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Abstracts Presented at the Twenty-Fifth Annual International Neuropsychological Society Conference

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WEDNESDAY AFTERNOON, FEBRUARY 5, 1997

Poster Session 1/4:30–7:30 p.m.

IMAGING—1

H. A. WHITAKER, D. POEPPEL, & D. HOCHMAN. A Logical Problem in the Interpretation of Functional Brain Images: The Need for Independent Evidence.
PET and fMRI brain images acquired during human cognition typically show increased activity in so-called regions of interest (ROI). The problem is that these are usually accompanied by decreased activity in other brain regions that are rarely identified as ROI. Since these decreases are statistically correlated with the experimental variables, they are logically equivalent data that demand interpretation. However, since the increases and decreases are opposites, interpretation requires independent (non-imaging-derived) data, such as those from lesion studies.
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R. LINN, A. LOCKWOOD, H. SZYMANSKI, R. MOSCATI, M. PAROSKI, M. COAD, & B. MURPHY. Parsing the PASAT: A ^{15}O-water PET Activation Study in Normal Adults.
The Paced Auditory Serial Addition Test (PASAT), a multivariate measure of cognition, assesses divided attention, working memory, speed of information processing, and calculation ability. Although frequently used in clinical evaluations of brain injury, the neuroanatomical systems responsible for intact functioning on the PASAT are not known. In this study of normal adults, cerebral blood flow (CBF) measured during ^{15}O-water PET scans was evaluated during performance of the PASAT and associated control contrast tasks. Compared to rest, the PASAT produced significantly increased CBF in the bilateral cerebellum, bilateral superior temporal gyri, and right anterior cingulate. Compared to a control task (repeating previously heard numbers aloud), increased CBF was present posteriorly, including the posterior cingulate region bilaterally, and the left precuneus. These findings indicate that normal performance of the PASAT involves a complex distributed network of cerebral components, and suggest that the impaired PASAT performances typical in brain-injured samples may reflect damage to any one of a number of neuroanatomical regions.
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I. TROPE, D. LOPEZ-VILLEGAS, & R. LENKINSKI. Alterations in the Metabolism of the Brain of a Child Exposed to Lead: A Noninvasive, In Vivo Proton Magnetic Resonance Study.
This study examined the *in vivo* use of Magnetic Resonance Spectroscopy (MRS) for the evaluation of the neurotoxic effects of lead on the nervous system. A 10-year-old boy with elevated blood lead levels and associated neuropsychological deficits was evaluated using MRI and MRS methods. The findings were compared to those of his 9-year-old sibling who did not suffer lead poisoning. While both children had a normal MRI examination of the brain, the lead poisoned boy evidenced a significant alteration in brain metabolites on MRS, with a reduction in N-acetylaspartate/creatine ratio. Since N-acetylaspartate is a brain metabolite shown to decrease in processes that involve neuronal loss, these findings suggest that lead has an effect on brain metabolites as detected by MRS *in vivo*.
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C.B. BRADSHAW. Localization of Receptive Prosody in the Right Hemisphere: Evidence From Intraoperative Mapping and Functional Neuroimaging.
Interpretation of the emotional prosody (or affective intonation) of language has been attributed to the posterior right hemisphere. This talk reviews two studies assessing right hemisphere support of receptive prosody: an intraoperative mapping study, and an fMRI study. In the first study, we performed functional cortical mapping with an Ojemann stimulator on epilepsy patients undergoing awake right- and left-side craniotomies. During cortical stimulation, subjects were aurally presented with content-neutral sentences that varied in prosody. During stimulation of the left cortex, subjects did not demonstrate deficits recognizing prosody. During stimulation of the right cortex, 5 of 6 subjects made errors identifying the prosody. Areas sensitive to disruption of receptive prosody were in the posterior superior temporal gyrus. In the second, fMRI study, 3 normal adult subjects judged the prosody of aurally presented content-neutral sentences, while undergoing right-side functional MRI scanning. In the contrasting control scanning condition, the subjects were aurally presented with random numbers, and determined whether each number was odd or even. The difference in activation between the prosody discrimination task and the number differentiation task revealed activation sites primarily within the right posterior superior temporal gyri. Our findings provide additional support for, and more precise localization of, the right hemisphere's role in receptive prosody.
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M.E. QUIG, T. TURKINGTON, T. HAWK, & K.A. WELSH-BOHMER. The Neural Correlates of the Working Memory and Secondary Memory Deficits in Alzheimer's Disease Using Resting State FDG-PET.
The current study explores the neural correlates of the working memory and secondary memory deficits of Alzheimer's disease (AD) using resting

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state FDG-PET. 18 AD patients were administered a brief neuropsychological battery and underwent FDG-PET scan procedures. The results showed that performance deficits on measures of delayed verbal recall were related to hypometabolism in discrete neural regions of the temporal lobe. Unexpectedly, performance on measures of working memory and executive function did not relate to metabolic rates in the frontal lobes. Systematic regional metabolic change in 3 sub-groups of AD patients is also addressed.
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T.D. ELKIN, W.E. REDDICK, J. GLASS, M.Y. KIBBY, A.A. BIEBERICH, & R.K. MULHERN. White Matter Loss and Specific Deficits in Pediatric Medulloblastoma Patients.
Neuropsychological deficits, especially those related to learning and memory, are problematic among survivors of childhood medulloblastoma, and are hypothesized to be secondary to either cranial radiation therapy (CRT)-induced loss of functional white or gray matter. We present data associating quantitative indices of white matter volume with intellectual performance and working memory in 28 long-term survivors (7–20, median = 14 years). All patients were greater than 1 year postcompletion of CRT. White, gray, and partial matter were classified from axial T1, T2, and proton density MRI using an automated segmentation algorithm. Results indicate that white matter volume, corrected for intracranial volume (ICV), and time since CRT significantly predict Verbal IQ better than gray matter corrected for ICV, but measures of working memory and Performance IQ were unaffected.
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M. CHERRIER, L. ERCOLI, S. BOOKHEIMER, M. COHEN, & J. WANG. Changes in Cortical Activity During a Spatial *Versus* Phonological Verbal Fluency Task.
Using fMRI techniques, we investigated the nature of neural activation associated with a geographical verbal fluency task. Two different word generation strategies (phonological *vs.* spatial) were used and compared to a control task (category fluency). Three subjects and two runs per subject were analyzed. Scans were performed on a GE 3 Tesla specially designed brain mapping instrument. T values above a selected threshold were examined for signal intensity-weighted images. The geographical fluency task, spatial strategy, evidenced activation of primary visual and secondary visual association areas. These areas were not activated with the category fluency or geographical fluency phonological strategy tasks. Our findings support the view that visual imagery frequently engages cortical visual areas generally associated with primary visual perception and suggests that cognitive maps contain both semantic and spatial information which activate unique brain regions.
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T. BAUMGARDNER, S. MOTT, A. REISS, G. AAKALU, & M. DENCKLA. Neurofibromatosis Type 1 (NF-1): Enlarged Corpus Callosum (CC) Correlates with Specific Motor Findings.
To determine whether the CC in children with NF-1 is enlarged to a degree in excess of megencephaly, common in NF-1, we measured the midsagittal CC and intracranial (IC) areas of 14 NF-1 subjects and their unaffected siblings (ages 6–16 years). Five CC segments (1-5, caudal-rostral) were also measured and Wilcoxin signed rank test showed larger CC/IC ratio in the NF-1 affected children ($p < .009$) and in segment 3/IC ratio ($p < .006$). The NF-1 group segment 3 CC area correlated $-.64$ ($p = .02$) with total score for overflow movements observed during neuromotor examination. The CC appears to be abnormally large in NF-1, enlargement that appears to be related to inhibition of motor overflow.
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D. JOHNSON-GREENE, K.M. ADAMS, S. GILMAN, R.A. KOEPPE, L. JUNCK, K. J. KLUIN, S. MARTORELLO, & M. HEUMANN. Effects of Abstinence and Relapse Upon Neuropsychological Function and Cerebral Glucose Metabolism Studied with PET in Severe Chronic Alcoholism.
Prolonged excessive consumption of alcohol has been associated with a variety of cognitive disorders, particularly those subserved by the frontal lobes. Studies with positron emission tomography (PET) have shown decreased local cerebral metabolic rates for glucose (lCMRglc) in frontal regions, with correlated abnormalities in executive function on neuropsychological tests. This investigation was designed as a pilot study to examine the effects of abstinence and relapse in severe chronic alcoholic subjects studied longitudinally with PET, and with neuropsychological evaluation to assess executive functions. Six patients, including 4 who remained abstinent and 2 who relapsed following their initial evaluation, were studied twice, with interevaluation intervals ranging from 10 to 32 months. These findings suggest that abstinence is associated with at least partial recovery of lCMRglc in two of three divisions of the frontal lobes and improvement on tasks of executive function, whereas relapse leads to further declines in these areas. These results suggest the potential for at least partial recovery in abstaining alcoholic patients.
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A. ROSEN, S.M. RAO, P. CAFFARRA, A. SCAGLIONI, S.W. WOODLEY, J. CUNNINGHAM, J. BOBHOLZ, T.A. HAMMEKE, C. UMILTA, D. SALMASO, & C. LANGER. Functional MRI Correlates of Spatial Attention and Inhibition.
Spatial orienting can either be directed by endogenous (internal) or exogenous (external) cues. Endogenous attention is thought to involve anterior brain structures, whereas exogenous attention is purported to involve posterior and subcortical brain structures. While both endogenous and exogenous cuing result in facilitation of attended and inhibition of unattended locations, inhibition of return (IOR) generally occurs only for exogenously cued stimuli. In IOR, reorientation to a previously attended region of space is slower than to a different location. Nine normal subjects performed the attentional tasks while undergoing whole-brain functional MRI (fMRI). Reaction time data demonstrated inhibition of invalid cues in the endogenous condition and IOR in the exogenous condition. The fMR images supported the existence of separable brain systems mediating exogenous and endogenous orienting.
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A.R. WOODARD, B.P. HERMANN, A. BACHHUBER, S.B. PERLMAN, R. DE LA PENA, J. ROSENBEK, D. CARISKI, J.C. JONES, P. RUTECKI, & N.W. SPENCER. Preliminary Examination of the Relationship Between PET Scan Temporal Lobe Asymmetry and Level of Performance on Measures of Memory, Naming, and Verbal Intelligence in Epilepsy Surgery Candidates.
The degree of left temporal lobe metabolic asymmetry (PET) among 25 candidates for dominant (left) anterior temporal lobectomy was correlated with preoperative scores on the Auditory Verbal Learning Test, Boston Naming Test, and WAIS–R Verbal IQ. The relative severity of left temporal lobe metabolic asymmetry was not associated with VIQ and confrontation naming performances, but was associated with signifi-

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cantly poorer overall learning on the AVLT (total words) and less benefit from cueing under delayed recognition conditions. PET temporal lobe asymmetry analysis may be more sensitive to episodic than semantic memory processes.
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J. RADCLIFFE, J.M. AMBROSINO, D. RAGLAND, A. ALAVI, R. GUR, P. MOLLOY, M. NEEDLE, M. O'ROURKE, & P.C. PHILLIPS. Memory-Activated Positron Emission Tomography (PET) Functional Blood Flow Studies in Long-Term Survivors of Childhood Cerebellar PNET/Medulloblastoma or Astrocytoma.
Studies of declarative memory with activated positron emission tomography (PET) scans have identified cerebral blood flow (CBF) changes in midtemporal and prefrontal regions. The purpose of this study was to extend this work to the study of long-term survivors of childhood cerebellar PNET/medulloblastoma and astrocytomas to better understand the nature of post-treatment cognitive deficits. Fourteen subjects ages 7 to 21 were seen 2 to 8 years postdiagnosis for activated PET scans using H_2O^{15} slow bolus methods. Scans were conducted during active baseline, verbal, and visual memory tasks. Group main effect, task main effect, and Task $\times$ Hemisphere interaction were hypothesized. Preliminary results do not evidence significant group differences, nor do they demonstrate task effects or interactions. However, trends were found in the expected directions.
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E. PRIMUS, E. BIGLER, C. ANDERSON, S. JOHNSON, & R. MUELLER. Subcortical Dementia Symptoms and Corpus Striatum Degeneration Following Traumatic Brain Injury (TBI): A Quantitative Analysis of Magnetic Resonance Imaging (MRI) and Neuropsychological Assessment.
MRI studies were used to obtain the surface area of the corpus striatum in control and brain-injured subjects. Several neuropsychological tests that measure subcortical functioning were administered to the experimental group. Corpus striatum surface areas of the two groups were compared and correlated with neuropsychological testing data of the experimental group. Preliminary analyses indicate that there is significant structural damage at the subcortical level following TBI. There appear to be patterns in the neuropsychological functioning; however, further analyses are being conducted in order to make definite conclusions. These results aid in establishing a better comprehension of subcortical impairments following TBI, as well as provide predictive information. Accordingly, this can lead to improved rehabilitation with the potential of earlier compensation for subcortical deficits subsequent to TBI.
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J.T.L. WILSON, D. HADLEY, D. WYPER, & G. TEASDALE. Changes on SPECT and MR Imaging and Neuropsychological Outcome After Focal and Diffuse Head Injury.
HMPAO-SPECT and MR imaging were employed in the acute stage and at 6-month followup in 103 head-injured patients. The patients were divided into four groups on the basis of MR in the acute stage: extensive focal injuries, diffuse injuries, mixed focal and diffuse injuries, and other moderate or minor injuries. The results indicate that focal and diffuse lesions have different initial patterns on MR and SPECT, and evolve in different ways. Relationships between neuropsychological outcome and imaging in focal and diffuse groups are described.
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PSYCHOPATHOLOGY—1

T. ALLISON, J. CARNEY, & E. ZAIDEL. Co-consciousness in Dissociative Identity Disorder: Attentional Performance and Hemispheric Function.
Patients with dissociative identity disorder (DID) report having multiple selves, or "alters," which may be present simultaneously. We used dichotic listening to nonsense CV syllables to study attention during such a co-conscious state, testing two alters of a 32-year-old left-handed woman. Our prediction that division of a task between alters would improve performance was true only for stimuli presented to the right ear ($z = 2.09$, $z = 2.42$; both $p < .05$). Left ear scores showed an opposite but smaller effect, so that overall accuracy was not affected by cooperation between alters. Co-consciousness produced a strong behavioral laterality effect (ear advantage), which was uniquely sensitive to attentional demands, reversing completely when the duration of attentional focus was reduced upon retesting. Multiple personalities all share a common pool of limited attentional resources. An unusual ability to shift attention and ear advantage between cerebral hemispheres appears to be fundamental to this disorder.
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J. J. VASTERLING, K. BRAILEY, J.I. CONSTANS, A. BORGES, & P.B. SUTKER. Attention and Memory Dysfunction in PTSD-Diagnosed Persian Gulf War Veterans.
Researchers have recently focused attention on neurobiological models of posttraumatic stress disorder (PTSD). To examine neuropsychological correlates of PTSD, attention and memory performances were examined in 19 PTSD-diagnosed and 24 psychopathology-free Persian Gulf War returnees. Relative to the comparison sample, the PTSD group exhibited less proficient initial acquisition of information, heightened sensitivity to retroactive interference, greater difficulty on attention tasks thought to reflect vigilance and mental manipulation, and a propensity to make errors of commission. Results are consistent with models of PTSD that emphasize the role of hyperarousal, and implicate dysfunction of frontal–subcortical systems.
Correspondence: *Jennifer J. Vasterling, Psychology Service (116B), VAMC, 1601 Perdido St., New Orleans, LA 70115, USA.*

S. KOTLER & M. DYMEK. Emotional Distress and Neuropsychological Functioning in Persian Gulf War (PGW) Veterans.
Sixty-eight PGW veterans complaining of cognitive dysfunction underwent neurocognitive and psychological testing. Subjects who evidenced exaggeration of emotional distress were excluded from the analyses. A composite score representing overall emotional distress was correlated with scores on selected neuropsychological tests. Greater emotional distress was associated with poorer performance on tasks measuring simple reaction time, complex and sustained auditory attention and rapid sequencing, rapid visuomotor and conceptual sequencing, and delayed visual recall. The results support earlier studies that attribute complaints of neurocognitive dysfunction in PGW veterans to high levels of emotional distress. These findings also highlight the importance of taking emotional distress into account when interpreting performance on specific neuropsychological tests.
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E. PAPPADOPULOS, R. GOLDMAN, J. BATES, & R. BILDER. Neuropsychological Abnormalities Precede the Onset of Tardive Dyskinesia.
While several studies have reported an excess of neurocognitive impairment in schizophrenic patients with tardive dyskinesia, few studies have examined whether neurocognitive dysfunction precedes the onset of TD. The patients in this study were first-episode schizophrenic patients who were examined prior to and over the course of treatment with typical neuroleptics. The present study finds that patients who develop TD exhibit more

