesion Volume Change in Brain Trauma.

Objective: This study had three aims: 1.) to quantify brain lesions on MRI following brain trauma 2.) to quantify change in the extent of lesions over time, and 3.) to validate a method (ISODATA) for quantifying lesions on a voxelwise basis.

Participants and Methods : Participants consisted of 10 healthy controls (HCs) and 13 individuals with moderate to severe traumatic brain injury. In order to quantify brain lesion extent and the alterations in brain lesions over time, MRI signal intensity was compared on a voxelwise basis. This was done with an in-house software (ISODATA) and AFNI software. Functional images were overlaid over structural images to examine the relationship between structural lesions and the fMRI signal. This method allowed for automated determination of lesion extent while minimizing investigator bias.

Results : The ISODATA procedure resulted in a method for quantifying lesion size on a voxelwise basis throughout the brain. This method was sensitive to change in lesion size over time. Consistent with prior literature in animals and humans, blood flow was diminished in areas that were construed to be lesions by ISODATA. This resulted in a correlation between lesioned areas and diminished fMRI signal.

Conclusions : The current study provides an important method for quantifying brain lesions without a prior knowledge of their location or extent. This study shows the sensitivity of ISODATA in detecting lesions as subtle differences in voxel intensity. Importantly, those areas noted to be lesions maintained a predictable relationship with the fMRI response.

Correspondence: *Frank G. Hillary, Ph.D., Psychology, Penn State University, 223 Moore Building, State College, PA 16802. E-mail: fhillary@psu.edu*

Language: Aphasia

V. BALASUBRAMANIAN. Oral Reading And Writing In Broca's Aphasia: A Psycholinguistic Case Study.

Objective: The objectives of the current study are 1) to undertake an analysis of word level writing and oral reading in a subject with Broca's aphasia, and 2) to verify the claim (Benson & Cumming, 1985) that the writing errors parallel speech disturbances in Broca's aphasia.

Participants and Methods : Subject. LK, a 45 year old right handed male high school teacher with a diagnostic history of left basal ganglia and left temporal-frontal lesion, had subsequently developed right hemiplegia and Broca's aphasia. In the post acute stage, LK learned to use his left hand for writing.

A number of tests from Psycholinguistic Assessment of Language Processing in Aphasics (PALPA, Kay, Lesser & Coltheart, 1992) were used to assess LK's reading and writing.

Results : A note worthy feature of LK's oral reading performance was the lack of grammatical class effect (PALPA, 32). LK read the derivational, regularly and irregularly inflected words at 73 %, 60 % and 20 % accuracy levels, respectively (PALPA 34). On the homophone reading task, LK's performance reached 40% accuracy level (PALPA 38). In reading orthographically irregular words, LK's semantic paralexias accounted for 9.3 % of his total errors, whereas semantic paralexias accounted for 4.1 % of his total errors in reading regular words.

LK's writing did not evidence semantic substitutions. Although, LK was able to write 22.5 % of dictated words, all the correctly written words were high imagery and high frequency words (PALPA 40). The grammatical class and lexical morphology tasks were the hardest writing tasks for LK (PALPA 41, PALPA 43). His performance on spelling regular-

ity task was better than his performance on all other writing tasks (PALPA 44). To sum up, LK's writing performance on PALPA subtests evidence the presence of 1) word length effect, 2) grammatical class effect, 3) imageability & frequency effect, 4) spelling regularity effect, 5) non-word effect, and 6) homophone effect.

Conclusions : These results are at variance with the 'parallel deficit' view. Correspondence: *Venu Balasubramanian, Ph.D., Speech-Language Pathology & Audiology, Seton Hall University, McQuaid Hall, 400 South Orange Ave, South Orange, New Jersey, NJ 07079. E-mail: balasure@shu.edu*

E.C. LERITZ, R. MCGLINCHEY, L. GRANDE, K. LUNDGREN, M. ALBERT & W. MILBERG. Using Preserved Lexical Access to Estimate Premorbid IQ in Aphasia.

Objective: In aphasia, assessment of premorbid abilities is difficult due to expressive and receptive language impairments. The current study evaluated a new test designed to take advantage of previous research suggesting aphasic patients can access lexical items under implicit conditions. We developed the Lexical-Orthographic Familiarity Test (LOFT), a lexical-familiarity measure containing words from the Wechsler Test of Adult Reading (WTAR) paired with antiquated but real English words. Task instructions were to identify the word in each pair that is 'most familiar' and successful performance required correct selection of the word taken from the WTAR.

Participants and Methods : Seventeen aphasic patients were administered both the LOFT and the WTAR as part of a larger neuropsychological battery. Average severity rating, an estimate of receptive and expressive language functioning, was 2.7 (on a scale of 1-5) for aphasics. Performance on the LOFT and WTAR was then compared to an age-comparable group of cardiovascular (CV) patients (n=78) and to a group of healthy control (HC) participants (n=47). Raw LOFT scores were converted to standard scores (estimated IQ) based on existing WTAR normative data.

Results : Estimated premorbid IQ scores from the WTAR were similar to LOFT scores and were in the average range for both the HC and CV groups. In contrast, the mean WTAR score for the aphasia group was 45.17, while the mean LOFT score was within normal limits (116.29).

Conclusions : Our results demonstrate preserved lexical retrieval in a group with significant language impairments. Importantly, these findings suggest that the LOFT provides a better estimate of premorbid functioning in patients with aphasia.

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*

A.M. RAYMER, L.X. BLONDER, R. APONTE, W. ATKINS, D. TAYLOR, K.M. HEILMAN & L.J. GONZALEZ ROTH. Conversational Gesture Use Following Verbal+Gestural Training in Aphasia.

Objective: In patients with aphasia, the pairing of gestures with speech has been used successfully in treatment to facilitate constrained picture naming abilities, but the generalized use of gestures in conversation has not been examined.

Participants and Methods : We examined conversational gesture use in 9 individuals with aphasia (6 nonfluent and 3 fluent) and limb apraxia who participated in verbal+gestural treatment for noun and verb retrieval. Treatment effects (d) were calculated for trained and untrained words in picture naming. Scripted conversational samples were videotaped before and after treatment. Three examiners, blind to treatment conditions, independently coded samples for use of content, filler, and emphasis gestures (Foundas et al., 1995) with high reliability (>80%). We calculated number of gestures per minute in each category.

Results : In pre-treatment measures, significant positive correlations were evident between use of content gestures and limb praxis scores

($r=.71$, $p=.03$), and use of emphasis gestures and naming accuracy ($r=.74$, $p=.02$). Post-treatment positive correlations were noted between total gestures per minute and effect sizes for untrained pictures (verbs: $r=.76$, $p=.02$; nouns: $r=.94$, $p=.00$). Following treatment there was no significant increased use of gestures in conversations ($t = 0.78$, $p = n.s.$).

Conclusions : Although conversational gesture use did not increase in the group overall, those individuals who demonstrated generalized increases in use of gestures during treatment also tended to increase their overall use of gestures in conversation. Our results also suggest that patterns of conversational gesture used by our participants depended on the severity of aphasia and limb apraxia.

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*

R.B. PARKINSON, Y. CHANG, A.M. RAYMER & B. CROSSON. Lesion Characteristics Related to Naming Improvement in Aphasic Stroke Patients: the Role of Anterior Cortex and the Basal Ganglia.

Objective: Few studies have examined the relationship between lesion location and naming treatment improvement in chronic aphasic stroke patients. The purpose of this study was to determine whether degree of lesion in certain brain regions was related to degree of treatment improvement demonstrated over the course of object and action naming treatments.

Participants and Methods : Fifteen aphasic left hemisphere stroke patients underwent naming treatments for object and/or action naming. Two raters assessed extent of lesion in 29 cortical and subcortical regions of interest (ROIs) on CT or MRI scans. Correlations were calculated between composite basal ganglia and anterior cortical lesion ratings and both pre-treatment and treatment-improvement measures for both object and action naming.

Results : Greater total basal ganglia lesion extent was highly correlated with worse scores on all four naming measures when partial correlations controlled for total anterior lesion extent (r ranging from $-.623$ to $-.785$). Also, unexpectedly, greater anterior cortical lesion extent was highly correlated with better scores on all four naming measures when partial correlations controlled for total basal ganglia lesion extent (r ranging from $.730$ to $.858$). No consistent differences were found between the correlations of ROI ratings with object naming versus action naming scores.