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severe neurocognitive deficits prior to and following neuroleptic treatment. In terms of the longitudinal course of the illness, the TD patients did not develop relatively greater deterioration in neuropsychological functioning. These findings point to a complex interaction of cognitive dysfunction and neuroleptic medication and provide support for neurocognitive vulnerability in the development of tardive dyskinesia.
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J.A. BATES, R.S. GOLDMAN, E. PAPPADOPULOS, & R.M. BILDER. A Neurodevelopmental Diathesis is the Basis of the Kraepelinian Form of Schizophrenia.
The present study utilized an empirical strategy that incorporated measures of neuropsychological function, demographic indices, and course characteristics to identify subtypes of patients with schizophrenia. We sought to determine whether Kraepelinian and non-Kraepelinian forms of schizophrenia are present in first episode patients. A cluster analysis was performed to identify critical premorbid as well as current measures of neuropsychological function, demographic indices, and course characteristics that would identify group membership. Analysis revealed two distinct groups, which closely paralleled the hypothesized pattern of deficits expected in Kraepelinian and non-Kraepelinian subgroups. The findings are suggestive of a strong neurodevelopmental diathesis in the Kraepelinian form of the disorder.
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I.C. SMET, R.S. GOLDMAN, B.A. BARTOK, R. TANDON, S. TAYLOR, L. DECKER, G. LELLI, B. TSANG, & S. BERENT. Neuropsychological Functioning in Patients with Schizophrenia: A Comparison of Atypical Neuroleptics.
The purpose of the present study was to identify differential effects of two frequently used atypical neuroleptics (risperidone and clozapine) on neuropsychological functioning in schizophrenic inpatients. Thirty-seven psychiatric inpatients meeting the diagnostic criteria for schizophrenia were placed in one of two groups according to their pharmacological treatment (clozapine and risperidone). There were no significant group differences in age, length of illness, or clinical symptomatology. Group performances did not significantly differ on any neuropsychological measure. These findings suggest that differential effects of neuroleptics on cognitive functioning in schizophrenic patients, in this sample, are not related to different pharmacotherapy. Consistent with findings of past studies, schizophrenic patients generally perform poorer on neuropsychological measures relative to a normative sample.
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R.S. KERN, K.S. KEE, M. McGEE, J.L. HAYDEN, & M.F. GREEN. Neurocognitive Functioning and Tardive Dyskinesia in Chronic Schizophrenia Patients.
Tardive dyskinesia (TD), a movement disturbance that affects 20 to 25% of psychiatric patients, is characterized by abnormal involuntary movements of the mouth, limbs, and trunk. The extent to which TD is associated with an increased severity of neurocognitive impairment is not well understood. We compared treatment-resistant DSM–III–R diagnosed schizophrenia patients with ($n = 14$) and without clinically significant TD ($n = 20$) on a battery of neurocognitive measures assessing domains of verbal learning and memory, procedural learning, visual discrimination, executive functioning, and motor proficiency. The results indicated that TD patients performed significantly worse than non-TD patients on measures of executive functioning, but not in other domains. These neurocognitive deficits associated with TD may (a) be a reflection of the late-occurring neuropathology underlying the movement disturbance, or (b) represent a premorbid vulnerability to the development of movement disturbances.
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J.E. HERRON, L.M. GRATTAN, E.F. ALDRICH, & P. J. ESLINGER. Secondary Mania Following Unilateral Left Frontal Lobe Damage.
Despite the high incidence of left hemisphere stroke, secondary mania is rarely reported in this population. Extant data suggest that the development and persistence of manic symptoms after dominant hemisphere lesions may be related to additional factors such as genetic predisposition, stressors, or cognitive status. Comparison of a patient with secondary mania following left frontal lobe lesion to 3 patients with similar lesions and no mania indicated that secondary mania cannot be independently explained by lesion site, cognitive profile, or the presence of psychosocial stressors. Findings support the hypothesis that a genetic predisposition is sufficient to be associated with secondary mania after damage to cortical and deep white matter of the left dorsolateral frontal lobe.
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D. ABWENDER, P. COMO, R. KURLAN, K. TRINIDAD, K. JONES, & E. HYMES. Features Resembling Tourette's Syndrome in Developmental Stutterers.
Recent theories have suggested extrapyramidal motor system involvement in developmental stuttering (DS). DS shares many clinical features with Tourette's syndrome (TS), a genetically determined extrapyramidal disorder with a rich behavioral presentation. We examined 10 child and 13 adult stutterers for characteristic neurobehavioral concomitants of extrapyramidal dysfunction. Definite or probable motor tics were observed in 48% of the sample. Obsessive-compulsive behaviors (48% of sample) and subtle attention/executive difficulties (39% of sample) were present in stutterers at rates higher than expected population prevalences, and comparable to those seen in TS. Eight participants (35%) reported a family history of tics. Findings are consistent with theories of DS that posit abnormal basal ganglia function, and raise the possibility that DS and TS are pathogenetically related.
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S. GRUBER, R. BLOOM, & D. YURGELUN-TODD. Stroop Performance in Relatives of Schizophrenic Patients.
We evaluated 125 first-degree relatives of DSM-IV schizophrenic patients, 19 first-degree relatives of DSM-IV bipolar patients, and 70 normal control subjects with the Stroop test. As hypothesized, significant differences were found between normal control subjects and relatives of schizophrenic patients on the time to complete the interference subtest ($p = .010$) and for the derived interference score ($p = .007$). Furthermore, no between group differences were found for the relatives of bipolar patients and normal control subjects on the interference subtest ($p = .573$), or the derived interference score ($p = .936$). These findings suggest that relatives of schizophrenics who are not schizophrenic exhibit less efficient attentional capacity when required to inhibit competing but incorrect responses. Our results are consistent with reports of alterations in the neuromodulatory functions of the cingulate cortex.
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D. DINKLAGE. Achievement Problems in Children Admitted to an Inpatient Psychiatry Service.
The prevalence and severity of achievement deficits were examined in 89 consecutive admissions to an inpatient child psychiatry service (ages 7–15 years). Achievement levels were significantly lower than FSIQ. Sixty-three percent of the children had at least one achievement score lower than 80 (standard score). Lower achievement levels were associated with inattention but not impulsivity as measured by a continuous performance test. The significance in terms of treatment planning and the involvement of neuropsychology on inpatient psychiatry services is discussed.
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D. J. MOORE, J.D. EVANS, J.S. PAULSEN, D.V. JESTE, & R.K. HEATON. Semantic Categorization in Older Schizophrenia Patients.
We examined semantic memory in older schizophrenia (SC) outpatients using a reaction time test that required subjects to determine whether an item was a member or nonmember of a given category. Five different conditions of semantic relatedness (typical, atypical, borderline, related, and unrelated) were used within each of nine categories. SC patients endorsed more related nonexemplars (e.g., an airplane is a bird) than controls ($p = 0.01$), suggesting an overactivated semantic network. SC patients scoring higher on items measuring hallucinatory statements and unusual thought content endorsed more related and unrelated nonexemplars as members of a given category. This study supports the concept that thought disorder, the hallmark symptom of SC, and semantic organization are related, and that these deficits may stem from the same origin.
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D.M. WHITESIDE & W. SPAULDING. Neuropsychological Deficits and Social Skill Acquisition in a Chronic Schizophrenic Population.
The current study evaluated the relationship between pretreatment neuropsychological functioning and acquisition of social problem-solving skills in a chronic inpatient schizophrenic population. Subjects were in a rehabilitation program, and were administered a neuropsychological test battery and a measure of social problem solving skills both pre- and posttreatment. The neuropsychological variables and the social problem-solving measure were factor analyzed in separate analyses, and then the resulting factor scores were placed into two multiple regression analyses along with a premorbid social functioning measure. The results indicated that pretreatment memory functioning was significantly related to acquisition of social problem-solving skills. Premorbid social functioning was also related to change in social skills, but not to posttreatment levels of social problem-solving skills.
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D.V. REYNOLDS, M. HARTLEY, & M. BEG. Toward a Computer Simulation of Brain Systems That Mediate Aggression.
A computer model based on functional neuroanatomy and functional neuroimaging was developed to simulate brain structure interaction associated with aggression. The large-scale network includes (but is not limited to) the amygdala, orbitofrontal cortex, septal area, ventral tegmental area and periaqueductal grey. The simulation, based on multivalue (fuzzy) logic, may help clarify how brain dysfunction contributes to aggression, and provide a way to evaluate methods for modifying aggressive behavior.
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A. DALTEG, M. LINDGREN, J. JENSEN, A.W. MEURLING, D.H. INGVAR, & S. LEVANDER. Dyslexia is Common Among Swedish Prison Inmates: A Replication.
In a previous study we found that more than 40% of the prison inmates in a region in Sweden were dyslexic. The aim of this study was to replicate this finding in another region. Forty-five inmates with Swedish as native language, ages 21 to 52 years, were examined with interviews, pedagogical tests, and neuropsychological assessment. Twenty-eight (62%) were diagnosed as dyslexic. This supported the interpretation in the previous study that dyslexia increases the risk of entering a criminal career and remaining in it.
Correspondence: *May Lindgren, P.O. Box 4003, S-572 04 Oskarshamn, Sweden.*

A. SCHAT & W. NORMAN. Intra- and Interhemispheric Processing in High and Low Schizotypes.
The present study provides evidence for intra- and interhemispheric processing deficits in undergraduates scoring high in schizotypy on the O-Life schizotypy scale. Responding on three divided visual field tasks differed for high and low schizotypes. An interhemispheric Stroop effect was larger for high schizotypes, possibly indicating problems in shielding independent processing in the two hemispheres. High schizotypes failed to show a RVF-LH advantage on a rhyming task, which may indicate an overreliance on RH processing for verbal information. On a picture-matching task high schizotypes did not show a larger across-hemisphere processing advantage when task difficulty was increased, indicating less responsiveness to distributing processing load for demanding tasks. The present study suggests that high schizotypes exhibit information processing deficits similar to those found in schizophrenic patients.
Correspondence: *W. Norman, Psychology Department, Redeemer College, 777 Hwy 53 East, Ancaster, ON L9K 1J4, Canada.*

S. ERTLE & C. REBOURG. Impairment of Perceptual Organization in Schizophrenia.
The aim of this study was to evaluate the quality of perceptual organization in schizophrenics. A group of schizophrenics ($n = 30$) were studied and compared to a control group matched in age (18 to 40 years), sex, education level, and laterality. Two tests were used, a test of progressive enrichment of visual information, and a description of an image taken from the Boston Diagnostic Aphasia Examination. Data analysis was performed by means of a score grid that made it possible to estimate the quality of perceptual organization. A *t*-test was used to compare the two groups. A significant lack of perceptual strategy was observed in the schizophrenics: impairment of perceptual scheme or global metastructure, disorganized visual scanning, and lack of the "causal and interactive synthetic loop" between perceptual groupings. This lack of a perceptual strategy may illustrate the frontal dysfunction in schizophrenics.
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M. BASSO & R. BORNSTEIN. Neuropsychological Deficits in Psychotic *Versus* Nonpsychotic Depression.
A broad range of neuropsychological functions was compared in samples of young adult depressed inpatients with and without psychotic features. Extending previous findings, the psychotic depressives demonstrated a broad range of deficits, including a prominent pattern of visuospatial deficits. Moreover, the psychotic depressives had a retrieval deficit on new-learning measures, while the nonpsychotic patients did not. These data are discussed relative to models asserting right-hemisphere dysfunction in depression and visuospatial deficits in schizophrenia. In the context of previous research, the current findings suggest that by accounting for individual differences, discrepancies between earlier studies of neuropsychological function in depression may be explained, and our understanding of the mechanisms by which depression influences cognition may be refined.
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MEMORY—1

M. DILLON, T. NOVACK, M. MENNEMEIER, & L. DUKE. Memory, Modality, and Traumatic Brain Injury.
Although organic amnesias may differ with lesion location, traumatic brain injury (TBI) populations are neglected in memory research. In order to differentiate theories of implicit memory, characterize TBI associated memory deficits, and better understand processes involved in rehabilitation of TBI patients, 18 TBI patients and 18 controls were tested for explicit (conscious awareness of having learned; remember words seen) and implicit (priming: report any word that comes to mind) memory in both auditory and visual modalities. Patients with TBI demonstrated impaired explicit but preserved implicit memory abilities. All subjects performed better on within- than cross-modality conditions for both explicit and implicit remembering. Patients with severe TBI performed differently from other amnestic populations. Modality of presentation was determined to be an important consideration in rehabilitation.
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B. NEWMAN, M. NEWMAN, A. KASZNIAK, & L. ALTHOFF-WEEKS. A Neurobiological Interpretation of Developmental Differences in Verbal and Nonverbal Memory: Comparisons of Adolescents, and Younger and Older Adults.

Young adolescents, younger and older adults were compared on verbal memory, and a spatial memory task believed to be sensitive to medial temporal lobe functioning: remembering the identity and location of 36 items in a 6×6 array. There was no significant difference between groups on verbal recognition or delayed recognition memory, nor on spatial or delayed spatial recall. However, the verbal free recall performance of adolescents was lower than that of the younger adults. The verbal free recall performance of older adults was not significantly different from the other two groups. Adolescents and older adults were equivalent on delayed verbal recall, but young adults were superior to the other groups. These results are discussed in terms of possible neurobiological mechanisms associated with these subtasks.

Correspondence: *Mary C. Newman, Department of Psychology, University of Arizona, Tucson, AZ 85721, USA.*

N.L. DENBURG & P.S. FASTENAU. Effects of Modality, Intentionality, and Age on Verbal Memory.

Intentional verbal memory is a commonly examined function in neuropsychological evaluation. However, many of an older adult's daily encounters consist of incidental reading material (e.g., reading the newspaper). This paper provides data from a healthy, age- and sex-stratified community sample of older adults ($N = 100$). Wechsler Memory Scale-Revised (WMS–R) Logical Memory Story B was presented to each participant. Directions (incidental *vs*. intentional) as well as presentation (reading *vs*. hearing) were experimentally manipulated. A three-factor ANOVA yielded a significant main effect for modality, with reading memory being more resistant to forgetting than hearing memory. In addition, there was a main effect for age, with younger adults performing better than older adults. It is very likely that the multimodal character of reading memory, involving both auditory and visual components, renders it more resistant to forgetting.

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L.L. CONANT, P.S. FASTENAU, B. GIORDANI, C. PERSAD, K. DOWNEY, & S. BERENT. Concept Formation in Semantic Clustering: Relationship Between Category Test and CVLT.

The present study examines the extent to which concept formation ability is predictive of semantic clustering in 63 adults diagnosed with ADD. The influences of potentially confounding variables (age, education, affect, attention) on semantic clustering are examined and statistically controlled in order to determine the unique variance accounted for by concept formation ability. Multiple regression (MR) was used to test the hypotheses. The Category Test failed to account for any variance in CVLT Semantic Clustering. Competing explanations for this finding are discussed.

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L.P. ALTMANN, D. KEMPLER, & E.S. ANDERSEN. Working Memory Tasks and Offline Semantic Tasks: Are They Measuring the Same Thing?

Numerous studies over the last two decades have associated working memory (WM) span and semantic ability in normal speakers, using semantic measures such as vocabulary, reading comprehension, and the ability to infer word meanings from context. We show that the relationship between WM and semantic ability holds even as both abilities fall below the normal range in Alzheimer's Disease. Two measures of semantic ability (naming and single word comprehension) are shown to share significant amounts of variance with two WM measures, listening span and ordering. Instead of proposing that deficits in either WM or semantic function cause impairment in the other domain, we suggest that both semantic and WM tasks are affected by a common variable—damage to connections within the semantic system.

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H. CLAUSEN, L. MILLER, & P. ACKLES. A Psychophysiological Study of Pitch Naming and Memory.

The processing mechanisms underlying absolute pitch (AP), and how these processes are related to other auditory discriminations have been in question for some time. Aspects of AP were investigated using event-related potentials. Ten musically trained participants, age 18 and over, and 10 people with AP participated. Participants performed four tasks: (1) pitch naming; (2) a pitch memory task, which entailed matching a standard pitch after several interference tones; (3) a pitch memory task with mistuned pitches; and (4) a visual "pitch memory" analog. The AP group exhibited significantly higher percent correct and *d*-prime scores on the pitch naming task and on the auditory memory tasks. AP subjects demonstrated increased P300 amplitude to the mistuned condition, and differential scalp topography effects for N100 amplitude in the tuned condition.

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M. MIMURA, S. KOMATSU, M. KATO, H. YOSHIMASU, K. SAKUMA, & H. KASHIMA. Cross-Script and Within-Script Priming in Alcoholic Korsakoff Patients.

Alcoholic Korsakoff patients and control subjects studied a list of Japanese nouns written in either Hiragana or Kanji script. Word-fragment completion and recognition tests were then administered in Hiragana. When the writing script was changed between study and test phases, repetition priming in word-fragment completion was significantly attenuated, but was still reliable as compared with baseline performance. This was confirmed in both Korsakoff patients and control subjects. In contrast, the script change had little effect on recognition memory, which was severely impaired in Korsakoff patients. The results suggest that repetition priming is mediated by two different implicit processes: one that is script-specific, and another that is assumed to operate at a lexical or semantic level.

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M. MOZAZ, E. CARRERAS, & A. MARTINEZ. Severe Amnesia and Dissociation of Frontal Lobe Functions Following a Bilateral Thalamic Infarction.

We report the case of a 65-year-old right-handed woman, with documented bilateral thalamic infarction. A neuropsychological assessment of the patient performed 6 months after the infarction included tests of mental state, intelligence, language, memory, attention, and praxias. On examination she was disoriented in time but not in space. Biographical data indicated behavior and personality changes as well as reduction of practical intelligence compared to the patient's premorbid state. In addition, we documented retrograde and anterograde amnesia, affected general intelligence, and selective frontal lobe related functions, although she remained skilled at card games. Furthermore, she showed parapraxia, and a striking paramnesic delusion concerning her family. The pattern of impairment is described in some detail, providing a basis for discussing the role of memory in frontal lobe cognitive dissociation and in parapraxia.

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J.G. BUCKWALTER, C.A. McCLEARY, K.R. LEUNG, B.W. BLUESTEIN, D.K. PAYNE, & T.M. GOODWIN. The Effects of Pregnancy on Verbal Memory.

Estrogen levels have been reported to be positively correlated with verbal memory skills. Estrogen increases dramatically during pregnancy and then declines after delivery. We hypothesized that verbal memory performance would change consistent with estrogen levels. Fifteen women were admin-

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istered the California Verbal Learning Test during their last month of pregnancy and within 2–6 weeks after delivery. Subjects performed significantly worse when pregnant on Trials 1–5 total, had more free recall intrusions, and poorer performance on short delay free recall. They also showed less consistency in items recalled, and showed a nonsignificant trend to use less semantic clustering. These results contradict our hypothesis. They are consistent, however, with reports of a negative cognitive effect of progesterone, which also increases during pregnancy.
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R. PROPPER & S. CHRISTMAN. Inter-*Versus* Intrahemispheric Processing of Episodic *Versus* Semantic Memories: A Test of the HERA Model.
Based on a review of neuroimaging studies, Tulving and colleagues have proposed *HERA*, a model of episodic memory in which the left *versus* right cerebral hemispheres are preferentially involved in the encoding *versus* retrieval of episodic memories, respectively. We present behavioral data in which normal subjects performed a recognition memory (episodic) or a lexical decision task (semantic), in which items were presented twice within a block, with the second presentation occurring in either the same or opposite visual field as the first presentation. Our results indicate that episodic memories involve interhemispheric processing, whereas semantic memories involve primarily intrahemispheric processing, which is consistent with the HERA model. However, unlike the HERA model's predictions, our results suggest that interhemispheric processing of episodic memories is not directional.
Correspondence: *Stephen Christman, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

D.A. CAHN, E.V. SULLIVAN, P.K. SHEAR, L. MARSH, R. FAMA, J.R. TINKLENBERG, J.A. YESAVAGE, K.O. LIM, & A. PFEFFERBAUM. Neuroanatomical Correlates of Verbal and Nonverbal Recognition Memory.
Neuroimaging and lesion studies have demonstrated that extent of hippocampal atrophy correlates with memory impairment, but material-specific lateralization of this structure–function relationship has been inconsistent. This MRI study examined the relative contributions of left and right temporal lobe volumes to verbal and nonverbal memory (Warrington Recognition Memory Test) in a group of 20 Alzheimer's disease (AD) patients. Right hippocampal volume made a significant independent contribution to face recognition, after accounting for left hippocampal volume and after accounting for right temporal horn volume. Word recognition was not significantly associated with either left or right hippocampal volume. Thus, face but not word recognition shows a material specific relationship with lateralized hippocampal volume in patients with AD.
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EPILEPSY—1

G. GLOSSER, G.K. DEUTSCH, L.C. COLE, & J. CORWIN. Differential Lateralization of Memory Discrimination and Response Bias in Temporal Lobe Epilepsy.
Recognition memory was assessed in 76 epilepsy patients after anterior temporal lobectomy. Measures of memory discrimination and response bias were obtained on a verbal memory test, California Verbal Learning Test (CVLT), and an analogue visuospatial memory test, Biber Figure Learning Test–Extended (BFLT–E). Lateralized material-specific deficits were found on memory discrimination measures. Left temporal lobectomy (LTL) patients were impaired on the CVLT, and right temporal lobectomy (RTL) patients were impaired on the BFLT–E. Lateralization for response bias was different. On *both* the CVLT and BFLT–E, LTL patients were significantly more liberal in their response bias. Findings indicate that the two hemispheres are not only specialized for processing different types of materials for memory, but also for the strategies or bias used when making decisions in situations of uncertainty.
Correspondence: *Guila Glosser, Department of Neurology (3W Gates), University of Pennsylvania Medical Center, 3400 Spruce St., Philadelphia, PA 19104-4283, USA.*

C. FLAHERTY & P. ESLINGER. Personality Traits as Predictors of Psychosocial Success Following Surgery for Temporal Lobe Epilepsy.
Current definitions of successful outcome following surgery for temporal lobe epilepsy (TLE) emphasize postoperative seizure frequency, with little consideration given to psychosocial indicators. We hypothesized that classification of TLE surgical candidates by MMPI–2 profile would reveal personality indicators predictive of psychosocial outcome, measured by the Washington Psychosocial Seizure Inventory, unaffected by seizure-free status following temporal lobectomy. Twenty-four TLE patients were assessed in the preoperative and postoperative phase (1–2 years postsurgery, all seizure-free), classified by normal *versus* abnormally high scores on each MMPI–2 subscale. Preoperative high scores on Hysteria, Psychopathic Deviate, and Social Introversion subscales significantly predicted persistently poor postoperative Medical Management, Adjustment to Seizures, and Interpersonal Adjustment, respectively. Findings suggest that the preoperative MMPI–2 profile may serve as a reliable predictor of postoperative psychosocial success following temporal lobectomy.
Correspondence: *Claire V. Flaherty, Division of Neurology, Pennsylvania State University, Hershey Medical Center, Hershey, PA 17033, USA.*

M. HARNADEK, P. PATHAK, & W. BLUME. Absence of Neuropsychological Deficits in a Patient with Mixed-Dominance Following Corpus Callosotomy.
Little is known about the neuropsychological outcome of patients with mixed-dominance following corpus callosotomy. However, such patients are thought to be at risk for postoperative language and writing disturbance. We report a patient with mixed-dominance, without pre-existing neuropsychological deficits, who was evaluated before callosotomy and during the immediate recovery period. There was no postoperative decline in language skills, writing, or praxis. However, a bilateral decline in sensorimotor functioning was noted. This case suggests that patients with mixed-dominance, with no preoperative neuropsychological deficits, may be at minimal risk for postoperative language disturbance or apraxia.
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J. ROBIDOUX, I. ROULEAU, & K. LAFLAMME. Hemispheric-Specific, Long Lasting Cognitive Deficits Following the Return to Baseline of the EEG During the Intracarotid Amobarbital Procedure (IAP).
The visual inspection of the EEG during the IAP is often used to monitor the intensity and duration of the hemispheric inactivation. It is assumed the return to baseline of the delta Amytal-induced activity in the EEG reflects also a return to baseline of cognitive functions. We examined whether cognitive deficits were present following the return to baseline of the EEG on two hemispheric-specific tasks (verbal: repetition; nonverbal: nonfigurative matching task) in a very homogenous sample of 8 patients receiving the IAP. Long lasting deficits were observed and they were specific to the hemisphere injected; repetition errors were present exclusively following the left (dominant) injection while the difficulties on the matching task were mostly observed following the right injection. These findings suggest that there is more time than originally thought to evaluate specific hemispheric functions such as language during the IAP without hindering the interpretation of the performance. On the other hand, the presence of long lasting deficits may limit the interpretation of the anesthesia of the other hemisphere if the procedures are performed too closely in time. Such findings may not apply to memory testing.
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A. PERRINE, M. SEIDENBERG, B. HERMANN, C. LEVERONI, & K. DAVIES. Memory for Famous Faces Following Anterior Temporal Lobectomy.

We examined remote memory for famous faces in a sample of unilateral right ($N = 13$) and left ($N = 24$) temporal lobe epilepsy (TLE) patients who had previously undergone anterior temporal lobectomy (ATL). Famous faces were selected from the time period 1970 to 1994, and were designated into a time period before surgery (retrograde) and a time period following surgery (anterograde) for each subject, using their own date of surgery as the demarcation point. Results revealed a significant interaction of Group × Time. Only the right ATL group showed a significant decline in memory for famous faces from the retrograde to the anterograde time period. These data suggest a role for the right temporal neocortex and hippocampal regions in the acquisition and retention of new famous faces.

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A.V. DAVIS, C.P. BUCHANAN, A. PERRINE, M. SEIDENBERG, & B.P. HERMANN. Memory for Face Identity and Face Location After Anterior Temporal Lobectomy.

Thirty-four anterior temporal lobectomy (ATL) patients (21 left and 13 right) were administered the Faces in Space Test (FIST) and the verbal and visual paired associates from the Wechsler Memory Scale–Revised. The FIST measures the recall of faces and their location in an irregular array and is thought to represent two parallel but independent visual–perceptual cortical processing streams. Right ATL subjects performed better than the left ATL group on both verbal and visual paired associates. Both ATL groups performed in a similar fashion on memory for faces, but the right ATL group scored significantly lower on location memory. In addition, face memory and location memory indices showed a minimal correlation, and the laterality effect for location memory was independent of performance on the Benton Face Recognition test. These findings suggest an independence of the "what" and "where" memory systems, and that the right mesial temporal lobe system plays an important role in memory for "where."

Correspondence: *A.V. Davis, Department of Psychology, Chicago Medical School, 3333 Green Bay Road, North Chicago, IL 60064, USA.*

D. CAUDLE, M. WRIGHT, A. ALEXANDER, & L. CHAPIESKI. Intellectual Functioning and Academic Achievement in Children With Idiopathic Epilepsy.

This study investigated the cognitive functioning of children with idiopathic epilepsy as compared to groups of siblings and normal controls. Children with seizure disorders were found to possess problems in performance on measures of intellectual functioning and academic achievement relative to normal controls. An interesting finding was that siblings of children with seizure disorders also have difficulties in cognitive functioning relative to normal controls. Indeed, there were no significant differences found between children with seizure disorder and their siblings. This suggests that there may be genetic and/or environmental factors that create deficits in siblings that are similar to those typically seen among children with epilepsy.

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G.L. RISSE, D.K. MERCER, M.C. FANGMAN, J.E. BRANDL, & J.R. GATES. The Relationship of the Boston Naming Test to Verbal Intelligence in Patients With Chronic Epilepsy.

This study investigated the sensitivity of the BNT to left *versus* right temporal lobe pathology in relation to verbal intelligence. BNT performance was highly correlated with WAIS–R Vocabulary, Similarities and FSIQ in a random sample of patients with epilepsy. Left temporal patients performed significantly more poorly on the BNT than right temporal patients as a group. However, when temporal patients were stratified by vocabulary scores, left–right differences on the BNT were greatest at lower vocabulary levels. Results suggest the BNT may be a better predictor of left hemisphere pathology in lower functioning patients.

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G. GLOSSER, G.K. DEUTSCH, L.C. COLE, & M. J. FARAH. Investigations of Neural Substrates of Face Processing in Temporal Lobe Epilepsy Patients.

Discrimination of unfamiliar faces was investigated in two studies of temporal lobe epilepsy patients. The first study evaluated patients before and after temporal lobectomy, and found that following surgery face discrimination declined significantly in right, but not left temporal lobectomy patients. Because of the asymmetric size of temporal lobe lesions in the two groups, a second study evaluated facial discrimination during the intracarotid amobarbital test (IAT) which produces equivalent lesions within each of the cerebral hemispheres. A complex interaction emerged between side of epileptic focus and side of IAT injection. The pattern of obtained results is most compatible with the view that temporal lobe structures within both hemispheres participate in face processing, but the contribution of the right visual system is more important than the left.

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M. PARSONS, S. KORTENKAMP, R. BAUER, R. GILMORE, & S. ROPER. Continuous Visual Memory Test in an Epilepsy Surgery Population: Presurgical Discrimination and Sensitivity to Hippocampal Pathology.

CVMT performance of 24 patients with left ($N = 13$) or right ($N = 11$) TLE was evaluated. The CVMT was generally unsuccessful in discriminating RTLE from LTLE during the presurgical evaluation. Despite this, two CVMT scores (total score, delayed recognition) were correlated with degree of cell loss in tissue resected during right, but not left, ATL. *Post hoc* analyses revealed a relationship between poor CVMT recognition and frontal–executive dysfunction, measured by Wisconsin Card Sorting Test perseverations. It is argued that executive function deficits might reduce the specificity of the CVMT to nonverbal memory impairment in nondominant TLE. Modifications to test procedures that might improve the performance of the CVMT in epilepsy surgery populations are discussed.

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R.F. KAPLAN, R.A. COHEN, L. JONES-WOODWARD, & D.H. JACOBS. Awareness of Deficit After the Sodium Amobarbital Test.

Diminished awareness of a deficit is a frequent, albeit not well understood concomitant of brain injury. This can also occur following amobarbital induced deficits in patients undergoing the Wada test. We examined the remembrance of hemiplegia and hemianopsia after recovery from unilateral injections of sodium amobarbital in 31 presurgical epilepsy patients. Patients almost always lacked awareness of hemiplegia following either the right (13/15) or left (9/15) intracarotid injection. This occurred independently of their memory performance. In contrast, almost all patients who received a selective posterior cerebral artery injection recalled their visual field loss. These data raise questions about the role of task demands as well as the anatomical basis of awareness of deficit in brain dysfunction.

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M.N. METZ-LUTZ, E. HIRSCH, F. FAUVET, A. DE SAINT MARTIN, P. MAQUET, & C. MARESCAUX. In Landau and Kleffner Syndrome (LKS) Acquired Neuropsychological Deficits May Be Nonaphasic.