Conclusions : Large anterior cortical lesions and an intact basal ganglia may both contribute to more efficient re-organization of language functions. Since in this group of patients lesion size in these two areas appears to affect naming in opposite directions, controlling for the effects of one is needed to more clearly observe the effects of the other.

Correspondence: *R.B. Parkinson, M.S., Clinical and Health Psychology, University of Florida, 1501 Patton Creek Lane, Hoover, AL 35226. E-mail: rparkins@phhp.ufl.edu*

M. GAIEFSKY, A.B. MOORE, L.J. GONZALEZ ROTH, M. MARSISKE, M. DIEHL & B. CROSSON. Self-Perception of Language Performance Following Stroke.

Objective: Acquiring disability in adulthood must be personally devastating.

The purpose of this study is to understand the relationship between fear of failure and language production ability in participants with aphasia.

Participants and Methods : Fourteen participants with nonfluent aphasia completed a measure of visual confrontation naming (Boston Naming Test; BNT) before completing a self-perception of performance inventory (Performance Failure Appraisal Inventory- Revised; PFAI-R). The PFAI-R has not been used previously to examine the self-perceptions of participants with aphasia. The PFAI-R was initially used by athletes to examine their athletic performance; however, this measure appears useful in understanding changes in self-perception of language performance experienced by participants with aphasia.

Results : Analyses show that for participants with nonfluent aphasia, one of five subscales of the PFAI-R (“fear of important others losing interest,”) does not correlate well with the other subscales, indicating that it may tap a unique construct in this sample. Preliminary analyses also indicate that participants with higher BNT scores rate themselves as experiencing significantly greater “fears of devaluing their self-esteem” than participants with lower BNT scores. Furthermore, analyses suggest a trend towards negative correlations between language performance and self-perception ratings. This suggests that participants with lower confrontation naming abilities endorse more intense feelings of failure regarding language performance across three of the five self-perception subscales, and participants with higher confrontation naming abilities show a trend of endorsing less intense feelings of failure across these three subscales.

Conclusions : Findings suggest that the PFAI-R is a useful measure for evaluating fear of failure regarding language performance in participants with nonfluent aphasia.

Correspondence: *Megan Gaiefsky, M.S., Clinical & Health Psychology, University of Florida, Health Science Center, PO Box 100165, Gainesville, FL 32610. E-mail: mgaiefsk@phhp.ufl.edu*

M. PURDY. Training Cognitive Flexibility in Aphasia.

Objective: Executive function/cognitive flexibility deficits have been identified in individuals with aphasia, and these deficits further impact the communication skills of aphasic persons. The current study is a first step in determining the efficacy of a cognitive flexibility training protocol.

Participants and Methods : Two persons demonstrating nonfluent aphasia and executive function deficits participated in this study. Initial assessment included the WCS test, the CADL, and a referential communication task. During training, participants were shown a pictured object that is used frequently in daily life and were asked to provide a gesture and a drawing, and to identify the object in a communication book. The order of targeted responses were changed randomly. When subjects learned the set of 20 pictures, the clinician showed the participant a picture to request from a communication partner, who had a set of pictures from which to choose. If the partner chose the wrong item, he waited until the participant switched to another modality. To assure adequate opportunities to switch modes, the partner was instructed in advance to intentionally choose the incorrect item in a random order. Initially, cues were given to encourage mode interchange skills, but prompts were faded over time. Post-training, initial testing procedures were re-administered. On the referential communication task, the participant had to describe an action picture containing 2-3 of the targeted pictures to a communication partner.

Results : Results demonstrated improvement in switching among response modes, resulting in improved communication skill.

Conclusions : These results suggest that treatments designed to specifically address cognitive flexibility in aphasia may be beneficial.

Correspondence: *Mary Purdy, Ph.D., Communication Disorders, Southern Connecticut State University, 501 Crescent Street, New Haven, CT 06515. E-mail: purdym1@southernct.edu*

K. MCGREGOR, K.D. WHITE, A. BACON MOORE, M.E. GAIEFSKY, C.E. WIERENGA, L. MAHER, M. KURTZMAN, K. GOPINATH, K. PECK, D. SOLTYSIK, A. WABNITZ, R.W. BRIGGS & B. CROSSON. An fMRI Investigation of Sentence Generation Attempts by Chronic Non-fluent Aphasics.

Objective: The current study investigated the neural correlates of sentence production attempts by nonfluent aphasia patients.

Participants and Methods : Four patients exhibiting agrammatic language production after suffering left MCA infarct at least three years prior to participation were scanned using block design fMRI at 3 Tesla.

Four healthy control participants also were scanned. During functional imaging runs, participants were asked to silently generate a passive sentence describing an action depicted in line drawings. Verbal fluency measures including performance on the scanning task were taken from participants prior to imaging.

Results : Patients exhibited poor performance on verbal fluency and syntactic speech assessments prior to scanning. In agreement with previous findings on the fMRI task, deconvolution analysis of imaging data from controls showed activated voxel clusters ($R^2 > .16$; $>100\mu\text{L}$) in (left) L Broca's area as well as in the left posterior middle temporal gyrus (L PMTG). Patient data indicated activation of the (right) R PMTG across all participants. Three of the four patients showed activation of (right) R Broca's homologue. Activated cluster volumes in patients for R Broca's homologue and R PMTG were larger than the control participants' activation in Broca's and L PMTG areas.

Conclusions : These findings are consistent with previous research in nonfluent aphasia showing activity in right-hemisphere homologues to language areas. Functionality of such activity is currently debated.

Correspondence: *Keith M. McGregor, University of Florida, 4012 sw 21st ln, gainesville, FL 32607. E-mail: kmcgrego@ufl.edu*

R.S. MARSHALL. Extinction in Aphasia: Deficiencies in Binding or Resource Allocation?

Objective: McNeil et al. (1991) suggested that variability of performance in patients with aphasia may be due to nonlinguistic cognitive variables, such as attention, and suggested a 'resource allocation framework' to explain performance decrements on linguistic tasks. Previous studies have also documented that following right hemisphere stroke, individuals demonstrate extinction in the auditory and visual modalities (Shisler et al., 2004; Baylis et al., 2001). One purpose of this study was to replicate findings from Shisler (2005) regarding deficits in extinction for individuals with aphasia. The second purpose of this study was to determine if binding played a role in auditory extinction in individuals with aphasia, or if resource allocation led to extinction deficits.

Participants and Methods : Eleven individuals with aphasia completed five auditory Double Simultaneous Stimulation (DSS) tasks. One task requiring identification and localization (and therefore binding) of auditory stimuli was used. This task was compared to a series of tasks that theoretically did not require binding: identification and counting, identification only, localization only, and counting only. If binding is deficient in individuals with aphasia, increased performance on non-binding tasks were hypothesized.

Results : Significant extinction was found for three of the five tasks for individuals with aphasia. Extinction amounts differed depending on the task completed. Paired comparisons revealed significant performance differences for the identification and localization versus identification only and localization only. Conversely, no significant difference was observed for the identification and localization task versus identification and counting task.

Conclusions : Results suggest that binding may not fully describe deficits that are observed with this population.

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*

S. ASH, M. KOCHMAN, P. MOORE, S. ANTANI, G. MCCAWLEY & M. GROSSMAN. Quantitative Analysis of Grammatical and Semantic Production Deficits during Narrative Production in Progressive Nonfluent Aphasia and Semantic Dementia.

Objective: We analyzed grammatical complexity and semantic well-formedness in progressive nonfluent aphasia (PNFA) compared to semantic dementia (SD) and healthy seniors to characterize grammatical deviance in PNFA.

Despite many clinical descriptions, quantitative work characterizing speech production in progressive aphasia is limited. We have found grammatical comprehension difficulty in PNFA, associated with limited working memory and slowed information processing speed. SD patients have relatively intact grammatical comprehension but impaired single word comprehension. We sought to determine whether features of sentence comprehension difficulty are also present in production.

Participants and Methods : We studied 10 PNFA patients and 13 SD patients, diagnosed according to published criteria, and 10 healthy seniors. Subjects narrated the wordless children's picture story *Frog, Where Are You?*, by Mercer Mayer. Narrations were recorded digitally, transcribed, and reviewed by two independent reviewers. Two investigators coded measures of sentence complexity, noun and verb phrase errors, and semantic and phonological paraphasias.