We describe 4 normally developed children who acquired, between 5 and 8 years of age, specific neuropsychological disorders associated with epilepsy. The electroclinical features were those of a LKS that is, localized spike-and-wave discharges during wakefulness, and continuous spike-and-

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wave during slow sleep. Except in one child who had acquired aphasia with auditory agnosia, the acquired cognitive disorders did not involve language. In one child the acquired cognitive impairment was an apraxia; in the others, a left hemineglect and frontal disorders. PET scan studies performed in all 4 children showed a focal hypermetabolism involving the area of the associative cortex concerned with the impaired specific cognitive processing. Aphasia should be considered as only one of the acquired cognitive disorders of LKS.
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K. BAYNES, N. KROLL, & N. DRONKERS. Contributions of the Corpus Callosum to Semantic Facilitation.
The function of the anterior callosum has proven difficult to specify although some role in the transfer of nonspecific semantic information has been documented. Therefore, when an opportunity to examine a patient before and after staged callosal surgery arose, semantic facilitation within and between the hemispheres was investigated. V.J. a 42-year-old left-handed female underwent section of the anterior callosum in January of 1995 and section of the posterior callosum in September of 1995. Lexical decision accuracy and facilitation were examined pre-, inter-, and postoperatively. Clear disruption of facilitation in the non-speech-dominant hemisphere was observed after anterior section, with subsequent recovery. Implications for callosal integration and hemispheric laterality are considered.
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M.L. PREVEY, R.H. MATTSON, R.C. DELANEY, J.H. KIM, S.S. SPENCER, & D.D. SPENCER. Memory Scanning in Temporal Lobe Epilepsy: Relationship to Hippocampal Cell Density.
Subjects with left and right temporal lobe epilepsy were compared to normal controls using the Sternberg memory scanning paradigm (verbal/nonverbal) prior to temporal lobectomy/hippocampectomy for relief of intractable seizures. All groups showed increasing time for response as the length of positive set increases. Slowed scanning time was seen in both seizure groups, but not a specifically slowed item scanning rate. For RTE subjects, there is a strong negative correlation between hippocampal cell densities and speed of scanning visual stimuli. A similar trend is seen in LTE subjects' scanning of verbal stimuli, though correlations are weaker.
Correspondence: *Mary L. Prevey, Neurology 127, DVA Medical Center, West Haven, CT 06516, USA.*

W.B. BARR, V. WARMFLASH, G. NEY, & N. SCHAUL. Use of a Two-Subtest WAIS–R With Epilepsy Surgery Candidates.
This study examined the use of a two-subtest (V, BD) short-form version of the WAIS–R in 104 candidates for anterior temporal lobectomy (58 LTL, 46 RTL). Regression-based estimates of FSIQ revealed a strong correlation with the 11-subtest FSIQ ($r = .90$, $p < .0001$). ROC curve comparisons revealed that classification of LTL and RTL patients with subtest score differences (V - BD) was equivalent to classification rates with standard VIQ–PIQ discrepancies. Subtest score differences greater than or equal to 3 classified subjects with 68% accuracy, while VIQ − PIQ greater than or equal to 10 classified subjects with 62% accuracy. The results indicate that this two-subset version of the WAIS–R provides valid estimates of FSIQ and useful information about the laterality of the EEG focus.
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J. BREIER, B. BROOKSHIRE, J. FLETCHER, P. PLENGER, J. WHELESS, A. THOMAS, A. PAPANICOLAOU, & L.L. WILLMORE. Identification of Side of Seizure Onset in Temporal Lobe Epilepsy Using Memory Tests in the Context of Reading Deficits.
Fifty-eight patients with temporal lobe epilepsy were classified into reading-deficient (RD; $n = 22$) and non-reading-deficient (non-RD; $n = 36$) groups. While selective deficits in verbal or nonverbal memory consistent with side of seizure onset were evident in the non-RD patients, both verbal and nonverbal memory performance were reduced equivalently in individuals with RD, regardless of side of seizure onset. As a result, memory tests that were accurate in identifying side of seizure onset in the non-RD group were not as accurate in the RD group. When individual cases were classified, 24% of those with RD were correctly classified as compared to 58% of the non-RD group ($\chi^2 = 5.93$, $p < .02$). Findings suggest that memory data obtained from individuals with epilepsy and evidence of RD may not be as valid an indicator of side of seizure onset as that obtained from patients without RD.
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J.A. SPRINGER, B.K. SCHEFFT, M.D. PRIVITERA, D. RIGRISH, & E.T. BARRETT. Examination of Two Dichotic Word Listening Tapes with Normal Controls and Complex Partial Seizure Patients: Comparability and Diagnostic Validity.
The performance of complex partial seizure (CPS) patients was compared to normal control (NC) subjects using two similar dichotic word listening tests. The performance of the CPS group was significantly poorer than that of the NC group. Examination of performance on an individual basis showed that more CPS patients had defective scores than NC subjects. Specific performance patterns with regard to lateralization of epileptogenic foci were informative but less conclusive. Although the dichotic listening tapes were relatively comparable and both demonstrated adequate overall correct classification rates (old tape = 73%; new tape = 83%), the findings showed somewhat greater accuracy for the newer tape. This study suggests that dichotic word listening offers the potential to contribute relevant diagnostic information to standard neuropsychological assessments of CPS patients.
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THURSDAY MORNING, FEBRUARY 6, 1997

Paper Session 1/9:00–10:40 a.m.

IMAGING—2

A. PALMER, M. MINTUN, R. NEBES, & J. BECKER. Regional Cerebral Blood Flow in Word and Nonword Reading.
The purpose of this study was to examine changes in regional cerebral blood flow using Positron Emission Tomography during word reading and nonword reading tasks. Ten subjects were scanned and rCBF was measured by [^{15}O]-water using standard PET imaging technology. The rCBF in different cognitive conditions were compared and a statistical parametric map of active brain regions was generated. When the subjects read aloud words that required complex speech (i.e., third-order approximation to English or irregular words), increases in rCBF were seen in Broca's Area. When reading aloud real words (which had important semantic components) activation of the fusiform gyrus was seen. These data are broadly consistent with brain regions generally associated with reading and emphasize the multimodal aspects of reading.
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K.E. CARROLL, A. J. SAYKIN, H. J. RIORDAN, T.M. DARCEY, D.W. ROBERTS, L.A. FLASHMAN, & P.D. WILLIAMSON. Functional MRI for Presurgical Mapping of Motor Area Shows Reorganization After Early Brain Injury.
Functional MRI (fMRI) motor mapping was performed on an 11-year-old candidate prior to focal resection surgery for epilepsy. An extensive left frontal lesion was demonstrated on structural MRI presumably due to a cerebral vascular accident *in utero*. The patient demonstrated pathologic left-handedness with transfer of language dominance to the right hemisphere. fMRI were performed at two axial planes. Conditions alternated between rest and lateralized finger sequencing. Image analysis was performed by subtraction and cross correlation methods. Results indicated posterior displacement of motor activation in the affected left hemisphere, suggesting ipsilateral reorganization of motor functioning. This case provides further support for the feasibility of using fMRI for presurgical mapping and studying patterns of brain organization.
Correspondence: *Andy Saykin, Department of Psychiatry HB-7750 DHMC/ Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001, USA.*

S. J. SWANSON, J.R. BINDER, M. FISCHER, T.A. HAMMEKE, J.A. SPRINGER, J.A. FROST, G.L. MORRIS, P.S. BELLGOWAN, & W.M. MUELLER. The Effects of Hemispheric Dissociations Between Language and Memory on Correlations Between Wada and fMRI Language Laterality Scores.
Previous research has shown excellent correlations ($r = .96$, $n = 22$) between language lateralization measures obtained using Wada testing and an FMRI semantic monitoring task in preoperative epilepsy surgery candidates. However, there is evidence that FMRI tasks developed to measure language systems also activate regions involved in episodic memory. To test this hypothesis, the Wada/FMRI language laterality correlations were compared in groups of epilepsy patients who showed: (1) language and memory in the same hemisphere ($n = 21$), (2) language and memory in opposite hemispheres ($n = 6$), and (3) bilateral language or memory ($n = 16$) on Wada testing. Correlations for the three groups were $r = .74$, $p < .001$; $r = -.29$, $p = .57$; and $r = .44$, $p = .08$, respectively. These results suggest that FMRI language tasks also activate regions involved in memory processing.
Correspondence: *Sara J. Swanson, Department of Neurology, Section of Neuropsychology, Medical College of Wisconsin, 9200 W. Wisconsin Ave., Milwaukee, WI 53226, USA.*

D. CAINE, P. ROACH, M. COLTHEART, & J. WATSON. Cerebral Hypoxia: Regional Cerebral Blood Flow (rCBF) and Neuropsychology.
An extensive network of brain regions is liable to be affected by hypoxia: The arterial boundary zones, as well as subcortical grey matter structures including the basal ganglia are all vulnerable. The aim of this prospective study was (1) to examine the acute and chronic cognitive sequelae of hypoxic events, and (2) to examine associations between neuropsychological outcomes and acute and followup regional cerebral blood flow studies. Neuropsychological data were analysed by principal components analysis, and rCBF studies were examined both qualitatively and quantitatively using the statistical parametric mapping method. Associations were found between the principal factors identified and changes in rCBF in both cortical and subcortical regions.
Correspondence: *Diana Caine, Neuropsychology Unit, Royal Prince Alfred Hospital, Camperdown, NSW 2050, Australia.*

J.A. SPRINGER, J.R. BINDER, T.A. HAMMEKE, S. J. SWANSON, J.A. FROST, P.S. BELLGOWAN, G.L. MORRIS, & W.M. MUELLER. Distributions of Language Lateralization in Normal Controls and Epilepsy Patients Using Functional Magnetic Resonance Imaging.
Whole brain FMRI was used to demonstrate the distribution of language dominance in a large group of normal right-handed subjects ($N = 50$). These findings were compared to right-handed epilepsy patients ($N = 19$). Semantic decision-tone discrimination tasks were used. Lateralization indices of normals varied continuously from strong left hemisphere dominance to symmetric language distribution with left dominance. A single subject had right hemisphere dominance. In contrast, there was a bimodal distribution of language dominance in the epilepsy group. The majority of patients had left hemisphere dominance, and there was a subgroup with atypical language lateralization. There was a significant difference between group mean laterality indexes. This study demonstrates that FMRI is a valuable tool for obtaining distributions of language dominance among normal subjects and patient samples.
Correspondence: *Jane A. Springer, Department of Neurology, Section of Neuropsychology, Medical College of Wisconsin, 9200 West Wisconsin Avenue, Milwaukee, WI 53226, USA.*

G.G. BROWN & S.S. KINDERMANN. Brain Activation Patterns With the Stroop Paradigm Studied by fMRI.
Patterns of brain activation associated with Stroop effects were studied in 4 young, healthy, adult-volunteers using blood oxygen level dependent, functional magnetic resonance imaging. Stroop tasks activated the anterior cingulate, although its activation was less robust than activation in the secondary occipital, occipital–parietal, and occipital–temporal regions. Among 3 subjects, activation was observed in various left premotor/ prefrontal regions. The robust activation of the posterior brain areas in the Stroop paradigm is probably not associated with the inhibition of the dominant reading response. Rather, our findings are compatible with the hypothesis that the Stroop paradigm activates visual pathways involved in selective attention.
Correspondence: *Gregory G. Brown, Psychology Service (116B), VAMC, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

Paper Session 2/9:00–10:40 a.m.

MEMORY—2

J. KIXMILLER, B. LEVINE, R. HILL, & L. CERMAK. Effect of Amnesia and Executive Dysfunction on Korsakoff Patients' Conditional Associative Learning.
The role of amnesia and executive dysfunction in Korsakoff patients' learning of novel symbol-pattern pairings was investigated. Korsakoff patients were compared to a group of mesial temporal patients who were equally amnesic, and to a group of alcoholic controls with executive dysfunction. Results indicated that the Korsakoff patients' associative learning was significantly worse than that of the other two groups due to their elevated propensity to commit prior-item perseverations. However, when learning cues were provided, Korsakoff patients' associative learning was found to be commensurate to that of the mesial temporal patients, while it remained significantly worse than that of the alcoholic controls. Findings support the conclusion that a combination of amnesia and executive dysfunction resulted in poorer performance for this group than either one of these factors alone.
Correspondence: *Jeffrey S. Kixmiller, MDRC (151A), Boston VA, 150 South Huntington Ave., Boston, MA 02130, USA.*

A.K. TROYER & F.I.M. CRAIK. Divided Attention at Retrieval Specifically Affects Reconstruction of Temporal Order.
Memory for context is affected to a greater extent than memory for content in normal aging and in frontal-lobe dysfunction. Divided attention (DA) paradigms have been used to simulate aging and frontal dysfunction in young healthy subjects. We examined the effect of DA on memory for content (i.e., items on a word list) and memory for context (i.e., color and temporal order of items) among 48 healthy young adults. DA at encoding uniformly decreased memory for item, color, and temporal order. In contrast, DA at both encoding and retrieval, in comparison to DA only at encoding, specifically decreased memory for temporal order. Findings support the idea that reconstruction of temporal order during retrieval is a relatively more strategic and attention-demanding task.
Correspondence: *Angela Troyer, Rotman Research Institute of Baycrest Geriatric Centre, 3560 Bathurst Street, North York, ON M6A 2E1, Canada.*

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B. J. DIAMOND, J. DELUCA, & S.M. KELLEY. Spatial Discrimination in Subjects With Aneurysms of the Anterior Communicating Artery.
Profound impairments in memory can be observed following Anterior Communicating Artery (ACoA) aneurysm. A prominent hypothesis attempting to explain these impairments is the Contextual Memory Deficit Hypothesis (CMDH) which proposes that amnesia results from a primary deficit in processing contextual information (i.e., spatial–temporal). To address the CMDH, we compared the performance of 5 amnesic and 5 nonamnesic ACoA subjects to a healthy control group on an incidental spatial discrimination task. Amnesics' level of immediate free recall was significantly below that of nonamnesics and controls, while recognition was equated across groups. Importantly, the amnesic group's mean free and cued spatial recall did not significantly differ from that of the nonamnesic and healthy groups. All groups displayed comparably enhanced cued *versus* free spatial recall. Furthermore, the performance of ACoA subjects, split according to high or low scores on Free and Cued Spatial Recall, did not differ on putative frontal tests (i.e., WCST–Categories). This study demonstrated that amnesic ACoA's encoded spatial information under minimally effortful learning conditions. Importantly, these findings do not support the CMDH which would have predicted a severe deficit in the processing of spatial context.
Correspondence: *Bruce J. Diamond/John DeLuca, Kessler Institute, Department of Research, 1199 Pleasant Valley Way, West Orange, NJ 07052, USA.*

A. SCHNIDER. Spontaneous Confabulations and the Perception of 'Now.'
We have recently demonstrated that spontaneous confabulations are based on a confusion of the temporal context of information acquisition within memory. In this study, the hypothesis was tested that spontaneous confabulators fail to make temporal judgments within the immediate present, a failure that would indicate deficient perception of the 'now.' In the first experiment, subjects were requested to discriminate the duration of two visual stimuli in the range of 1s, one stimulus being 1.25 to 3 times longer than the other. In the second experiment, subjects had to estimate the time an invisible dot with known speed needed to run around a circle. In both experiments, spontaneous confabulators performed significantly worse than both the healthy controls and the nonconfabulating amnestic patients. Spontaneous confabulations appears to be typically associated with an inability to make temporal judgments within the immediate present.
Correspondence: *Armin Schnider, Neurologische Universitätsklinik, Inselspital, CH-3010 Bern, Switzerland.*

E.V. SULLIVAN, P.K. SHEAR, L. MARSH, M. J. MORRELL, K.O. LIM, & A. PFEFFERBAUM. Relationship of Memory to Temporal Cortical and Hippocampal Volumes in Schizophrenia and Temporal Lobe Epilepsy.
Impairment in explicit memory is among the most consistently documented cognitive deficits in schizophrenia (SZ), but the identity of the brain structures underlying this deficit is controversial. This MRI study investigated temporal cortical and hippocampal volumes in relation to memory performance in SZ compared with focal temporal lobe epilepsy patients (TLE). SZ had temporal cortical but not hippocampal volume deficits, whereas TLE had hippocampal and cortical volume deficits. Left, but not right, hippocampal volume was a significant predictor of digit span in SZ and of delayed verbal recall in TLE. However, forward digit span, but not delayed verbal recall, emerged as a unique predictor of left hippocampal volumes in SZ, whereas the opposite occurred in TLE, suggesting an extrahippocampal substrate of explicit memory impairment in SZ.
Correspondence: *Edith V. Sullivan, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 95405, USA.*

P. J. ESLINGER & C.V. FLAHERTY. Autobiographic Amnesia After Temporal Lobe Lesions.
Autobiographic memory was examined in 4 adult patients using the Autobiographical Memory Interview, which provides personal–semantic and episodic memory measurements from childhood through recent years. Results indicated that lesion of the right medial, inferior and polar temporal lobe after encephalitis did not significantly alter autobiographic memory. Isolated lesion of left medial, inferior and polar temporal lobe after encephalitis did alter personal–semantic retrograde memory, but autobiographic episodes were intact. Bilateral temporal lobe lesions caused marked impairment of both personal–semantic and episodic autobiographic memory. Findings support a model of bilateral representation of episodic autobiographic memory, but left-sided mediation of personal–semantic autobiographic memory.
Correspondence: *Paul J. Eslinger, Division of Neurology, Hershey Medical Center, 500 University Drive, Hershey, PA 17033, USA.*

Paper Session 3/9:00–10:40 a.m.

LIMBIC CIRCUITRY

A.A. BAIRD, S.A. GRUBER, D.A. FEIN, P.F. RENSHAW, & D.A. YURGELUN-TODD. fMRI of the Amygdala During Recognition of Facial Expression.
The recognition of facial expression relies heavily on both visuospatial and affective systems within the brain. It has been hypothesized that damage to the amygdala must occur early in life for later manifestation of deficits in the ability to recognize emotional expression. We have attempted to further elucidate the role of the amygdala in the recognition of facial expression in a group of 6 healthy adolescents using functional magnetic resonance imaging (fMRI) technology. All subjects demonstrated an increase in signal intensity in the amygdala for a facial emotion task compared to a visual control task. Our data are consistent with previous work implicating the amygdala as essential for the recognition of fearful facial expression. In addition, our data suggest that the role of the amygdala during development may be to recognize facial expression and, through experience, learn to assign appropriate labels to facial expression.
Correspondence: *Abigail Baird, Brain Imaging Center, McLean Hospital, Harvard Medical School, 115 Mill Street, Belmont, MA 02178, USA.*

D. FEIN, D. YURGELUN-TODD, P. RENSHAW, A. BAIRD, J. SELPH, M. KINSBOURNE, & L. WATERHOUSE. Exploratory Study of Amygdala Activation with Emotional Stimulation.
The amygdala is thought to play a key role in the emotional evaluation of both negative and positive stimuli. PET activation of amygdala in response to emotional arousal has been reported, but to date fMRI-measured amygdala activation has not appeared in the literature. Blocks of positive and negative emotionally arousing pictures, alternating with blocks of neutral pictures, were presented to 11 young normal male and female adult volunteers. Results found no strong on–off activation as is found with cortical or cognitive paradigms, but approximately one third of the pixels showed small but significant signal increases in the emotional over the neutral blocks, with response to "horror" stimuli more consistent across subjects than responses to "nice" stimuli. Percent signal change in the emotional condition averaged about .75%, with some pixels above 1%. Individual differences were marked. Pitfalls in measuring emotional arousal and amygdala activation will be discussed.
Correspondence: *D. Fein, Dept. of Psychology, University of Connecticut, U-20, 406 Cross Campus Rd., Storrs CT 06269-1020, USA.*

R.A. COHEN & R.F. KAPLAN. Attention and the Anterior Cingulate Cortex.
Neurobehavioral and psychophysiological manifestations of bilateral anterior cingulate lesions were previously demonstrated. Attention, particularly response intention, selection and control, was found to be most impaired. As a further test of these initial observations, we compared 18 cingulotomy patients to 15 chronic pain patients on a battery of tests sensitive to different elements of attention. Cingulotomy patients exhibited much greater impairments on measures of sustained attention (ARCPT), motor persistence (sustained finger tapping), concurrent response production, and response spontaneity. Focused attention was mildly impaired (e.g.,

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Digit Symbol). Sensory selective attention (Letter Search, Lexical Decision), attention span, and most other measures of automatic attention were not impaired. Severity of attentional impairment correlated strongly with lesion size. The results confirms that the anterior cingulate influences attention, most notably response intention, initiation, and persistence.
Correspondence: *R.A. Cohen, Neuropsychology, The Miriam Hospital, Brown University, 164 Summit Ave., Providence, RI 02960, USA.*

G.P. LEE, A. BECHARA, R. ADOLPHS, J. ARENA, & D.W. LORING. Psychophysiological Changes After Bilateral Amygdalotomy in Humans.
The amygdalar complex is thought to be an important neural structure underlying autonomic system activity, but systematic observations of autonomic responsiveness before and after amygdalotomy in humans have not been reported. We examined the psychophysiological effects of amygdalar destruction pre- and postoperatively in two patients who underwent bilateral amygdalotomy for intractable aggression. Following surgery, both patients showed a dramatic reduction in autonomic arousal (i.e., skin conductance response and facial EMG to various stressful stimuli). In one patient the effect was immediate (within 5 days of surgery) while the other patient's diminished autonomic arousal was not evident until later (more than 5 months postsurgery). These results extend the animal work indicating a reduction in autonomic arousal levels after bilateral amygdalar destruction to humans.
Correspondence: *Gregory P. Lee, Section of Neurosurgery, Medical College of Georgia, Augusta, GA 30912-4010, USA.*

D.D. ROMAN, S. NUGENT, & T.E. BENIAK. Hemispheric Organization of Memory in Late *Versus* Early Onset Left Temporal Pathology.
Cerebral organization of material specific memory was studied in 40 patients with intractable left temporal focus complex partial epilepsy. All patients were left hemisphere dominant for language. Age of pathology onset was determined by a review of the medical records. Results revealed better mediation of memory (both verbal and nonverbal) by the right hemisphere for the group as a whole. Regression analysis showed pathology occurring at or before age 5 years predicted better right hemisphere performance on Total Memory score. Age of pathology ≤ 9 predicted better right hemisphere performance on Nonverbal Memory. Verbal memory was not affected by an early *versus* late pathology onset.
Correspondence: *Deborah D. Roman, Neuropsychology Laboratory, University of Minnesota, Box 390, 420 Delaware St. S.E., Minneapolis, MN 55455, USA.*

A. BELGER, A. McNULTY, & J.H. KRYSTAL. Frontal/Cingulate Attention Deficits in Schizophrenia.
Schizophrenia is associated with prefrontal cortical pathology, as well as vast deficits in the attention domain. We employed a modified Posner paradigm to demonstrate that schizophrenic patients show selective deficits in self-guided attention, hypothesized to rely upon the anterior cingulate region, but not stimulus-driven spatial attention, hypothesized to rely upon the posterior parietal regions. Thirteen medicated schizophrenic and 13 healthy control subjects performed cued-orientation tasks with (1) a peripheral box cue, (2) a central arrow cue, and (3) a central word cue. The results indicated that patients responded significantly slower to targets preceded by a central word cue [$F(2, 24) = 4.74$, $p < .05$] relative to central arrow and peripheral box cues, which did not differ for healthy subjects. Furthermore, patients but not healthy subjects responded slower to right visual field targets preceded by an invalid cue relative to targets preceded by a valid or nocue. These findings suggest a deficit in self-guided attention orientation in schizophrenia, while orientation in response to peripheral cues are intact. Furthermore, a selective deficit in orienting to right visual field in response to invalid cues also suggests a greater left hemisphere involvement. We suggest that schizophrenic patients show abnormalities in anterior attention systems relying upon the anterior cingulate cortex, but not posterior parietal attention systems.
Correspondence: *Aysenil Belger, Yale University School of Medicine, Psychiatry Service 116A, VA Medical Center, 950 Campbell Ave., West Haven, CT 06516, USA.*

Poster Session 2/9:00 a.m.–12:00 p.m.

TRAUMATIC BRAIN INJURY—1

S.S. DIKMEN, J.E. MACHAMER, G. FORMEA, & N.R. TEMKIN. The Relationships Between Neuropsychological and Psychosocial Functioning in Persons With Head Injury.
Information regarding the relationship between neuropsychological and psychosocial functioning is important because such information is relevant to questions frequently asked of neuropsychologists. The present study examined the relationship between neuropsychological functioning and the probability of return to work or independent living in persons with head injury. The results indicate that neuropsychological functioning is related to return to work or independent living and the degree of the relationship may be different from brain-injured *versus* nonbrain-injured persons. Furthermore, the presence and severity of the injury appears to modify this relationship. Injury severity and neuropsychological functioning are closely related but make independent contributions to psychosocial outcome.
Correspondence: *Sureyya Dikmen, Department of Rehabilitation Medicine (Box 356490), University of Washington, Seattle, WA 98195, USA.*

E. VAKIL, M. OPENHEIM, D. FALCK, Z. GROSWASSER, & S. ABERBUCH. Direct and Indirect Measures of Memory for Words and Their Modality: Closed-Head Injured Patients *Versus* Control Subjects.
Twenty-six closed-head injured (CHI) patients and 28 control subjects were tested on recall and recognition of words. In addition, memory for the modality of word presentation was measured directly and indirectly. The CHI patients were impaired in recall and recognition of words, and modality recognition. However, the CHI and the control groups demonstrated a modality effect of the same magnitude. Notice that the dissociation between direct and indirect memory was demonstrated here for both, items (i.e., words) as well as source (i.e., modality) information. The findings are discussed in terms of the distinction between item and source memory and the contribution of the middle temporal and the prefrontal structures to these processes.
Correspondence: *Eli Vakil, Department of Psychology, Bar Ilan University, Ramat Gan 52900, Israel.*

C. BOAKE, S.R. MILLIS, W.M. HIGH, Jr., R. DELMONICO, J.S. KREUTZER, M. ROSENTHAL, M. SHERER, & C. IVANHOE. Using Early Neuropsychological Testing To Predict Long-Term Productivity Outcome From Traumatic Brain Injury.
The utility of early neuropsychological testing in predicting long-term outcome from traumatic brain injury (TMI) was evaluated in a four-center study of 241 rehabilitation inpatients who were enrolled in the Traumatic Brain Injury Model Systems project. A standard neuropsychological test battery was administered as soon as possible after the end of posttraumatic amnesia. The results showed that 10 of 15 neuropsychological tests were statistically significant predictors of productivity outcome at 1 to 4 years postinjury. Time from injury to testing was also a useful predictor of outcome. The results demonstrate that early neuropsychological testing can be helpful in predicting long-term outcome from TBI and suggest some clinical guidelines for neuropsychological testing during early stages of recovery from TBI.
Correspondence: *Corwin Boake, TIRR, 1333 Moursund, Houston, TX 77030-3405, USA.*

N. JAIN, B. LAYTON, & P. MURRAY. Are Aphasic Patients Who Fail the GOAT in PTA/RA? A Modified Galveston Orientation and Amnesia Test for Persons With Aphasia.
Because the Galveston Orientation and Amnesia Test (GOAT) requires verbal responses to assess orientation, it may misclassify persons recovering from head injury who also are aphasic. To correct for possible misclassification due to language impairment, a modified multiple choice format of the GOAT (AGOAT) was developed. The average AGOAT score of 10 control nonaphasic head injury patients suggested that an AGOAT score of 90 corresponds to the standard GOAT cutoff score of 75 for posttraumatic amnesia (PTA). Using this criterion, 3 to 10 aphasic head injury patients

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(mean Boston Naming Test = 11.4, range 0–39) classified as amnestic on GOAT were classified as nonamnestic on AGOAT. A multiple choice format may be justified in evaluating orientation for all head injured patients.
Correspondence: *Barry S. Layton, Department of Physical Medicine & Rehabilitation, MetroHealth Medical Center, 2500 MetroHealth Drive, Cleveland, OH 44109-1998, USA.*

K.D. CICERONE & K. KALMAR. Postconcussive Symptoms in Mild Brain Injury and Neurologic Controls.
While the diagnosis of postconcussion syndrome relies largely on the nature of patients' subjective complaints, many "postconcussive" symptoms are common in the general population. We compared both the endorsement and severity of postconcussive symptoms in patients with mild traumatic brain injury, peripheral neurologic (vestibular) dysfunction, and nonmedical controls. Although common in normal controls, endorsement of symptoms differed among the three groups. Symptom severity meaningfully differentiated between the two patient groups, with cognitive symptoms most strongly related to mild brain injury and dizziness/imbalance most strongly related to vestibular dysfunction. Emotional functioning was related to subjective complaints in both patient groups. The nature and severity of subjective complaints thus distinguished among patients with different neurologic conditions and normal subjects. The contributions of emotional and motivational factors require further investigation.
Correspondence: *Keith D. Cicerone, JFK-Johnson Rehabilitation Institute, 2048 Oak Tree Road, Edison, NJ 08820, USA.*

W. MITTENBERG, L. MILLER, V. CAREY, M. McMORROW, T. KUSHNER, & J. WEINSTEIN. Astereopsis Caused by Traumatic Brain Injury.
Impaired depth perception (astereopsis) has been observed in a variety of cerebral pathologies effecting the posterior parietal lobe. In the current study of 93 consecutive head trauma admissions, 24% had complete astereopsis and 41% performed greater than 2 standard deviations below 30 orthopedic controls. Degree of impairment was related to GCS, PTA, and the presence of CT visualized intracranial pathology of the parietal lobes. Impairment was also related to trauma severity in patients with normal CTs, presumably due to diffuse axonal shearing or microvascular hemorrhage. Ten percent of this group had complete astereopsis, and clinically meaningful impairment (2 *SD*s below controls) was observed in 25%. Stereoacuity was unaffected by education or culture, and screening required 1–2 min. Undetected astereopsis may increase risk for subsequent MVAs or falls.
Correspondence: *Wiley Mittenberg, Nova Southeastern University, Center for Psychological Studies, 3301 College Avenue, Fort Lauderdale, FL 33314, USA.*

W. MITTENBERG, R. J. FERGUSON, & L. J. MILLER. Postconcussion Syndrome in Sports-Related Head Injury.
Mild head trauma is often complicated by a persistent set of symptoms known as postconcussion syndrome (PCS). Past research has suggested that an expectancy guided, retrospective recall bias may account for much of the variance in PCS symptoms. The present study examined the influence of symptom expectations on mild head trauma symptom reports among participants in contact sports. Head injured athletes ($n = 50$) reported symptom rates that did not differ from those of uninjured athletes ($n = 159$), but they consistently underestimated the preinjury incidence of symptoms. Athletes with no head trauma history overestimated the expected degree of pre- to postinjury change in symptom status. Results suggest that individuals with mild head injury tend to overestimate postconcussion symptom change in a manner consistent with their symptom expectations.
Correspondence: *Wiley Mittenberg, Center for Psychological Studies, Nova Southeastern University, 3301 College Avenue, Fort Lauderdale, FL 33314, USA.*

A.M. SANDER, A.D. WITOL, & J.S. KREUTZER. Relationship Between Depression and Neuropsychological Neurobehavioral Performance in Patients With Mild Brain Injury.
The present study investigated the relationship between depression and neuropsychological/neurobehavioral performance in 52 persons with mild brain injury. Patients had been referred for outpatient neuropsychological evaluation at a major urban medical center. Measures of Depression included the Beck Depression Inventory (BDI) and the MMPI–2 Scale 2. Neuropsychological measures assessed the following areas: attention, verbal and visual memory, visuoconstruction, motor speed, and reasoning. The Neurobehavioral Functioning Inventory was used to measure difficulties in daily functioning. Computation of correlation coefficients revealed that higher scores on the BDI and MMPI–2 Scale 2 were associated with poorer performance on tests of attention and visual memory. Depression scores were also related to a greater endorsement of difficulties in everyday functioning.
Correspondence: *Angelle M. Sander, Department of Physical Medicine and Rehabilitation, Medical College of Virginia, P.O. Box 980542, Richmond, VA 23298-0542, USA.*

S.R. ROSS & S.R. MILLIS. Neuropsychological Predictors of Outcome on the Community Integration Questionnaire in Traumatic Brain Injury.
A previous investigation by Millis and Rosenthal suggested that neuropsychological measures, in particular the Rey Auditory Verbal Learning Test and Trails B, may be useful in predicting later psychosocial adjustment to traumatic brain injury as measured by the Community Integration Questionnaire. Using a larger sample, we found that, although the RAVLT and Trails B were useful predictors, age combined with Trails at initial and 1-year postinjury accounted for more than twice the variance in CIQ score over RAVLT and Trails B alone. These results underscore the utility of neuropsychological measures such as Trails in the prediction of outcome in traumatic brain injury.
Correspondence: *Scott R. Ross, 555 Neuropsychology, 261 Mack Blvd., Rehabilitation Institute of Michigan, Detroit, MI 48201, USA.*

N.V. MARSH, D.A. KERSEL, J.H. HAVILL, & J. SLEIGH. Components of Caregiver Burden at 1 Year Following Severe Traumatic Brain Injury.
Forty-one primary caregivers of people with severe traumatic brain injury (TBI) were assessed at 1 year postinjury. The relationship between caregiver reports of changes in the TBI person's physical, cognitive, emotional, behavioral and social functioning, and caregiver levels of objective burden, subjective burden, and psychosocial functioning were examined. All aspects of the TBI person's functioning were significantly related to caregiver levels of subjective burden. The TBI person's physical, emotional, behavioral, and social functioning were related to caregiver levels of objective burden and depression. Caregiver levels of social adjustment were related to the TBI person's emotional and behavioral functioning. There was no relationship between the TBI person's level of functioning and caregiver levels of anxiety. The results from multiple regression analysis indicated that it was the TBI person's level of social contact that had the greatest impact on caregiver levels of burden.
Correspondence: *Nigel V. Marsh, Department of Psychology, University of Waikato, Private Bag 3105, Hamilton, New Zealand.*

A.A. RUSSO & E.D. BIGLER. Affect, Concentration and Traumatic Brain Injury: Examining the Consequences.
Emotional changes following a TBI are common as are complaints of attention/concentration disturbances. However, no distinct profiles of dysfunction have been quantified. This project examines the affective and neuroimaging status of a group of TBI patients. Seventy patients ages 16 to 68 years (48 men) were collected at a major hospital with evaluation of emotional functioning collected as part of a comprehensive neuropsychological assessment. Mildly injured patients had significantly higher levels of depression and anxiety as measured by the BDI and BAI ($p < .05$). While no significant differences were noted in the attention/concentration scores, mildly injured patients did have lower performance in this area. These findings suggest that emotional functioning following a TBI may be related not only to structural changes in the brain but also to severity of the injury with mildly injured patients complaining of more difficulties. This may be related to their level of awareness.
Correspondence: *Erin D. Bigler, Department of Psychology, Brigham Young University, 1086 SWKT, Provo, UT 84602, USA.*