Results : PNFA and SD were impaired relative to controls on gross measures of production, including words per minute (WPM), mean length of utterance (MLU), number of phonological and semantic paraphasias, and proportion of well-formed sentences (all p -values < 0.05). PNFA were also impaired relative to SD on WPM, total words produced, and phonological paraphasias. In addition, PNFA were impaired on measures of grammatical complexity compared to controls. In contrast, SD patients were impaired on measures of semantic production. SD produced a low proportion of open class words compared to controls, and they produced a higher proportion of semantic paraphasias compared to controls and PNFA patients.

Conclusions : PNFA patients have significant difficulty with grammatical production, while SD patients provide reduced semantic content, paralleling comprehension profiles.

Correspondence: *Sharon Ash, Neurology, University of Pennsylvania, 3 West Gates, Hospital of the University of Pennsylvania, Philadelphia, PA 19104. E-mail: ash@babel.ling.upenn.edu*

M.R. KENNEDY & H. CHIOU. Executive functions and Aphasia: Relationships Between Metacomprehension and Switching Behavior.

Objective: Adults with aphasia often demonstrate impaired discourse comprehension, whereas demonstrating the existence of impaired executive functions (EF) has proven challenging because of the linguistic load in most tasks. Metacomprehension, an EF, is the ability to self-monitor one's understanding of what was heard or read. We hypothesized that set loss and switching behavior in the non-linguistic tasks would be correlated with metacomprehension accuracy.

Participants and Methods : The present study examined relationships performance on two non-linguistic tasks, Design Fluency and Trailmaking (Delis, Kaplan, Kramer, 2001), and metacomprehension accuracy in adults with aphasia. Thirteen adults with aphasia listened to eight narratives, responded to yes/no questions and made judgments of confidence in their answers using a Likert rating scale.

Results : Robust relationships were found between set loss and switching (Design Fluency) and metacomprehension accuracy. Those who were better at judging their answers had fewer set loss errors and made correct set switches. Number/letter switching (Trailmaking) was not related to metacomprehension accuracy, but composite scores from number and letter sequencing were related to metacomprehension accuracy.

Conclusions : These results provide evidence that maintaining set, switching between sets and metacomprehension accuracy share similar underlying cognitive processes. Set loss and switching (Design Fluency) requires you to self-monitor prior designs by "holding" the set in one's mind in order to prevent repetition of previous responses while creating new designs. When judging comprehension in question-by-question formats, participants provide ratings that should reflect their internal confidence in their answer. This requires a differentiation of confidence across questions. Clearly, there are shared underlying cognitive processes between these two very different tasks, suggesting that maintaining a set may be a general ability used in various skills.

Correspondence: *Mary R. Kennedy, Ph.D., Communication Disorders, University of Minnesota, 115 Sherlin Hall, 165 Pillsbury Dr. SE, Minneapolis, MN 55455. E-mail: kenne047@umn.edu*

M. CATO, C. WIERENGA, B. PARKINSON & B. CROSSON. Lesion Pattern and Rehabilitative Treatment Success in Aphasia: Comparison of Quantitative Voxel-Based vs. Qualitative Lesion Rating Approaches.

Objective: Factors that predict recovery potential in chronic nonfluent aphasia are not well understood. Recently, Crosson et al. (Richards et al., 2002) developed a rehabilitative treatment of language production deficits in aphasia. Here, we examine the relationship between lesion pattern and level of success on this treatment using two methodologies, qualitative lesion ratings and quantitative voxel-based lesion-symptom mapping (VLSM). Previously, we found that level of pre-treatment comprehension positively correlated with level of treatment success (Cato et al., 2004). Here, we hypothesized that level of treatment success is related to lesion extent in posterior regions, given their importance in comprehension. Both analyses were performed using T1-weighted MRI scans. The qualitative analysis was modeled after Naeser et al.'s methods (e.g., 1998). VLSM analyses were performed according to Bates et al. (2003).

Participants and Methods : Nine left MCA nonfluent aphasia patients with wide ranging lesion patterns were included in this analysis. Results from both methods confirmed our hypothesis.

Results : Qualitative analysis revealed that treatment change scores were significantly negatively correlated with lesion extent in several posterior regions, including Wernicke's area, supramarginal gyrus, and the posterior 1/3 of periventricular white matter (PVWM). Similar results were found using VLSM. However, results of VLSM revealed some additional anterior regions that were highly associated with negative treatment outcome. These anterior regions included an insular region and anterior periventricular white matter areas including medial subcallosal fasciculus.

Conclusions : Thus, while the 2 lesion analysis methodologies provided similar results, findings were not wholly convergent. Further comparison of qualitative vs. quantitative lesion rating methods is warranted. Correspondence: *Margaret Cato, PhD, VA San Diego, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: acato@ucsd.edu*

Neglect

Y. TANAKA, M.L. ALBERT & M. MIYAZAKI. Evaluation of Sensory Extinction by EEG Mapping.

Objective: Consensus has not been reached regarding incidence, laterality, and mechanism of the sensory extinction phenomenon associated with unilateral hemispheric lesions. In this study we used EEG mapping to evaluate extinction in relation to habituation.

Participants and Methods : We tested 22 subjects: 12 patients with single, unilateral, hemispheric strokes—9 right-sided (RHL), 3 left-sided (LHL); and 10 age- and gender-matched normal controls.

Pain stimuli and tactile stimuli were presented unilaterally or simultaneously bilaterally to the calf area. Stimulus duration was 60 seconds and the examination was repeated six times. EEG mapping was recorded for 30 seconds during each 60-second stimulation. We analyzed change ratios of the absolute power from baseline.

Results : Three of 9 patients with RHL and one of 3 patients with LHL exhibited extinction. In the control group, the change ratio for unilateral stimulation was the same as that for bilateral simultaneous stimulation. In stroke patients with extinction, Fm θ and fast waves increased. In contrast, stroke patients without extinction showed a decrease in $\alpha 1$, $\alpha 2$, β waves and Fm θ . One stroke patient with extinction showed increasing Fm θ and fast waves initially; but subsequently, after extinction disappeared, showed decreasing Fm θ and fast waves.

Conclusions : 1) Even under conditions of unilateral sensory stimulation, perception of painful or tactile stimuli may be processed in both hemispheres. 2) The sensory extinction phenomenon can be caused by either (or both) of the following mechanisms: hyperattention and/or inadequate habituation.

Correspondence: *Yutaka Tanaka, MD., PhD, Neurology, Tanaka Clinic, 124 Shimogaito., Heguri-Cho., Ikoma-Gun, Nara 636-0933, Japan. E-mail: EZZ05540@nifty.ne.jp*

A.J. WOODS, M. MENNEMEIER, E. GARCIA-RILL, T. WALLACE, K.C. CHELETTE, G. MCCULLOUGH & J. SCHMIDLEY. Cold pressor stimulation improves neglect, magnitude estimation and arousal (P50 amplitude).

Objective: Neglect after brain injury is theoretically linked to decreased arousal (hypoarousal). Patients with neglect misperceive the intensity of sensory stimulation (magnitude estimation) which accounts for how much of a stimulus is neglected. Increasing arousal should improve neglect and related deficits in magnitude estimation. We used cold pressor stimulation (CPS: immersing the foot in iced water for 50 seconds) to increase arousal and ameliorate neglect-related deficits in one patient. The state of arousal was quantified electrophysiologically.

Participants and Methods : A 63 year-old female with chronic left neglect following a MCA infarction of the right hemisphere was tested. Neglect was assessed on a drawing test. Magnitude estimation was assessed for judgments of finger span and visual area. The P50 potential amplitude was used to quantify arousal. [The P50 is a vertex recorded, midlatency ERP to a click stimulus (90dB) generated by the cholinergic arm of the reticular activating system and sensitive to altered states of arousal in a variety of clinical populations.] Neglect, magnitude estimation, and P50 potential amplitude were examined at baseline and following CPS of the right foot.

Results : Neglect and deficits in magnitude estimation resolved immediately following CPS. The P50 potential amplitude was negligible (0 μ V) at baseline but normalized immediately following CPS (1.7 μ V, normal range=1.5-2.5 μ V). P50 potential amplitude returned to a below-normal level (0.6 μ V) 20 minutes after stimulation.

Conclusions : This study provides the first evidence that CPS can improve neglect. Convergence of an increase in P50 potential amplitude and improvement in both neglect and magnitude estimation following CPS supports the theoretical link between neglect and deficits in arousal.

Correspondence: *Adam J. Woods, B.S., Psychology - Cognitive Neuroscience, George Washington University, 200 K Street NW, Apt 51S, Washington, DC 20001. E-mail: ajwoods@gwu.edu*

M. JUNCADELLA, E. AZANON, S. SINNETT, F. RUBIO, R. RAFAL & S. SALVADOR. Spatial hemineglect in vision and audition: Evidence for a dissociation.

Objective: Patients with right unilateral brain damage often suffer from contralesional extinction. This attentional deficit manifests the failure to consciously perceive contralesional stimuli if they are concurrently presented with ipsilesional stimuli. Some authors have proposed that extinction symptoms in the auditory and visual modalities are frequently associated, thus suggesting a common attentional deficit across modalities. However, these studies usually correlate visual and auditory performance levels using very different methods to test each modality. Generally, auditory measures have been more precise using a combination of sophisticated testing and measuring techniques.

In the present study we extend this research using a more reliable and equivalent task in both the auditory and visual sensory modalities.

Participants and Methods : Lesions of all patients (n=7) involved temporal parietal damage. All patients had at some point exhibited visual neglect symptoms (based on clinical visual neglect tests). Ten age and education matched control subjects were tested

Results : A temporal order judgment (TOJ) task required patients to identify which of two temporally and spatially separated events had been presented first. This task allows one to obtain a psychophysical estimation of any contralesional delay in visual or auditory awareness (point of subjective simultaneity, PSS). The visual results showed that patients needed the contralesional stimuli to be presented 193 ms before the ipsilesional stimulus for the stimuli to be perceived as arriving at the same time. The auditory PSS was much smaller being reduced to 69 ms.

Conclusions : Interestingly, this association apparent in the group analysis was not reflected when individual scores were correlated. Many of our patients exhibited strong levels of dissociation between visual and auditory neglect.

Correspondence: *Montserrat Juncadella, Dr, Neurology, Hospital Universitari de Bellvitge, Feixa Larga s/n, Hospitalet de Llobregat 08904, Spain. E-mail: mjuncadella@csub.scs.es*

V. DRAGO, G.R. FINNEY, Y. JEONG, T. MIZUNO, C.P. CRUCIAN & K.M. HEILMAN. Ipsilesional Neglect in Upper Versus Lower Space.

Objective: In the acute post stroke stage of neglect, on both line bisection and cancellations tasks, right hemisphere damaged patients (RHD) often show more severe contralesional lower than upper spatial neglect. After weeks or months many patients recover or even convert from contralesional to ipsilesional neglect. The purpose of this study was to learn if this initial vertical difference in neglect severity influences the vertical severity of ipsilesional neglect in chronic RHD participants.

Participants and Methods : The participants were 12 subjects with RHD and 8 matched healthy people (NC). Subjects attempted to bisect 24 horizontal 242 mm lines viewed in lower and 24 viewed in upper space (via a video-monitor), but physically bisected in lower space. Deviation from midline were measured to the nearest mm.

Results : When compared to the NCs the RHD subjects demonstrate less ipsilateral neglect (a contralesional bias) in lower than upper space.

Conclusions : Robinson et al., (1978) found in monkeys that visually responsive (attentional) parietal neurons appear to selectively respond to a combination of contralateral and inferior visual field stimuli. Thus, an inferior orientation bias may also be a predominant feature of parietal neurons in people and injury to these neuron might induce more persistent lower (inferior) than upper contralesional inattention.

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

G.M. NYS, M.J. VAN ZANDVOORT, P.L. DE KORT & E.H. DE HAAN. Motor Perseveration in Neglect and Non-neglect Patients in the Acute Phase of Stroke.

Objective: Motor perseveration has been reported in 30-90% of patients with neglect. These patients repetitively re-mark items in cancellation tasks or futilely elaborate on details in drawing on the ipsilesional side. It has been suggested that motor perseveration is related to impaired spatial working memory or to executive failure on top of a spatial bias. The aim of this study was to examine motor perseveration in neglect and non-neglect patients and to scrutinize its relation with working memory, executive function, and clinical outcome.

Participants and Methods : The present study included 207 patients who were examined at a mean interval of 7.3 +/- 3.9 days post-stroke. Unilateral neglect was assessed with the Star Cancellation using a lat-

erality index. Motor perseveration was operationalized as re-markings on the Star Cancellation and elaboration on the Rey Figure. The Digit Span and Corsi Block Span were administered to assess working memory, Fluency and Visual Elevator to assess executive function, and Barthel Index for clinical outcome.

Results : For the acute stroke population as a whole, 44% demonstrated perseveration on the Star Cancellation and 27% on the Rey Figure; 23.7% demonstrated unilateral neglect. Neglect patients showed more re-markings ($p < 0.05$) and more often perseveration on copying ($p < 0.001$) than non-neglect patients. In neglect patients, motor perseveration was related to neglect severity ($p < 0.01$), but not to working memory or executive function. Neglect patients with motor perseveration demonstrated a poorer Barthel Index than those without perseveration ($p < 0.05$). In non-neglect patients, motor perseveration was related to Fluency ($p < 0.05$) and Elevator performance ($p < 0.05$).

Conclusions : These findings suggest different mechanisms for motor perseveration in neglect and non-neglect patients which will be discussed. Neglect patients who show motor perseveration demonstrate a worse clinical outcome than neglect patients without motor perseveration.

Correspondence: *Gudrun M. Nys, PhD, Psychological Laboratory, Utrecht University, Heidelberglaan 2, Utrecht 3584CS, Netherlands. E-mail: g.nys@fs.uu.nl*

K.E. HOKENSON, R.R. ANFANG, J. FELLUS & A.M. BARRETT. Can We Improve Care Plans for Right Hemisphere Stroke and Spatial Neglect?

Objective: Spatial neglect is a failure to orient, report or respond to stimuli in the side of space opposite a brain lesion (Heilman, 1979), when associated with functional disability. Understanding spatial neglect and its impact on recovery is important in assessing rehabilitative care. We wished to determine if spatial neglect negatively influenced length of stay or functional independence in acute rehabilitation, and assess differences in care plans for subjects with and without spatial neglect.

Participants and Methods : We reviewed consecutive medical records of 69 of 160 people admitted to an acute rehabilitation care facility 12/3/2003- 12/23/2004 with a right brain stroke, and recorded: demographic data, length of stay, admission cognitive, motor and total Functional Independence Measure (FIM), and FIM change. We also qualitatively examined therapies and medications patients received, and whether they were seen by neuropsychological or neuro-optometric consultants.

Results : People with spatial neglect had longer mean rehabilitation stays (mean 19.4 versus 15.2 days), but this did not reach significance. Spatial neglect was associated with lower cognitive (neglect mean 15.4; no neglect 22.5; $p < 0.001$) and total admission FIM (neglect mean 39.6; no neglect 51.9; $p < 0.05$), but motor FIM difference between subjects with spatial neglect and those without neglect did not reach significance (neglect mean 23.8; no neglect 29.41; $p = 0.067$). Documentation reflected neuropsychological consultation in 69% of subjects with spatial neglect, and neuro-optometric consultation in 54%, although all subjects with spatial neglect received speech, occupational and physical therapy care.

Conclusions : Our results support previous reports of an adverse effect of spatial neglect on acute rehabilitation. An expanded role for specialists may be available in care of spatial neglect, where developing care plans, which may include targeted or more intensive therapy, may improve the result of rehabilitation and post-stroke recovery.

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*

Poster Symposium 3

9:00–10:30 a.m.

The Quantified Process Approach - New Directions in Neuropsychological Assessment

J.L. WOODARD. Memory Performance Indexes for the Rey Auditory Verbal Learning Test: Clinical Application of the Quantified Process Approach.

Word list learning measures have historically lent themselves well to the development of indexes that describe component aspects of learning and memory. The Rey Auditory Verbal Learning Test (RAVLT; Rey, 1958) is an example of a word list learning measure for which numerous memory performance indexes have been derived. Some of these performance indexes were clinically based process measures developed by Rey himself, whereas other measures have their foundations in information processing theory and/or cognitive psychology (e.g., Woodard, Dunlosky & Salthouse, 1999). While a number of these indexes describe aspects of memory processes in a qualitative sense, relatively few have been translated into quantitative indicators that can unite descriptors of learning and memory processes with normative information. This presentation will briefly review the historical development of the AVLT, describing the process indicators that were identified by Rey as providing clinically meaningful information. Next, Rey's process indicators and more recently developed memory performance indexes that have been derived from the RAVLT will be reviewed, with an emphasis on illustrating the utility of applying the Quantified Process Approach to these measures. These illustrations will demonstrate how the Quantified Process Approach can facilitate interpretation of both normal age-related changes as well as aspects of memory pathology in clinical groups. Correspondence: Amir M. Poreh, Ph.D., Psychology, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115. E-mail: aporeh@yahoo.com

P.K. SHEAR. Quantitative Aspects of Block Design Performance.