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N. NABORS, S. MILLIS, & M. ROSENTHAL. Use of the Neurobehavioral Cognitive Status Examination (NCSE) With a Traumatic Brain Injured Population.
The clinical utility of the Neurobehavioral Cognitive Status Examination (NCSE) was investigated with a traumatic brain injured (TBI) population by determining the relationship of the NCSE to traditional neuropsychological measures of cognitive functioning. NCSE subtests and a derived total score were compared to traditional measures of memory, language, attention, visuospatial construction and executive functioning. Results indicated that the TBI sample scored in the impaired range on the NCSE subtests assessing memory, calculation, construction, and reasoning. The NCSE total score was significantly related to measures of verbal memory and attention. The NCSE subtests assessing memory, language comprehension and construction were significantly related to neuropsychological measures of memory, comprehension and visuospatial construction. These results suggest that the NCSE is sensitive to cognitive impairment in the TBI population.
Correspondence: *Nina A. Nabors, Rehabilitation Institute of Michigan, Department of Rehabilitation Psychology, 261 Mack Blvd., Detroit, MI 48201, USA.*

HIV—1

T.D. MARCOTTE, R.K. HEATON, O. ALHASSOON, M. J. TAYLOR, K. ARFAA, I. GRANT, & the HNRC GROUP. Mild HIV-Related Cognitive Impairment is Associated With Reduced Performance on a Driving Simulator.
HIV infection often results in neuropsychological (NP) impairment. However, there has been little research on the effect that these deficits may have on driving abilities. Sixty-nine HIV seropositive subjects completed an NP battery and two PC-based driving simulations. Thirty-two subjects were classified as NP impaired; the majority evidenced only mild impairment. NP impaired subjects failed a previously validated simulation at a much higher rate than NP intact subjects. On a simulation of city driving, NP impaired subjects had significantly more accidents than the intact group. Although it would be premature to extrapolate these findings to impairment in on-the-road driving, they do argue for greater attention to the impact that subtle HIV-related NP deficits may have on driving skills,
Correspondence: *Thomas D. Marcotte, Department of Psychiatry, University of California at San Diego, HIV Neurobehavioral Research Center, 2760 Fifth Avenue, Suite 200, San Diego, CA 92103, USA.*

J.E. ARRUDA, R.A. STERN, J.A. SOMERVILLE, R. COHEN, M. STEIN, & E.M. MARTIN. Neurobehavioral Functioning in Asymptomatic HIV–1 Infected Women: Preliminary Findings.
Although there have been numerous reports that have assessed the neurobehavioral functioning of asymptomatic HIV–1 infected men, to date there have been no published studies of the neurobehavioral functioning of asymptomatic HIV–1 infected women. In this investigation 31 women (17 asymptomatic HIV–1 seropositive, 14 seronegative) were administered a comprehensive battery of neurocognitive and neuropsychiatric instruments. Participants in both groups were matched for age, education, months since injection drug use, and substance abuse. Group comparisons revealed no significant differences in any of the neurocognitive or neuropsychiatric measures. The results of this preliminary study suggest that neurobehavioral dysfunction is unlikely in asymptomatic HIV–infected women. However, additional studies are needed with larger sample sizes and with careful attention to possible confounding or masking variables.
Correspondence: *R.A. Stern, 110 Lockwood Street, 430 Physicians Office Building, Neurobehavioral Research, Department of Psychiatry, Rhode Island Hospital, Providence, RI 02903, USA.*

J. GONZÁLEZ, M. PONTÓN, & P. SATZ. Clinical Detection of HIV–1-Associated Dementia in Monolingual/Bilingual Hispanics.
Neuropsychological test data were collected on 50 Hispanic adults, 25 HIV symptomatic seropositives/AIDS and 25 seronegative controls, using a newly developed and normed test battery for Spanish speaking individuals. They were administered the NeSBHis battery, 10 neuropsychological tests assessing a broad range of cognitive domains (factors): attention, learning/memory, visual processing, and language. Consistent with past research, results show that the first three factors in the NeSBHis differentiated the HIV/AIDS group from normals. Discriminant function analysis revealed that the classification accuracy rate was 86%. Results from this study support the usefulness of the NeSBHis in assessing subtle cognitive and marked progression of HIV in this at risk population.
Correspondence: *José J. González, Department of Neuropsychology, UCLA-NPI/C8-747, 760 Westwood Plaza, Los Angeles, CA 90095-1405, USA.*

C.H. HINKIN, S.A. CASTELLON, S. WOOD, E.L. GRANHOLM, & G. SIEGLE. Computerized and Traditional Stroop Task Dysfunction in HIV–1 Infection.
To examine cognitive slowing, executive dysfunction, and controlled attentional processing in HIV infection, 21 HIV infected subjects and 16 seronegative controls were administered an experimental reaction time version of the Stroop task (Stroop–RT) as well as the standard paper version of the Stroop. On both the standard Stroop and the Stroop–RT the HIV+ subjects were significantly slower than controls. Subjects were also significantly slower on color-incongruent trials than on color congruent trials. An interesting dissociation was found between the HIV+ subjects' RT for blocked trials (e.g., homogenous sets of only color-incongruent or color-congruent trials) *versus* random trials (e.g., congruent and incongruent trials randomly interspersed), with the HIV+ subjects performance significantly slower than controls on blocked, but not random trials, particularly for incongruent stimuli. These data suggest that HIV infection may lead to a subtle dysexecutive disorder characterized by difficulty adopting cognitive set and deficits in controlled attentional processing.
Correspondence: *Charles H. Hinkin, Department of Psychiatry and Biobehavioral Sciences, UCLA School of Medicine, 760 Westwood Plaza, Room C8-747, Los Angeles, CA 90024, USA.*

M. J. TAYLOR, D.P. SALMON, N. BUTTERS, J.H. ATKINSON, J.A. McCUTCHAN, I. GRANT, & THE HNRC GROUP. Speed of Memory Scanning in HIV-Positive Individuals With Minor Cognitive/Motor Disorder.
Efficiency in mental processing is believed to be affected in HIV-infected individuals. Fourteen HIV+ men diagnosed with Minor Cognitive/Motor Disorder (MCMD), 32 HIV+ men without MCMD and 13 HIV− controls were compared on a variation of the Sternberg speed of memory scanning task. The groups did not differ significantly in age, education, or level of depression. In addition, the two HIV+ groups did not differ significantly in level of illness. The results indicated that the MCMD group displayed significantly poorer processing efficiency and slower motor response compared to both non-MCMD groups. Test–retest reliability was also assessed with data from 25 HIV-controls to address the concerns of Becker et al., who have expressed some concern regarding the reliability and stability of the slope and intercept scores from the memory scanning task, yielding considerably higher estimates.
Correspondence: *Michael J. Taylor, Department of Psychiatry, Clinical Sciences Building, Room 249, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093-0680, USA.*

J. MANLY, S.W. MILLER, R. HEATON, I. GRANT, & HNRC GROUP. Acculturation Accounts for Ethnic Group Differences in Neuropsychological Test Performance Among HIV+ Individuals.
This study examined the effect of self-reported acculturation on the ability of neuropsychological tests to detect HIV-related cognitive impairment. Participants were 20 non-Hispanic White and 20 African American HIV+ individuals matched on age, education, gender, and disease stage. The African American Acculturation Scale and a complete neuropsychological battery were administered. The HIV+ African American group had significantly lower scores on measures of abstraction (Category Test and Trails B), visuospatial skill (Block Design), language (Vocabulary) and

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learning (Story and Figure Learning) than White subjects ($p < .01$ for all). However, after accounting for acculturation, ethnic group differences on all these measures except Story Learning became nonsignificant. This study suggests that accounting for within-group cultural differences may improve the neurodiagnostic accuracy of certain neuropsychological tests.
Correspondence: *Jennifer Manly, HNRC, 2760 Fifth Avenue, Suite 200, San Diego, CA 92103, USA.*

J.W. GICONI, O.L. LOPEZ, & J.T. BECKER. A Self-Report Rating Scale for Motor and Mental Slowness: Preliminary Results.
We developed a self-report rating scale for motor and mental slowness. Items are intended to approximate general activities of daily life around the home: housekeeping, personal care, recreation and leisure, cognitive skills, and reaction time. The scale was administered to 86 HIV-infected individuals along with a neuropsychological test battery. Half of the subjects were tested again 6 months later. Item discrimination indices of .28 to .84 provide evidence of validity. Factor analysis yielded one factor accounting for 62% of the variance. Slowness ratings correlated with neuropsychological tests in which timing is critical. Analysis of internal consistency ($\alpha = .94$) provides evidence of reliability. Slowness ratings taken 6 months apart correlated significantly ($p < .001$), providing evidence of stability.
Correspondence: *Jeanne Wess Giconi, Neuropsychology Research Program, Suite 502 Iroquois Bldg., 3600 Forbes Ave., Pittsburgh, PA 15213, USA.*

S. CASTELLON, C. HINKIN, & S. WOOD. Apathy, Depression, and Cognitive Performance in HIV–1 Infection: Who Cares?
Although apathy, depression and neuropsychological (NP) impairment have all been observed in HIV–1 infected individuals, the relationship between these constructs has yet to be empirically explored. Research suggests that apathy and depression are overlapping but discriminable behavioral domains that may have different underlying mechanisms. The current study examined the relationship between apathy, depression, and NP performance in 27 HIV-seropositive individuals and 18 seronegative controls. Apathy, but not depression, was found to be associated with working memory deficits. In contrast, self-reported depressive symptomatology, but not apathy, was related to both information-processing slowing and increased error rates on a choice reaction time task. Apathy was much more prevalent in HIV-seropositive subjects (compared to seronegative controls) and was associated with self-report cognitive/affective symptoms of depression but not with somatic symptoms.
Correspondence: *Steven Castellon, Department of Psychology, University of California, Los Angeles, 405 Hilgard Ave., Franz Hall, Los Angeles, CA 90095-1563, USA.*

A.D. KALECHSTEIN, C.H. HINKIN, P. STENQUIST, W.G. VAN GORP, P. SATZ, S. WOOD, L. MOORE, & N. PACHANA. Disease Severity *Versus* Demographic Characteristics as Predictors of Neuropsychological Dysfunction in HIV-Infected Patients.
In a sample of 347 HIV-infected patients, the present study examined the relative strength of the relationships between education, symptom status, CD4 count, and neuropsychological impairment. Participants completed a measure of episodic memory, two measures of psychomotor speed, three measures of executive systems functioning, and a measure of emotional functioning. Increased age and lower education consistently were associated with decreased neuropsychological performance while symptom status and CD4 count showed inconsistent relationships with neuropsychological functioning. These findings further underscore the complex relationship between premorbid level of functioning and level of resistance to CNS disease.
Correspondence: *Ari D. Kalechstein, Department of Psychiatry, UCLA School of Medicine, 760 Westwood Plaza, Room C8-747, Los Angeles, CA 90024, USA.*

DEMENTIA—1

B. GIORDANI, C. PERSAD, C. MESSMER, A. SIMA, S. GILMAN, R.L. ALBIN, N.L. FOSTER, M.E. HEUMANN, & S. BERENT. Lewy Body Disease Differs From Alzheimer's Disease in Neuropsychological Profile.
A retrospective chart review identified the following pathology confirmed and neuropsychologically studied dementia cases—28 Alzheimer's disease (AD), 6 Lewy body disease (LB), and 14 with combined LB and AD pathology (AD/LB). No group differences were found for age, education, mental status, or dementia ratings. The LB group performed significantly better than the others in language (Boston Naming) and memory (delayed recall). No significant group differences were found in verbal fluency, block design, figure copy, or initial learning. On family behavioral ratings, the LB group reflected decreased energy in comparison to the others, whereas the AD/LB group exhibited greater paranoid ideation than LB or AD patients. LB and AD/LB cases appear to exhibit neuropsychological profiles distinct from one another.
Correspondence: *B. Giordani, Neuropsychology Division, Rm. 480 Med Inn, University of Michigan, Box 0840, 1500 East Medical Center Dr., Ann Arbor, MI 48109-0840, USA.*

J.B. RICH, R.S. COLLIS, S. DOPKINS, & J. BRANDT. Impaired Structure and Consistency of the Semantic Network in Alzheimer's Disease.
Twelve AD patients and 12 normal control (NC) subjects participated in triadic comparison (i.e., judging which two of three animals were most alike) and ordering (i.e., sequencing stimulus cards along a continuum ranging from small to big or tame to wild) tasks. Two conditions (lexical *vs.* pictorial representations of the animals) were administered for each task. Analyses of the triadic comparison judgments indicated that the patients made an equivalent number of size and domesticity judgments, whereas the control subjects made judgments based primarily on domesticity. When the subjects' own ordering data indicated that items were closely related on both size and domesticity dimensions, the patients were less likely than the controls to choose those two items as being most alike on the triadic comparison task. Among the patients, this deficit was correlated with dementia severity for the word condition. Taken together, the results suggest that both the structure and consistency of the semantic network are impaired in AD.
Correspondence: *Jill B. Rich, Department of Psychology, York University, 4700 Keele Street, North York, ON M3J 1P3, Canada.*

M. NEWMAN, A. KASZNIAK, L. HENMAN, & L. ALTHOFF-WEEKS. Verbal and Spatial Memory Performance in Healthy Younger and Older Adults, and Persons with Alzheimer's Disease.
Younger and older adults, and persons with AD were compared on spatial memory tasks believed to depend upon the hippocampal system. Older adults were impaired on tasks believed to rely most heavily upon that system: spatial and delayed verbal or spatial tasks. Older adults had more difficulty learning spatial relationships. Once established, those representations remained relatively accurate through permutations in the environment. Persons with AD were impaired on both verbal and nonverbal subtasks, including those believed to depend upon the hippocampal system. This group improved across the learning trials. However, they were still impaired relative to the younger adults on Trial 3. This pattern suggests learning and retrieval deficits. Following a 5-min delay, scores in the AD were again lower than the younger *and* the older healthy adults, suggesting rapid loss of information in this group. These impairments appear to occur very early in the course of AD.
Correspondence: *Mary Newman, Department of Psychology, University of Arizona, Tucson, AZ 85721, USA.*

M.E. QUIG, M. MURRAY, & K.A. WELSH-BOHMER. The Role of Executive and Working Memory Deficits in the Rapid Forgetting of Early Alzheimer's Disease.
The current study examined the performance of patients with Alzheimer's disease (AD; $N = 29$) and elderly controls ($N = 34$) on measures of sec-

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ondary memory (narrative recall, word list memory), working memory, and executive function in order to explore the relative contribution of each to the memory deficit of early AD. Results showed that measures of secondary memory were more sensitive than measures of working memory and executive function without fail. When the most efficacious measures were considered together, measures of working memory contributed significantly to the discrimination of cases from controls. Findings suggest a separate working memory impairment operating independently in AD, which contributes to the rapid forgetting defect.
Correspondence: *M.E. Quig, Baltimore VA Medical Center, 10 N. Greene Street, 6C-171, Baltimore, MD 21201, USA.*

M. PRASAD, P. MASSMAN, & N. COOKE. Memory for Emotionally Arousing Events in Patients With Probable Alzheimer's Disease.
Highly arousing events are thought to be better recalled than neutral incidents. Brown and Kulik (1977) postulated that these "flashbulb" memories are retained in greater detail because of an acute neurophysiological process that results from the highly arousing nature of the incidents. However, some theorists assert that these events are remembered in greater detail because they are rehearsed more frequently over time and not because of an acute neurophysiological process. This study investigated remote memory for emotional life events, both public and personal, in patients with probable Alzheimer's disease on three tasks: emotional word cues, specific life events, and flashbulb memories of national tragedies. Alzheimer's disease patients were impaired relative to normal control on all three tasks and displayed higher scores for recollection of personal life events than national events. These findings suggest that memories of emotionally arousing events are formed and retained by a neurocognitive process that is either the same or comparable to that for neutral events.
Correspondence: *Mary Prasad, UTHHSC, 6431 Fannin, Suite 3.252, Houston, TX 77030, USA.*

E. SHAPIRO, M. BALTHAZOR, L. LOCKMAN, & W. KRIVIT. Memory and Dementia in White Matter Disease.
Patients with genetic neurodegenerative diseases of the white matter, adrenoleukodystrophy (ALD) and metachromatic leukodystrophy (MLD), classified by region of abnormality according to MRI, were given the CVLT adult or child version, the WAIS–R or WISC–III, and were rated on a Dementia Rating Scale based on clinical and neurological, but not neuropsychological data, appropriate to their disease. Patients with predominantly anterior disease did more poorly on the CVLT than those with posterior disease. CVLT Total scores were more strongly related to Verbal than Performance IQ. However, Performance IQ was markedly more associated with DRS scores than was the Total CVLT score. In white matter disease, CVLT scores may not be as sensitive to dementia as Performance IQ.
Correspondence: *Elsa Shapiro, Division of Pediatric Neurology, University of Minnesota, Box 486 UMHC, 420 Delaware St. SE, Minneapolis, MN 55455, USA.*

A.U. MONSCH, B. THALMANN, D. ERMINI-FÜNFSCHILLING, H.B. STÄHELIN, & R. SPIEGEL. A Combination of the Clock Drawing Test (CDT) and the Mini-Mental Status Examination (MMSE) Helps to Improve the Screening for Dementia.
The objectives of this study were (a) to determine discriminating CDT scoring criteria, (b) to establish the optimal MMSE cutoff score, and (c) to derive an algorithm with the CDT and MMSE for use in dementia screening by GPs. 176 outpatients with dementia (91 with probable Alzheimer's disease, 60 with vascular dementia, and 25 with mixed dementia) and a demographically comparable group of normal control subjects ($n = 88$) participated in this study. Reliability of CDT scoring criteria: All 264 clocks were scored independently by three nonpsychologists using 41 CDT scoring criteria found in the literature. Twenty-six CDT scoring criteria with an interrater reliability greater than .85 were identified. Validity: Stepwise logistic regression revealed 4/26 criteria that best discriminated between patients and controls (exactly 12 numbers present, "12" at the top, two distinguishable hands, and correct reading of the time). Seventy-six percent of all subjects were correctly classified employing these four criteria (i.e., 77% sensitivity, 75% specificity). The optimal MMSE cutoff score was found to be 26/30 (77% sensitivity, 91% specificity). This MMSE cutoff score combined with the four CDT variables classified subjects with 81% sensitivity and 90% specificity. The use of the CDT/MMSE provides a brief, accurate dementia screening.
Correspondence: *A.U. Monsch, Memory Clinic, Kantonsspital, Hebelstrasse 10, 4031 Basel, Switzerland.*

D. GELDMACHER & C. ESTEBAN-SANTILLAN. Cancellation Assessment of Automatic and Effortful Visual Processing in Alzheimer's Disease.
Both automatic and effortful (controlled) cognitive processes are affected in Alzheimer's disease (AD), but their effects on visual information processing are incompletely understood. This study was therefore designed to determine the impact of AD on simple clinical tests designed to elicit automatic and effortful processing of visual stimuli. Seventeen persons with AD and 15 normal controls each completed four timed random array cancellation forms with 10 letters "I" or "O" as targets and 40 letters "L" as distractors. AD subjects were slower on all tests, but showed preserved distinctions between automatic and effortful tasks. This study demonstrates the ability to elicit automatic or effortful information processing on random array cancellation tasks. Task completion time also distinguishes between AD and normal aging in this paradigm.
Correspondence: *David Geldmacher, Alzheimer Center, University Hospitals of Cleveland, 12200 Fairhill Road, Cleveland, OH 44120, USA.*

J. OLIN, J. ERBLICH, C. GHOSH, & L. SCHNEIDER. The California Verbal Learning Test (CVLT) in Alzheimer's (AD) Patients: The Effect of Severity on Performance.
Reports on the CVLT, a standardized assessment of memory function, have not identified whether dementia severity affects its performance. We gave it to 24 AD patients [mean age = 76.3 ($SD = 8.8$); mean education = 14.1 (2.2)], who were stratified into four groups based on MMSE scores [mean = 14.8 (5.2)]. ANOVAs revealed severity effects for list A total recall ($p = .0001$), Trial 1 ($p = .001$), Trial 5 ($p = .0006$), and short and long delay measures. However, most of these differences seemed due to floor effects. For example, patients with MMSE scores less than 21 scored 0.5 words for short-delay free recall and 0.2 words for long-delay free recall. Discriminability, intrusion, and perseveration measures were not significantly affected by severity. Overall, the CVLT did not seem useful in discriminating levels of dementia severity.
Correspondence: *Jason T. Olin, USC Dept. of Psychiatry, 2011 Zonal, HMR101, Los Angeles, CA 90033, USA.*

D. STRITE, P. J. MASSMAN, N. COOKE, & R.S. DOODY. Patterns of Neuropsychological Deficits in Alzheimer's Disease.
This study investigated neuropsychological asymmetry along both lateral and anterior–posterior axes using principal component factor analysis in a sample of 175 patients diagnosed with probable AD. Using factor scores, patients were classified into groups exhibiting asymmetric or symmetric profiles of neuropsychological deficits. In the analysis of lateral asymmetry, 27.5% of patients were classified as asymmetric (10% verbally and 17% visuospatially). In the analysis of anterior–posterior asymmetry, 40% of patients were classified as asymmetric. Consistent with reports of continued asymmetry beyond the mild dementia stage, asymmetry was exhibited in the mild, moderate, and severely demented groups in the lateral and anterior–posterior analyses. These findings are consistent with the picture of significant neuropsychological heterogeneity in AD that has been emerging over the past decade.
Correspondence: *Daniel Strite, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

K. WILD & D. JONES. Driving as a Behavioral Correlate of Awareness Deficits in Patients With Alzheimer's Disease.
Diminished knowledge regarding cognitive, behavioral, sensory or motor functioning in Alzheimer's disease patients creates a disparity between per-

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ceptions of their abilities and actual performance. A lack of insight regarding impairments can lead to participation in activities that are dangerous and unrealistic, and can jeopardize the ability of the person to live independently. The present study describes discrepancies in ratings of abilities between patients with AD and their caregivers. The relationship between driving status and awareness of deficit in patients with Alzheimer's disease was also examined. Twenty-eight patients with possible or probable AD and their caregivers completed parallel questionnaires concerning the patients' abilities related to memory and daily functioning. Discrepancies between patient self-reports and caregiver ratings suggest that awareness of deficits is a phenomenon that can occur throughout the course of the disease.
Correspondence: *Katherine V. Wild, Oregon Health Sciences University, Department of Neurology, CDW2, Portland, OR 97201, USA.*

MEDICAL ILLNESS—1

N. PLISKIN, H. YURK, L. HO, & J. UMANS. Attention and Mental Processing in Chronic Hemodialysis Patients.
We reported previously that well-dialyzed end stage renal disease (ESRD) patients had no clear neurocognitive deficits when compared with a control group, save for lesser performance on one of four tests of attention and mental processing speed (A/MPS). We administered a battery of five attentional tasks to 10 chronic hemodialysis patients and 10 controls. Results of the Gordon Diagnostic System, Trailmaking, Digit Span and PASAT did not differ between groups. However, as reported previously, differences in the Stroop Color and Word conditions were of a magnitude that might be of functional importance. It is unclear whether the apparent Stroop subtest differences depend upon corrected uremia or other factors. We conclude it is unlikely that well dialyzed patients with ESRD manifest clinically significantly euremic neurocognitive deficits in the functional spheres related to sustained attention or mental processing speed.
Correspondence: *Neil Pliskin, Department of Psychiatry, University of Chicago, 5841 S. Maryland Ave., Chicago, IL 60637, USA.*

J. PICKETT, D. THEBERGE, W. BROWN, S. SCHWEITZER, & A. NISSENSON. Neurocognitive Status, EEG Frequency Spectra, and Correction of Anemia in Hemodialysis Patients.
The effects of increased levels of blood hematocrit (Hct) on neurocognitive status of 20 chronic hemodialysis (CHD) patients was examined using EEG frequency spectra. Patients received recombinant human erythropoietin (rHuEPO) to increase their Hct levels above current clinical guidelines. EEG frequency spectra were recorded at moderate (Time 1), then at high (Time 2) Hct levels and transformed into theta/(alpha + theta) ratios. Analysis of variance yielded a significant effect of time (low Hct *vs*. high Hct; $p < .023$). The decrease in ratios (i.e., decrease in EEG slowing) from Time 1 to Time 2 indicates improvement in neurocognitive function at higher Hct levels. These findings support the association between higher levels of Hct and improved mental status of CHD patients being treated for anemia with rHuEPO and suggest the advisability of a higher clinical standard for Hct.
Correspondence: *Warren S. Brown, The Travis Institute, Fuller Graduate School of Psychology, 180 North Oakland, Pasadena, CA 91101, USA.*

C.F. SALORIO, D.A. WHITE, J.F. PICCIRILLO, & S.P. DUNTLEY. Memory Function in Adults With Obstructive Sleep Apnea Syndrome.
Obstructive Sleep Apnea Syndrome (OSA) is a respiratory disorder that is characterized by repeated cessation of breathing during sleep due to the obstruction of upper airways. Cognitive impairments have been documented in patients with OSA. It remains unclear if these deficits are related to excessive daytime sleepiness or to repeated nocturnal hypoxia. The current study was conducted to further delineate the nature of the memory impairments seen in patients with OSA. Eighteen patients with OSA were tested on the CVLT and an experimental working memory task. Results suggest that patients with OSA demonstrate impairments in memory function, and these impairments appear to be related to the ability to employ memory strategies and efficiently retrieve encoded information from long term memory stores. These results are also consistent with the notion that cognitive dysfunction seen in these patients may be related to oxygen reduction to the frontal and hippocampal areas of the brain.
Correspondence: *Cynthia F. Salorio, Department of Psychology, Box 1125, Washington University, St. Louis, MO 63130, USA.*

S. HOLLIDAY, R. BREY, G. ESCALANTE, & M. LEDBETTER. Neuropsychological Functioning in SLE: Computer-Assisted Testing in a Predominantly Hispanic Sample.
Several studies have reported high rates of neuropsychological (NP) abnormalities in patients with Systemic Lupus Erythematosus (SLE). This study investigated the NP impairment among a group of predominantly Hispanic SLE patients attending a university medical center rheumatology clinic. NP performance was measured using MicroCog, a set of computer-administered tests assessing a variety of NP functions with special emphasis on reaction time and processing speed. The Brief Symptom Inventory was used to measure psychiatric distress. SLE patients were compared to a similar number of healthy controls matched for ethnicity, gender, age, and education from the Psychological Corporation's national normative database. General cognitive functioning on MicroCog was significantly lower than the matched controls who also scored slightly below general U.S. population norms. Information processing speed was similarly impaired in the SLE group, although the controls scored in the normal range. SLE patients performed significantly lower than controls on measures of attention/concentration, abstract reasoning, and reaction time. Neuropsychological measures did not correlate with SLE disease activity or steroid dosage. Only simple reaction time was marginally correlated with the general level of psychiatric distress and depression. Computer-administered tests sensitive to reaction time and speed of information processing may be helpful in future research studying SLE.
Correspondence: *Stephen L. Holliday, San Antonio VAMC, 7400 Merton Minter, San Antonio TX 78284, USA.*

S. REDIESS & A.A. RAHILL. The Role of Neuropsychological Evaluation in Listing Candidates for Liver Transplant.
Neuropsychologists are often asked to offer clinical opinions that can profoundly influence patients' lives. One such situation involves the assessment of cognitive deficits in patients considered for liver transplant. Noncompliance with the rigorous demands of lifetime immunosuppressant therapy remains one of the most common causes of late transplant rejection. Evaluation of neuropsychological impairment can play an important role in identifying those patients at risk for rejection due to noncompliance. This paper presents three case vignettes to illustrate how neuropsychological evaluation contributed to listing decisions for liver transplant.
Correspondence: *Sharilyn Rediess, Program in Geriatrics and Neuropsychiatry, University of Rochester Medical Center, 300 Crittenden Blvd., Rochester, NY 14642, USA.*

G.E. SWAN, D. CARMELLI, A. LaRUE, M.R. McELROY, & W.M. SMITH. The Relationship Between Peripheral Arterial Disease and Neuropsychological Performance in Elderly Adult Male Normotensives and Hypertensives.
This analysis examined the relationship between the ankle/arm SBP ratio and performance on tests of both speeded psychomotor performance as well as of verbal learning and memory in 635 men (mean age = 76 years) from the Western Collaborative Group Study. Participants were classified as either hypertensive or normotensive on the basis of blood pressure less than or equal to 160/90 mmHg or current use of antihypertensive medication. Individuals with a history of either stroke or dementia were excluded from the analysis. Correlational analyses of the relationship between ankle/arm SBP ratio and neuropsychological performance were then performed in both normotensives and hypertensives. These associations were calculated before and after adjustment for the effects of age and education. After adjustment, no significant associations between the ankle/arm SBP ratio and neuropsychological performance in normotensives were observed. In

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contrast, in hypertensives, the adjustment procedure did not eliminate all of the associations with neuropsychological performance. Both short and long delay cued recall from the CVLT remained significant at $p < .05$ and in the expected direction (e.g., lower ratios associated with lower levels of performance). These results suggest that in older adults, the relationship between subclinical peripheral arterial disease and verbal memory is, in part, associated with the presence of hypertension.
Correspondence: *Gary E. Swan, Center for Health Sciences, SRI International, Menlo Park, CA 94025, USA.*

M.-S. HUA, S.-T. CHEN, L.-M. TANG, & W.-M. LEUNG. Neuropsychological Function in Patients With Nasopharyngeal Carcinoma Following Radiotherapy.
A neuropsychological test battery was given to 29 adult nasopharyngeal carcinoma patients having received radiotherapy, to 28 adult nasopharyngeal carcinoma patients who were waiting for radiation treatment, and to 36 adult normal control subjects. Members of the three groups were matched for age, and educational level. Comparisons of test results showed that our NPC patients with radiotherapy had neuropsychological impairments including auditory attention/concentration, immediate and delayed verbal and immediate nonverbal recall, and recent memory, higher-order visuospatial abilities, spontaneous writing, and bimanual dexterity. Our results did not fully support the previous observations. The discrepancy between the previous findings and ours might be due to a different research design and neuropsychological measures. We thus suggest further prospective study to investigate this inconsistent issue.
Correspondence: *Mau-Sun Hua, Department of Psychology, National Taiwan University, Taipei 106, Taiwan.*

V. MICHIELS, R. CLUYDTS, & B. FISCHLER. Cognitive Functioning in Patients With Chronic Fatigue Syndrome (CFS), Multiple Sclerosis (MS) and Depression (DEP): A Preliminary Comparison.
The purpose of the present study was to evaluate whether patients with CFS can be distinguished from patients with MS, patients with DEP, and healthy controls (HC) on the basis of their cognitive functioning. A standardized neuropsychological test battery was presented to 16 CFS and to 10 MS, 11 DEP and 10 HC subjects. The results show that patients with CFS as compared to HC have selective cognitive difficulty, particularly in the area of attention and verbal fluency. The CFS group shows less dramatic cognitive difficulty than patients with MS. The cognitive performance of the CFS group cannot be distinguished from patients with depression. The heterogeneity in cognitive dysfunction within the CFS sample points possibly towards the existence of CFS subgroups with respect to cognitive functioning.
Correspondence: *Raymond Cluydts, Department of Psychology, Free University of Brussels, Pleinlaan 2, 1050 Brussels, Belgium.*

K. GOODALL & M.I. VRBANCIC. The Effect of Carotid Endarterectomy on Cognitive Functioning.
Five patients undergoing carotid endarterectomy were tested for cognitive functioning 12–24 hr preoperatively and 6–8 weeks postoperatively using the Neurobehavioral Cognitive Status Exam and the Mattis Dementia Rating Scale (MDRS). In addition, measures of anxiety, estimated intelligence and depression were administered. Scores obtained on these tests were compared with scores obtained by a group of normal age-matched controls who were tested on two occasions 6–8 weeks apart. The groups did not differ significantly in age, verbal IQ, level of anxiety, or depression. No significant Group × Time interactions were noted, suggesting that carotid endarterectomy has no effect on cognitive functioning of these patients. However, the endarterectomy group had a significantly lower mean total score on the MDRS, suggesting cognitive impairment in this group without improvement after surgery.
Correspondence: *Kate Goodall, Department of Psychology, 9 Campus Drive, University of Saskatchewan, Saskatoon, SK S7N 5A5, Canada.*

B. BELL, M. PRIMEAU, J. SWEET, & K. LOFLAND. Neuropsychological Status of Patients With Migraine Headache, Nonheadache Chronic Pain, or Mild TBI.
Reports of cognitive and neurophysiological differences between migraine headache patients and normal controls have led to the hypothesis that migraine may result in subtle brain injury. However, migraineurs have not been compared neuropsychologically to patients with other chronic pain conditions. We compared demographically-matched groups with either migraine headache or nonheadache chronic pain, and a third group of patients with mild TBI ($N = 58$). Depression and other potential moderator variables did not contribute significantly to neuropsychological performance. A MANOVA showed the two pain groups did not differ cognitively, whereas each was superior to the mild TBI sample. Normative-based score data indicated that the migraine groups performed normally.
Correspondence: *Brian Bell, Semmes-Murphey Clinic, Suite 730, 930 Madison Ave., Memphis, TN 38103, USA.*