The block design task was initially developed as a measure of intelligence, and it is commonly administered to assess visuoconstructural ability. In addition, it has been widely held that qualitative aspects of the process patients apply to solving block design items can provide lateralizing and localizing information about cerebral dysfunction. Guidelines about the interpretation of qualitative features of block design performance have been based largely on clinical impressions and case studies of individual patients. More recently, however, a small but growing number of studies have been conducted to quantify indices that provide information about block design process. This presentation will begin with a summary of experimental studies in children and adults that have explored the impact of specific stimulus features of block design items on task performance. Studies of the reliability with which qualitative aspects of performance can be recorded and codified will be reviewed, as well as validity data drawn from patients with neuropsychiatric disorders and the available normative data for these process measures. Final comments will address the implications of the existing literature for clinical interpretation of quantitative process measures and for future research and test development.

Correspondence: Amir M. Poreh, Ph.D., Psychology, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115. E-mail: aporeh@yahoo.com

D.J. LIBON. Executive Control and Working Memory Deficits in Cortical and Subcortical Dementia: A Process Neuropsychological Analysis.

The terms and 'subcortical' dementia describe syndromes with very different cognitive deficits. Past research shows that distinctive patterns of executive control deficits in Alzheimer's disease (AD) and vascular dementia (VaD) can be obtained with a process analysis of errors. Perseveration - Errors from the Graphical Sequence Test suggests perseverations made by AD patient are context dependent and related to semantic/lexical retrieval deficits. Perseverative behavior in VaD is context independent and related to impaired rudimentary motor operations. Concept Formation - AD and VaD patients make very distinctive errors on the WAIS-R Similarities subtest. AD patients may produce a superordinate albeit vague response (i.e., inset errors; dog-lion - you can have these them). Errors produced in VaD can be grossly out of set (dog-lion - one barks, one roars). A factor analysis shows inset errors are related to the ability to access semantic information, while out-of-set errors are related to gross executive deficits. Working Memory - For digits backwards an alternative scoring method is to assign 1 point for the correct recall of digits regardless of serial order (ANY ORDER) vs. 1 point when digits are recalled in their correct serial order (SERIAL ORDER). ANY ORDER may provide a measure of rehearsal while SERIAL ORDER may provide a measure of manipulation. No differences were found with respect to ANY ORDER recall. VaD patients obtained lower SERIAL ORDER scores suggesting differential impairment in manipulation. Processing Speed - When controlled for total output, the percent words generated on tests of letter fluency in AD is similar to normal elder performance. VaD patients tend to generate their maximum in the first 15s. Such analyzes provide a measure of bradyphrenia. In sum, a process analysis of errors is able to provide operational definitions of executive constructs that separate cortical from subcortical dementia syndromes.

Correspondence: Amir M. Poreh, Ph.D., Psychology, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115. E-mail: aporeh@yahoo.com

A.M. POREH, D. ALLEN & A. HUBLEY. The Quantified Process Approach - Providing Higher Resolution to Existing Neuropsychological Tests.

For the past decade numerous researchers have published articles attempting to quantify the process approach. Much of this work has gained considerable recognition, but its clinical utility has been limited due to the lengthy training and time it takes to score these aspects of psychological tests. Since 2000, the author of this presentation has been working on the development of new computer methodologies for quantifying the process approach. In this presentation, these computer based methodologies will be presented for the first time, demonstrating how the resolution of some of the most widely used measures in neuropsychology can be significantly enhanced. Methods for re-examining performance on tests such as the Trail Making Test, Porteus Mazes, and Clock Drawing Test will be demonstrated, allowing for clinical researchers to obtain empirical data regarding the decision making and errors that underlie patient performance on these widely used tests. It will be shown how theoretical models can be applied to everyday clinical practice and research, thus enhancing assessment techniques.

Correspondence: Amir M. Poreh, Ph.D., Psychology, Cleveland State University, 2121 Euclid Avenue, Cleveland, OH 44115. E-mail: aporeh@yahoo.com

Paper Session 5

11:15 a.m.–12:45 p.m.

Neuropsychology and Aging

J.L. WOODARD, L.S. MILLER & L.W. POON. Neuropsychological Predictors of Functional Capacity in Centenarians and Octogenarians.

Objective: The purpose of this study was to identify and compare neuropsychological predictors of basic (BADL) and instrumental (IADL) activities of daily living performance in a population based-sample of octogenarians and centenarians.

Participants and Methods : 78 octogenarians and 217 centenarians were administered a battery that included: Fuld Object Memory Evaluation (FOME), verbal phonemic fluency, WAIS-III Similarities, Behavioral Dyscontrol Scale (BDS) and Severe Impairment Battery (SIB), as well as directly observed, standardized measures of BADL and IADL performance (Direct Assessment of Functional Status) and the Health & Safety scale of the Independent Living Scale [H-S]). Hierarchical regression analyses, entering the SIB first to control for global cognition, were used to evaluate cognitive predictors of functional capacity for each group.

Results : All measures of functional capacity correlated strongly with all cognitive measures ($r=.45$ to $.96$) for both groups, with the SIB ($r=.74$ to $.96$) and BDS ($r=.63$ to $.90$) showing the strongest correlations. For centenarians, the BDS, FOME Recall and Similarities predicted unique variance in IADL and H-S performance beyond SIB performance, but only the SIB predicted BADL performance. For octogenarians, Similarities and BDS accounted for unique variance beyond the SIB for BADL performance, but only the BDS predicted H-S performance beyond the SIB and no cognitive measures predicted IADL performance beyond the SIB for octogenarians.

Conclusions : IADL competency has multiple cognitive components for centenarians that include executive functioning skills and memory. These abilities may be needed to compensate for age-related declines in global cognitive abilities that are less prominent in octogenarians.

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*

R. CABO, A.M. BRICKMAN & J.J. MANLY. Interaction of Literacy and Education on Dementia Risk among Ethnically Diverse Elders.

Objective: To examine the independent influences of literacy and years of education on risk for dementia.

Participants and Methods : Participants were selected from an epidemiological study of aging and dementia among elderly residents of Northern Manhattan, NY. None had psychiatric or cognitive deficits at baseline. Baseline examinations were followed every 18 months with repeat medical, neurological, psychiatric, and neuropsychological examinations. English literacy was assessed with the Reading Recognition subtest of the WRAT-3. Four education (<12 vs. 12+ years) x literacy (WRAT-3 score < 48 vs. 48+) groups were created.

Results : The final sample ($n=1,192$) had a mean age of 76.1 ± 6.3 years, mean duration of follow-up of 3.7 ± 2.7 years, included 67.2% women, and described themselves as Caucasian (43.3%), African American (48.9%), Hispanic (3.9%), and "other" (2.0%). The risk of incident dementia associated with membership in four education (low vs. high) by reading level (low vs. high) groups was examined after adjusting for sex, age, and ethnicity. Compared to the high education–high reading level reference group, risk of developing dementia was higher

in the low education–high reading level group [1.3 (95% CI: 0.4 - 4.2)] and the high education–low reading level group [2.0 (95% CI: 0.6 - 6.1)], but only the risk associated with membership in the low education–low reading level group [4.7 (95% CI: 1.8 - 12.2)] reached statistical significance.

Conclusions : Years of education and reading level are independent and additive predictors of incident dementia among this ethnically diverse cohort of English speaking elders.

Correspondence: *Jennifer J. Manly, Ph.D., Columbia University Medical Center, 630 West 168th St., P&S Box 16, New York, NY 10032. E-mail: jjm71@columbia.edu*

M.M. BURNETT, J.H. KRAMER, M.E. WETZEL, D. MUNGAS, B.R. REED, M.W. WEINER, B.L. MILLER & H.C. CHUI. Longitudinal Brain Changes Predict Executive Function Decline in Healthy Aging.

Objective: Numerous cross-sectional studies have documented cognitive decline and structural brain changes in healthy aging. The purpose of this study was to examine relationships between longitudinal change in brain structure and change in memory and executive functioning in normal aging.

Participants and Methods : We studied 53 elderly controls (22 male, mean age=74.1, mean MMSE=29.0, mean education=15 years). Subjects were studied at baseline and follow-up (mean interval=44 months) with brain MRI and neuropsychological testing. MR image processing yielded volumes of cortical gray matter (CG), hippocampus (HV), and white matter signal hyperintensity (WMSH). Neuropsychological testing yielded psychometrically robust composite scores for executive functioning and memory.

Results : Multiple regression was used to determine MRI predictors of change in memory and executive functioning. In each analysis, follow-up cognitive scores were the dependent variable. Baseline cognitive scores were entered into the model first, followed by changes in CG, HV, and WMSH. None of the MRI change scores predicted memory performance at follow-up. For executive functioning, however, longitudinal change in MRI explained an additional 16% of the variance ($p<.001$). Each MRI change score remained in the model (CG: $\beta=.28$, $p<.005$; HV: $\beta=.19$, $p<.05$; WMSH: $\beta=-.24$, $p<.01$), with age-related decline in executive functioning predicted by smaller CG and HV, and increased WMSH.

Conclusions : These results indicate that age-related decline in executive function is predicted by changes in CG, HV, and WMSH. No relationship between memory and MRI volumes was discerned. This report is among the first to describe a longitudinal relationship between brain structure and cognitive function in normal aging, revealing a potential link between MRI markers of cerebrovascular disease and executive functioning.

Correspondence: *Molly M. Burnett, Memory and Aging Center, University of California at San Francisco, 350 Parnassus Ave, Suite 706, San Francisco, CA 94143-1207. E-mail: molly_burnett@yahoo.com*

S. HAN, W.S. HOUSTON, A.J. JAK, L.T. EYLER, B.J. NAGEL, A.S. FLEISHER, G.G. BROWN, J. COREY-BLOOM, D.P. SALMON, L.J. THAL & M.W. BONDI. Verbal Paired-Associate Learning by APOE Genotype in Non-Demented Older Adults: fMRI Evidence of a Right Hemispheric Compensatory Response.

Objective: Previous studies of episodic memory report a greater extent of blood oxygenation level dependent (BOLD) response in non-demented older adults with the apolipoprotein E epsilon-4 (APOE $\epsilon 4$) allele than in those without the allele. These studies implicate an over-recruitment of right hemispheric activity in $\epsilon 4$ subjects regardless of the modality of stimulus material. However, many of these studies have methodologi-

cal difficulties that complicate their interpretation. Therefore, we conducted a functional MRI study to investigate whether APOE genotype is related to brain response to verbal paired-associate encoding and consolidation, particularly in the right hemisphere, among healthy non-demented older adults.

Participants and Methods : Twenty-five non-demented older adults (13 non- $\epsilon 4$ and 12 $\epsilon 4$ subjects) learned a set of 16 word-pairs in a learning-to-criterion format. Subjects were then scanned while viewing previously studied word-pairs and new word-pairs. Structurally-segmented volumes were measured, and BOLD response was assessed throughout the brain and specifically in hippocampal regions of interest (ROIs) manually outlined in native space.

Results : The $\epsilon 4$ group displayed greater activation than the non- $\epsilon 4$ group in multiple right hemisphere regions for previously encoded word-pairs relative to fixation. Activation from manually outlined hippocampal ROIs also displayed genotype-specific dissociations consistent with whole-brain analyses. Furthermore, this differential BOLD response occurred in the presence of equivalent behavioral and neuropsychological performances as well as comparable hippocampal and overall structural segmentation volumes between groups.

Conclusions : Results implicate a widely-distributed and interconnected network of right hemisphere brain regions that may be involved in compensating for APOE $\epsilon 4$ -related deficiencies associated with verbal episodic memory encoding and consolidation.

Correspondence: *S. Duke Han, PhD, Psychiatry, UCSD, Psychology (116B), 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: duhan@ucsd.edu*

N. WOLFE, D.C. DELIS, E. KAPLAN & J.H. KRAMER. The Role of Executive Functions and Education on Memory Performance in the Elderly.

Objective: Education is associated with preserved memory with aging, but the underlying mechanisms are not clear. We hypothesized that the effect of education may be mediated by executive functions.

Participants and Methods : Three hundred and sixty three healthy elderly participants aged 50-89 (mean age=69.9 years) completed the D-KEFS (Delis-Kaplan Executive Function System) including California Card Sorting Test, Verbal Fluency tests, the California Verbal Learning Test (CVLT-II) and WASI full scale IQ testing.

Results : Mean CVLT-II 20 minute delay free recall was 8.8 (s.d.=3.4). Education level was correlated with delayed recall on the CVLT (Pearson $r=.26$, $p<.001$) explaining 6.2% of the variance. Multiple stepwise linear regression with memory (delayed recall on the CVLT) as the dependent variable, with age, IQ, education and verbal fluency as independent variables, showed verbal fluency explained 13.3% of the variance in memory score (Beta = .19, $t = 3.1$, $p = .002$) with education level contribution no longer significant (Beta = .03, $t = .59$, $p = .56$). In a similar regression, California Card Sort Test performance explained 11.9% of the variance in memory (delayed recall on the CVLT) score (Beta = .15, $t = 2.4$, $p = .02$) while education level did not contribute significantly (Beta = .06, $t = 1.0$, $p = .31$).

Conclusions : Results highlight the importance of executive functioning on memory performance, even after controlling for IQ. In addition, education's association with memory was non-significant when the contributions of these measures of executive functions were considered.

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

A.L. JEFFERSON, D.F. TATE, A. POPPAS, S. WONG, R.H. PAUL, J. GUNSTAD, R.A. COHEN & A.M. BRICKMAN. Subcortical hyperintensities are associated with systemic hypoperfusion in geriatric cardiac patients.

Objective: The present study examined the relationship between systemic hypoperfusion via cardiac output (CO) and MRI indices including white matter hyperintensities (WMHs) and total brain volume (TBV).

Participants and Methods : Geriatric outpatients with treated, stable cardiovascular disease and no history of neurological illness ($n=36$, ages 56-85) underwent echocardiogram for Doppler derived CO as well as MRI acquisition. WMHs were quantified separately for three anatomic and functionally related areas: periventricular WMHs, neocortical WMHs, and subcortical WMHs. TBV was also quantified.

Results : WMHs data were log-transformed for statistical analyses. Partial correlations adjusting for age and systolic blood pressure yielded a significant relationship between subcortical WMHs and CO ($pr = -.37$, $p = .03$) but not between CO and total WMHs, periventricular WMHs, neocortical WMHs, or TBV. A second set of partial correlations adjusting for age and history of hypertension yielded similar results such that there was a significant association between subcortical WMHs and CO ($pr = -.43$, $p = .03$) but not for any of the remaining MRI variables (i.e., total WMHs, periventricular WMHs, neocortical WMHs, or TBV).

Conclusions : Findings support a relationship between reduced systemic perfusion and the integrity of subcortical white matter. These data augment our previous work depicting a relationship between reduced CO and executive functioning impairments sensitive to frontal-subcortical circuitry.

Correspondence: *Angela L. Jefferson, PhD, Alzheimer's Disease Center, Department of Neurology, Boston University School of Medicine, Robinson Complex, Suite 7500, 715 Albany Street, Boston, MA 02115. E-mail: angelaj@bu.edu*

Symposium 19

11:15 a.m.–12:45 p.m.

Assessing the Contribution of Vascular Disease in Demented and Non-Demented Patients: The Paradigm of Vascular Load

D.J. LIBON & K.M. HEILMAN. Assessing the Contribution of Vascular Disease in Demented and Non-Demented Patients: The Paradigm of Vascular Load.

Symposium Description : There is now keen interest in the association between vascular disease and cognitive decline. Recent research with dementia patients and patients with mild vascular cognitive impairment suggests that the manner in which vascular disease influences clinical presentation is more complex than previously believed. For example, some reports suggest that vascular disease may alter the distribution and number of senile plaques. Risk factors traditionally associated with stroke/ vascular dementia (VaD) are now also associated with Alzheimer's disease (AD). Although AD and VaD are associated with differential impairment in memory and executive control, respectively, considerable overlap can be present in individual patients.

The term vascular load is designed to suggest a paradigmatic shift in assessing the impact of vascular disease on cognition. The paradigm of vascular load does not seek to replace the commonly used diagnostic criteria for AD/ VaD. However, rather than assuming a specific biologic substrate will lead to a signature clinical presentation, the paradigm of vascular load asks the question what percent of variance does one data set (e.g., imaging/ biomarker parameters) account for in relation to another data set (e.g., neuropsychological variables). Instead of viewing the relationship between vascular disease and alterations in cognition as a set of discrete or categorical variables, the paradigm of vascular load may be viewed as a regression model.

The papers contained in this symposium seek to employ imaging and/or biomarker variables as either grouping variables. Neuropsychological data are used as outcome variables. The benefits to be realized using the paradigm of vascular load are greater cogency regarding the clinical/theoretical constructs that underlie vascular disease and alterations in cognition and potential new directions in developing strategies to treat and manage patients with vascular disease.

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

M. LAMAR, C.C. PRICE, D.J. LIBON, K.S. SCHMIDT, D.L. PENNEY, E. KAPLAN & K.M. HEILMAN. Leukoaraiosis and Working Memory Deficits in Dementia.

Objective: This research investigated working memory (WM) deficits in dementia. This study used the 40-point Junque Leukoaraiosis (LA) Scale to quantify MRI-LA and divide dementia patients into groups with little to mild LA (LO-LA; n=34) vs. moderate to severe LA (HI-LA; n=32).

Methods: WM was assessed with a modified digits backward task whereby patients were presented with seven 3, 4, and 5 span test trials (total trials=21). Drawing from prior work of Baddeley and Smith & Jonides, a WM-rehearsal mechanism was defined by tallying the number of correctly recalled digits regardless of order (ANY ORDER; 47981 - 18943; score=4). A WM-manipulation mechanism was defined by tallying digits recalled in correct serial order (SERIAL ORDER; 47981 - 18943; score=3). Qualitative errors believed to reflect frontal systems dysfunction were also tallied.

Results: Core main findings are as follows: 1.) There was no difference for any ANY ORDER comparisons suggesting equal WM-rehearsal functioning regardless of LA load. However, the HI group obtained lower SERIAL ORDER scores across all span lengths suggesting differential WM-manipulation impairment; 2.) ANY and SERIAL ORDER recall was assessed with separate step-wise regression analyses forcing MMSE before step-wise procedures for composite executive control, language, and memory indices. ANY ORDER recall was related to only to dementia severity (MMSE; 17% variance). SERIAL ORDER performance variance was explained by both dementia severity (MMSE; 21%) and the executive control index (14%). **Conclusion:** These results suggest that quantified measures of MRI-LA coupled with a simple test of WM can address the clinical question of whether white matter matters, but theoretical questions regarding select aspects of working memory/ frontal system dysfunction in dementia.

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

R. COHEN, R. PAUL, D.J. MOSER & P. MALLOY. Vascular Cognitive Impairment: Evidence for relationships among peripheral vascular function, structural brain abnormalities, and cognition.

Objective: A relationship between subcortical white matter abnormalities and cognitive dysfunction in vascular dementia (VaD) is known to exist. Yet, this relationship is not a simple one, as patients with VaD also exhibit cortical morphometric changes that may be associated with global cognitive dysfunction than are white matter abnormalities.

Methods: In an effort to understand the relationship between specific vascular risk factors, MRI brain abnormalities, and the development of cognitive impairments, we studied 180 elderly adults with significant cardiovascular disease (CVD), but no known clinical history of neurological or cognitive impairments. Measures of endothelial dysfunction (brachial artery reactivity and inter medial carotid thickness and stiffness) were collected along with measures of cardiac output, and blood pressure variability. Subcortical hyperintensities (SH) on FLAIR MRI brain imaging were determined by semi-automated thresholding, along with cortical gray matter volume by segmentation.

Results: Our results indicate that SH quantity is associated with speed of processing and executive functioning in CVD patients ($R^2 = .56, p < .01$), and is more strongly related to cognition compared to cortical volume. These findings contrast with VaD patients among whom reduced cortical volume seems to play a greater role. Both SH volume and cognitive measures of processing speed and certain attention/executive functions were associated with brachial artery reactivity ($R^2 = .44, p < .05$), carotid thickness and stiffness ($R^2 = .42, p < .05$), as well as cardiac output and blood pressure variability measures.

Conclusions: These results suggest a complex relationship between cardiac function, endothelial health, and development of brain dysfunction in CVD prior to the development of VaD. The importance of exploring the relationships among cardiac, peripheral vascular, and cerebrovascular functions in the development of VCI is supported.

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

G.T. STEBBINS, D.L. NYENTHUIS, C. WANG, L. DETOLEDOMORRELL, S. FREELS, R. BAMMER, M. MOSELEY & P.B. CORELICK. The Changing Nature of Vascular Load Following Ischemic Stroke.

Objective: White matter integrity contributes to cognitive function in post-ischemic stroke patients. However, the extent of this vascular load measure may change over time. We examined changes in normal appearing white matter (NAWM) integrity over a three-year observation period.

Method: Diffusion tensor imaging (DTI) scans from 80 consecutively approached ischemic stroke patients (mean [SD] values: age = 63.8 [8.7]; education = 14.0 [3.1]; total stroke number = 2.3 [2.5]; Stroke Severity Scale = 1.6 [2.0]; CDR = 0.3 [0.5]) were examined for baseline (within 3 to 6 months post stroke) and up to three years follow-up during annual scanning. Values of NAWM integrity were derived from individual fractional anisotropy (FA) maps. Changes in NAWM integrity were assessed using a mixed effect regression model.

Results: After age and baseline FA were entered as covariates of no interest, a linear increase in FA over time was found ($F[1,145] = 30.68, p < .001$). Adjusting for a quadratic function further increased the fit ($F[1,145] = 5.56, p < .02$) demonstrating that the best fit to the data was an increase in NAWM integrity from baseline to year 2 follow-up, with a stabilization in FA values by year three follow-up.

Conclusion: Our findings highlight the importance of examining for changes in vascular load when attempting to understand its relationship to cognitive function. In this sample, improvements in NAWM integrity extended over at least two years following ischemic stroke. The effects of this slowly evolving improvement on cognitive function needs further study.

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

D.L. NYENTHUIS, L. PEDELTY, G.T. STEBBINS, L. DETOLEDOMORRELL, S. FREELS, S. BYRD, M. JHAVERI, C. WANG, K. SRIPATHIRATHAN, J. WILLIAMSON & P.B. CORELICK. Factors Associated with Post-Ischemic Stroke Cognitive Impairment.

Objective: To examine the significance and independent contribution of demographic (age, education), stroke-related (stroke number, left hemisphere stroke, stroke volume), volumetric (normalized hippocampal and entorhinal cortex volume), and other imaging-related factors (ventricle-brain ratio, whole brain white matter DTI fractional anisotropy, VBM-measured thalamic density, white matter hyperintensity load) to cognitive impairment 3 to 6 months post ischemic stroke.

Method: 112 consecutively ischemic stroke patients (mean [SD] values: age: 65.04 [9.0]; education: 13.93 [3.78]; stroke number: 1.74 [1.98]; Stroke Severity Scale: 1.67 [1.97]; CDR: 0.35 [0.52]) participated. Linear regression analyses were completed with age and education forced into the model in step 1 and the remainder of factors eligible for forward stepwise entry in step 2. Dependent variables were principal component scores generated from neuropsychological tests in cognitive areas sensitive to vascular cognitive impairment (overall, working memory, encoding memory, and psychomotor).

Results: After age and education were forced into the model, the presence of any left hemisphere stroke and thalamic density were significant independent predictors of overall cognitive impairment ($R = .591$), working memory ($R = .592$), and psychomotor skill ($R = .713$). Normalized hippocampal volume was an additional predictor of encoding memory ($R = .621$). The remaining variables did not contribute to the models.

Conclusion: These results highlight the importance of thalamic integrity to cognition and suggest potential thalamic involvement in post-stroke cognitive abilities in addition to the deficits associated with frank thalamic infarction noted in other studies. The relationship of left sided infarction to cognition is consistent with previous findings.

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

C.C. PRICE, D. BOWERS, I. SCHMALFUSS, D.J. LIBON, K.M. HEILMAN, D. DICKEY, P. GEARSEN & T.G. MONK. Pre-Operative White Matter Alterations Predicting Post-Operative Cognitive Decline in Healthy Older Adults.

Objective: A prospective study examined whether specific pre-operative neuroanatomical variables predicted severity/ type of cognitive change after orthopedic surgery among non-demented older adults. Based on the concepts of vascular brain burden and threshold theory, we hypothesized that individuals with greater white matter alterations (WMAs) within the deep regions of the brain, as determined by MRI, will exhibit greater post-surgical decline in executive functions.

Participants and Methods: Total knee replacement surgery patients ($n=31$) and age-osteoarthritis matched controls ($n=15$) completed a baseline brain MRI and neuropsychological measures at baseline, acute post-surgery (2-week) and then 3-months later. WMAs were assessed within the periventricular, deep and subcortical regions using a semi-automated pixel threshold method. Analyses were conducted on percent WMA by region (region/total WMA) and neuropsychological composite change scores.

Results: The surgery and nonsurgery groups were comparable in terms of baseline demographic, intellectual and regional WMA severity (all p values $>.10$). Although there were significantly more WMAs in the periventricular region relative to deep and subcortical regions (all $p <.001$), only deep region WMAs correlated with a post-surgery decline in executive function ($r = -.42, p=.02$). Relationships between baseline WMAs and cognitive change variables were not observed for the control group (all r values $<.2, ns$).

Discussion: Acute post-operative cognitive decline among healthy older adults, specifically on measures assessing executive function, is at least partially explained by pre-surgical vulnerability within the deep white matter region of the brain. These findings support the concept of vascular brain burden and the threshold theory. Supported by F32 AG021363-01, MO1-RR00082

Correspondence: *David J. Libon, Ph.D., Center for Aging, UMDNJ-SOM, Suite 1800, 42 East Laurel Rd, Stratford, NJ 08084. E-mail: libondj@UMDNJ.edu*

Paper Session 6

11:15 a.m.–12:45 p.m.

Executive Abilities in Children

L. EWING-COBBS, M.R. PRASAD, P.R. SWANK, M. BARNES & X. ZHANG. Development of Working Memory and Inhibitory Control Processes Following Early Traumatic Brain Injury.

Objective: To characterize the development of working memory and inhibitory control processes five years after moderate to severe inflicted and noninflicted traumatic brain injury (TBI) sustained during infancy and preschool years.

Participants and Methods : Children sustaining inflicted and noninflicted TBI between the ages of 4 and 71 months were enrolled in a prospective, longitudinal study. Mean age at injury was 21 months; mean age at assessment was 89 months. Working memory and inhibitory control scores from the TBI group ($n=23$) and a community comparison group ($n=21$) were compared using ANCOVA with age at assessment as a covariate.

Results : The TBI group scored lower than the comparison group on the Stationary Boxes score reflecting efficiency of retrieval of spatial information from working memory, $p=.0319$, but did not differ on a Delayed Matching to Sample task. Inhibitory control tasks evaluated shifting set, inhibiting motor movements, and delaying responding. On the Spatial Reversal task, younger children with TBI had difficulty maintaining a response set, $p=.0312$. The TBI group scored lower than controls only on inhibition trials of Simon Says, a behavioral go-no go task, $p=.0415$, and on verbal interference trials from the Same World, Opposite World task, $p=.0159$. Performance on Delayed Gratification and Forbidden Toy tasks evaluating delay or inhibition of behavioral responding did not differ across the groups.

Conclusions : Children sustaining early TBI had difficulties on measures of spatial working memory and on inhibitory control tasks requiring behavioral inhibition and control of verbal interference. These findings suggest vulnerability of executive processes often attributed to dorsolateral frontal networks. Supported by R01-NS029462.

Correspondence: *Linda Ewing-Cobbs, PhD, Pediatrics, University of Texas Health Science Center at Houston, 7000 Fannin, Suite 2401, Houston, TX 77030. E-mail: linda.ewing-cobbs@uth.tmc.edu*

S. CHRIST, R. STEINER, D. GRANGE, R. ABRAMS & D. WHITE. Inhibitory Control in Children with Prefrontal Dysfunction Related to Phenylketonuria.

Objective: A number of past studies have identified impairments in executive abilities such as strategic processing and working memory in children with early-treated phenylketonuria (PKU); however, findings have been inconsistent in terms of the integrity of inhibitory control, another executive ability. The goal of the present investigation was to shed additional light on inhibitory control in children with PKU.

Participants and Methods : Four inhibitory tasks (i.e., flanker, Stroop, go/no-go, antisaccade) were administered to 26 children with PKU and 25 typically developing control children. A neutral/baseline condition for each inhibitory task was included to allow us to control for individual differences in other cognitive abilities (e.g., processing speed, memory, etc.) that may have influenced performance.

Results : Children with PKU performed more poorly than typically developing children on the two inhibitory tasks that placed the largest demands on inhibitory control (i.e., go/no-go, antisaccade). The observed inhibitory impairment was comparable for older and younger children with PKU.

Conclusions : Our findings suggest that the inhibitory deficit associated with PKU is subtle, and inconsistent findings in past studies may be due largely to the insensitivity of experimental manipulations in some tasks. Correspondence: *Shawn E. Christ, Ph.D., Psychology, Washington University, Campus Box 1125, 1 Brookings Drive, St. Louis, MO 63130-4899. E-mail: shawnchrist@wustl.edu*

E.L. WODKA, M. MAHONE, J.G. BLANKNER, J.C. GIDLEY LARSON, S. FOTEDAR, M.B. DENCKLA & S.H. MOSTOFSKY. Evidence That Response Inhibition is a Primary Deficit in ADHD.

Objective: To examine response inhibition in children with ADHD using three go/no-go tests that systematically varied the demand for working memory and the availability of response costs and rewards.

Participants and Methods : Children, ages 7-17, with ADHD (n = 40) and controls (n = 53) were administered three computerized go/no-go tests. The "simple" go/no-go test incorporated an overlearned stimulus-response association (green = go, red = no-go) that minimized working memory demands. The "cognitive" go/no-go test increased working memory demand using instructions to inhibit responding to red stimuli only when preceded by an odd number of green stimuli. The "motivation-linked" go/no-go test used the simple go/no-go design with response cost for incorrect and rewards for correct responses.

Results : Children with ADHD made significantly more commission errors on the simple, cognitive, and motivation-linked tests than did controls. Children with ADHD also made more omission errors and were more variable in reaction time on the motivation-linked test. In examining the effect of test, both ADHD and controls performed worst on the cognitive test and best on the simple test, although there were no significant group-by-test interactions.

Conclusions : Children with ADHD have more difficulty on tasks requiring response inhibition than controls, regardless of the degree of working memory demand or the level of feedback provided. In children with ADHD, response inhibition appears to be a primary deficit that is observed even when executive function demands of tasks are minimal. Although increasing working memory demands appears to impede response inhibition, this effect is similar in ADHD and typically developing children.

Correspondence: *Mark Mahone, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave., Baltimore, MD 21231. E-mail: mahone@kennedykrieger.org*

O.G. BERWID, J.M. HALPERIN, R. JOHNSON, JR. & D.J. MARKS. Differential Post-Error Reaction Time Slowing in Preschool Children with and without Hyperactivity/Inattention.

Objective: Slowing of reaction times (RT) for correct responses following errors made during decision tasks has been interpreted as an indication of intact self-regulatory functioning in adults as well as in school-aged children. This study mapped the development of RT slowing in preschool-aged children and examined whether ADHD symptoms are associated with an early-emerging self-regulatory deficit.

Participants and Methods : A two-choice RT task was administered to an ethnically diverse sample of three-, four- and five-year-old children classified as either 'control' (n = 46) or 'hyperactive/inattentive' (n = 12) using parent- and teacher-rated ADHD symptoms. Parametric and Chi-Square analyses were conducted to assess the developmental course of post-error slowing and to determine whether HI preschoolers exhibit a deficit in this self-regulatory ability.

Results : Both analyses examined the effects of Age and Risk Status on RT Type (correct following errors vs. correct following corrects). These analyses revealed that post-error RTs slowed significantly in the control group, an effect that did not vary with age. In contrast, a significant Risk Status x RT Type interaction indicated that hyperactive/impulsive children did not exhibit the same slowing on correct trials after errors.

Conclusions : By three years of age, children are able to regulate their behavior to compensate for non-optimal performance on RT tasks. However, this self-regulatory ability appears to be impaired in hyperactive/inattentive preschoolers already at this stage of development.

Correspondence: *Olga G. Berwid, M.A., M.Phil., Psychology, Queens College/CUNY, 6530 Kissena Boulevard, Flushing, NY 11367. E-mail: o_berwid@yahoo.com*