T.P. ROSS, P.A. LICHTENBERG, L. YOUNGBLADE, & J.W. DWYER. Do Medical Burden and Functional Disability Play Mediating Roles in the Relationship Between Depressive Symptoms and Cognition in Elderly Adults?
This study examined 543 elderly medical patients to investigate whether medical burden and functional disability served as mediator variables that account for the relationship between depressive symptoms and cognitive performance. Results did not support the hypothesis that medical burden, as assessed by the Index of Comorbidity, functioned as a mediator variable. In contrast, increased functional disability as assessed by the Functional Independence Measure (FIM) was found to act as a *partial mediating variable*. Results support the interpretation that functional disability systematically influenced the relationship between depressive symptom endorsement and cognitive functioning in the present sample. Clinical and theoretical implications of these results are presented along with limitations of the present study and directions for future research.
Correspondence: *Thomas P. Ross, Department of Psychology, Rehabilitation Institute of Michigan, 261 Mack Blvd., Detroit, MI 48201, USA.*

M. ALFANO, S. HOLLIDAY, & P. CLEMENT. Neuropsychological and Psychological Subgroups in Gulf War Syndrome.
Neuropsychological characterization of Gulf War Syndrome (GWS) has proved to be difficult, perhaps because GWS may be composed of multiple subtypes with respect to psychiatric and neuropsychological impairment. We examined the neuropsychological and MMPI–2 data from 105 individuals diagnosed with GWS. The participants, as a group, were not impaired on the neuropsychological measures. However, to examine the possibility that overall group scores may have obscured characteristics of the component subgroups, we performed a cluster analysis of neuropsychological and MMPI–2 variables. The cluster analysis supports the idea that this group is composed of discrete subpopulations with varying patterns of neuropsychological and personality difficulties. The fact that the group as a whole does not exhibit neuropsychological impairment should therefore not lead to the premature conclusion that GWS does not have an organic component.
Correspondence: *Steve Holliday, Audie Murphy VA Hospital, 7400 Merton Minter Blvd., San Antonio, TX 78284, USA.*

A.E. THORNTON & N. RAZ. Memory Impairment in Multiple Sclerosis Patients: A Quantitative Review.
Thirty-six studies comparing the memory of multiple sclerosis (MS) participants to healthy participants were analyzed quantitatively. We analyzed (a) the pattern of impairment across short-term memory (STM), working memory (WM), and long-term memory (LTM); (b) the moderating influence of different levels of retrieval support (i.e., free recall, cued recall, and recognition) on LTM impairment; and (c) the influence of clinical characteristics of MS on memory impairment. Our integration of previous research revealed significant deficits across all memory domains and these deficits were associated with disease severity indices. In contrast to

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previous reports, our analyses also indicate a more global pattern of impairment and fail to support a retrieval account of LTM dysfunction.
Correspondence: *Allen E. Thornton, Department of Psychiatry and Psychology, The Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195, USA.*

V. JEAN, W. BEATTY, R. PAUL, & L. MULLINS. Neuropsychological Function and Coping in Noninstitutionalized MS Patients.
This study was designed to assess the neuropsychological function of community dwelling MS patients and their ability to cope with self-remembered stressful situations that were disease-related and general in nature. MS patients completed a test battery that tapped seven cognitive domains, the Ways of Coping Questionnaire as well as other measures that affect the coping ability of chronically ill individuals. Despite the fact that 49% of the MS patients obtained domain scores indicative of global cognitive impairment, there was no relationship between neuropsychological test performance and the ability to utilize coping strategies involving problem-solving. There was a direct relationship between the level of psychological distress and the use of emotion-focused coping strategies.
Correspondence: *William Beatty, Department of Psychiatry and Behavioral Sciences, 410 Rogers Building, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73190, USA.*

P. MASSMAN, L. HAVERKAMP, N. COOKE, J. SIMS, V. APPEL, & S. APPEL. Verbal Learning and Memory in Amyotrophic Lateral Sclerosis.
The California Verbal Learning Test (CVLT) was administered to 145 patients with amyotrophic lateral sclerosis (ALS), as well as to normal controls (NC), Huntington's disease (HD) patients, and Alzheimer's disease (AD) patients. Using three key CVLT indices in a discriminant function (DF) analysis, the NC, HD, and AD subjects were classified with over 90% accuracy. Next, this *same* DF was applied to the ALS patients, and it was found that 99 patients (68.3% of sample) showed a Normal CVLT profile, 41 patients (28.3%) displayed an HD profile (ALS–HD subgroup), and 5 patients (3.4%) exhibited an AD profile (ALS–AD subgroup). The ALS–HD subgroup had considerable difficulty on the learning trials (e.g., decreased recall, semantic clustering, consistency, learning slope), but unlike the ALS–AD subgroup, displayed normal retention, substantial improvement on recognition testing, and normal intrusion rates.
Correspondence: *Paul Massman, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

P. ARNETT, C. HIGGINSON, B. VOSS, W. BENDER, J. WURST, & J. TIPPEN. Working Memory Span and Long-Term Memory in MS.
Although numerous studies have documented long-term memory deficits in multiple sclerosis (MS), the mechanism underlying these deficits remains poorly understood. The current study was designed to examine the possible relationship between deficits in working memory span and long-term memory in MS. We compared a group of MS patients with high working memory spans (High-Span) to a group of MS patients with low working memory spans (Low-Span) on two verbal and one visual memory measure. Groups were closely matched on subject and illness characteristics. The High-Span group performed significantly better than the Low-Span group on the verbal memory measures. Our results indicate that deficits in verbal working memory span are associated with impairments in long-term verbal memory.
Correspondence: *Peter Arnett, Department of Psychology, Washington State University, Pullman, WA 99164-4820, USA.*

M.K. JÓNSDÓTTIR & Ó. KJARTANSSON. Pure Alexia in Multiple Sclerosis: A Case Report.
Language is generally thought to be well preserved in MS. Aphasia is rare and reading disorders almost unheard of. We present an MS patient, HK, with alexia and auditory comprehension difficulties. In reading there were no effects of word class, word frequency, or concreteness. Errors were mostly additions, omissions and substitutions of single letters. Most of the errors were on the right side of the words but neglect was not seen elsewhere. There were no difficulties on other visual tasks, e.g., cancellation tests. An MRI showed lesions in the paraventricular white matter bilaterally. There were also small lesions subcortically in the superior temporal gyrus bilaterally and bilateral lesions in the occipital lobe white matter (tractus opticus and cuneus).
Correspondence: *María K. Jónsdóttir, Reykjavík Hospital, Department of Neurology and Rehabilitation Medicine and Gerontology, Grensásvegi 62, 108 Reykjavík, Iceland.*

T. LAZARUS. What Factors Predict Neuropsychological Test Scores in Transient Ischemic Attacks?
The study aimed at using stepwise regression analyses in a sample of transient ischemic attack and control subjects to determine which factors loaded on scores in these groups. The findings suggested that stenosis formed a significant contributor to the scores on Digit Span, PASAT and Trails A and B in the transient ischemic attack group, while education was significant in the control group. Education thus appears to have differential effects on neuropsychological test performances in groups with cerebrovascular diseases. These findings are discussed within the context of which functions are susceptible to transient disruption of blood supply to the brain, and the consequences this finding may have for brain functioning.
Correspondence: *Theophilus Lazarus, Department of Psychology, University of Durban Westville, Private Bag X54001, Durban, 4000, Kwazulu Natal, South Africa.*

PEDIATRIC NEUROPSYCHOLOGY—1

M.B. SHAPIRO, M.K. MORRIS, & R.D. MORRIS. A Case Study of Neuropsychological Functioning After Herpes Simplex Viral Encephalitis in Middle Childhood.
The prevalence of herpes simplex viral encephalitis (HSE) is unknown, but mortality rates are high. Unlike most viral infections of the central nervous system, the effects of HSE in adults are typically focal, rather than diffuse. Dense memory defects and behavioral changes reflect damage primarily to temporal and orbitofrontal areas. Published reports regarding neuropsychological sequelae of HSE in children are rare, however. The present study describes the neuropsychological functioning of a premorbidly gifted youngster 1, 6, and 12 months after HSE diagnosis and treatment. Although initial evaluations documented the characteristic patterns of memory, executive, and social–emotional deficits associated with HSE, 12-month testing indicated markedly improved functioning with much less residual impairment than expected by initial radiological findings or case studies reported in the literature.
Correspondence: *Marla B. Shapiro, Department of Psychology, Georgia State University, University Plaza, Atlanta, GA 30303, USA.*

A. BIEBERICH & S. MORGAN. Affective Expression in Preadolescent Children With Autism or Down Syndrome.
This study compared affective expression in preadolescent autistic children and Down syndrome children within a semi-structured play session involving the child and mother. Groups were closely matched on chronological age, gender, race, socioeconomic status, and verbal ability. Children were rated on negative affect, positive affect, self-regulation, and activity level with a behaviorally anchored measure, the Minnesota Preschool Affect Rating Scales. Autistic children were rated more deviant than Down syndrome children in positive affect, negative affect, and self-regulation skills. Of these variables, self-regulation was best at discriminating the two groups. These findings are related to recent research implicating frontal lobe and cerebellar deficits in autism.
Correspondence: *Andrea Bieberich, Department of Psychology, University of Memphis, Memphis, TN 38152, USA.*

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S.D. GREWE, R. HOPKINS, J. RUSIN, K.O. YEATES, & R. BATLEY. Neuropsychological and Neuroradiological Outcomes Following Carbon Monoxide Poisoning in a Young Child.
Carbon monoxide (CO) is a toxic gas that can produce significant neuropsychological impairment. However, most investigations of the neuropsychological consequences of CO poisoning have focused on adults rather than children, who may be even more vulnerable to CO exposure. We examined a young boy who suffered CO poisoning when he was 6 years of age. He underwent an MRI and a neuropsychological evaluation during his initial hospitalization and again 13 months later. Neuroimaging revealed progressive diffuse encephalopathy. Upon followup, general intellectual functioning had improved, but deficits persisted in processing speed, attention, verbal memory, and executive functions. The results suggest greater vulnerability in the developing brain to CO poisoning.
Correspondence: *Scott Grewe, Department of Psychology, Timken Hall, Children's Hospital, 700 Children's Dr., Columbus, OH 43205, USA.*

K. GYATO, M.D. RIS, & A. WEBER. Exploring the NLD Pattern in PKU.
Rourke's White Matter Model postulates that the pathophysiology of nonverbal learning disability (NLD) is a disturbance of cerebral myelination. Recent neuroimaging studies have found white matter abnormalities in the phenylketonuria (PKU) population. Thus, PKU is an ideal condition to examine the presence of the NLD pattern. This study examines the NLD pattern (i.e., neurocognitive pattern of verbal *versus* spatial discrepancy and psychosocial deficits) in a cohort of 25 adult early treated PKU (ETPKU) patients compared to 15 sibling controls. The results indicate the absence of the core neurocognitive and psychosocial features of the NLD pattern in our adult ETPKU patients. It is hypothesized that the white matter abnormalities associated with PKU may be dissimilar to the demyelinating or dysmyelinating white matter diseases associated with the NLD syndrome.
Correspondence: *Kunsang Gyato, Division of Psychology, Children's Hospital Medical Center, 3333 Burnet Avenue, Cincinnati, OH 45229, USA.*

W.D. ROSEN, M. NELSON, L.A. VALENTINO, & H. KAIZER. Neuropsychological Development of a Child Treated With Bone Marrow Transplant for Mucopolysaccharidosis Type VII (Sly Syndrome).
Pediatric neuropsychology is increasingly investigating medical syndromes of multisystem involvement, including mucopolysaccharidoses (MPS). This presentation examines a heretofore unpublished case of MPS VII (Sly syndrome) prior to and following treatment with bone marrow transplant (BMT) of an unrelated donor. Prior to BMT at first evaluation (11 months), the patient showed low average mental capacity and lower motor coordination on the Bayley. Three months later following BMT and recovery from Graft Versus Host Disease, a loss of abilities was documented. Subsequent evaluations showed progressive development but at a decelerating rate (MDI $<$ 50). It is unclear whether BMT prompted relative cognitive decline, but it clearly has not improved outcome, a pattern consistent with the post-BMT course in children with Sanfilippo and Hunter but not Hurler MPS syndromes. Of note, adaptive functioning has been age-expected, suggesting a unique MPS profile.
Correspondence: *Warren D. Rosen, Rush-Presbyterian-St. Luke's Medical Center, 1653 West Congress Parkway, Chicago, IL 60612, USA.*

S. FRUTIGER, E. FENNELL, & M. PARSONS. Resolution of Cortical Blindness Following an Acute Posterior Leukoencephalopathy in Childhood.
A reversible posterior leukoencephalopathy syndrome, associated with cortical blindness and radiological changes suggestive of white matter edema in the posterior parieto–temporal–occipital region, has been recently reported. However, only 1 child case has been reported, and neuropsychological findings have not been previously reported. We present both acute and 1 month neuropsychological findings in a child (D.B.) who suddenly developed cortical blindness and decreased alertness in response to Cyclosporine neurotoxicity. Neuroradiological and clinical ophthalmological findings resolved rapidly and D.B. demonstrated a significant improvement in functional visual capacity. However, he continued to demonstrate significant prosopagnosia, achromatopsia, and problems with tasks requiring mental imagery 1 month after the acute episode. Findings will be discussed within the context of implications for assessment and relevance to cognitive visual neuroscience.
Correspondence: *Sally Frutiger, Department of Psychiatry, Dartmouth-Hitchcock Medical Center, One Medical Center Drive, Lebanon, NH 03756-0001, USA.*

J.M. KIEFEL, S. GUY, K.O. YEATES, N. LOSS, & B. ENRILE. Constructional and Figural Memory Skills in Children With Myelomeningocele.
This study examined constructional and figural memory skills in children with myelomeningocele (MM) using the Rey–Osterrieth Complex Figure (ROCF). Participants included 61 children with MM, 53 of whom had a history of shunted hydrocephalus, and 27 of their siblings, all from 8 to 15 years of age. They were asked to copy the ROCF and then to draw it from memory immediately and again following a delay. Outcome measures included the number of elements reproduced, organizational quality, and style of production. Compared to the siblings, the MM group reproduced as many of the elements of the ROCF during the copy but significantly fewer during immediate and delayed recall. The MM group organized the elements less well than the siblings, especially during the copy. The MM group and the siblings did not differ in style of production, although the MM group tended to use a part-oriented approach more often during the copy. The organizational difficulties demonstrated by the MM group when copying the ROCF probably affects their subsequent recall of specific elements during immediate and delayed recall.
Correspondence: *Keith Yeates, Department of Psychology, Timken Hall, Children's Hospital, 700 Children's Dr., Columbus, OH 43205, USA.*

R.W. BARRON, M.W. LOVETT, & K.A. STEINBACH. Remediating Spelling Disabilities: Differences Between Developmentally and Neurologically Impaired Dyslexic Children.
Three groups of dyslexic children ($N = 6$ per group; equivalent in vocabulary, word and nonword reading, and chronological age) were compared in a 24-lesson remediation study of the acquisition and transfer of spelling skill. The HC group had early-onset hydrocephalus, the MN group a variety of neurological disorders, and the DD group developmental dyslexia. The three groups were similarly improved in their ability to spell specific training words following remediation, but the HC and MN groups both made significantly greater gains than the DD group in their ability to spell untrained transfer words. These data provide further evidence that developmental dyslexia involves transfer-of-learning difficulties specific to acquiring printed language skills; the results have implications for remediating spelling disabilities in different subgroups of dyslexic children.
Correspondence: *Roderick W. Barron, Department of Psychology, University of Guelph, Guelph, ON N1G 2W1, Canada.*

B.L. BROOKSHIRE, D.N. CANALES, L. EWING-COBBS, G.A. STALLINGS, & J.M. FLETCHER. Specific Language Deficiencies in Children With Early Onset Hydrocephalus and Average Verbal Ability.
In this study, 15 children with early onset hydrocephalus, malformations of the corpus callosum, and average verbal ability, were assessed on measures of specific language including receptive and expressive vocabulary, verbal abstraction, social comprehension, fluency and automaticity, and story generation. Relative to a comparison group, children with hydrocephalus demonstrated difficulty with receptive vocabulary, social comprehension, and fluency and automaticity. Except for problems with sequencing of core propositions, children with hydrocephalus produced core propositions appropriate to a picture story sequence, similar to a comparison group. These results will be discussed in relation to the corpus

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callosum defects of these children and underlying mechanisms including speed of processing and integration of verbal and nonverbal information.
Correspondence: *Bonnie Brookshire, Department of Pediatrics, University of Texas–Houston Health Science Center, 6431 Fannin, Suite 7.142, Houston, TX 77030, USA.*

J. SCHATZ, S. CRAFT, M.R. DeBAUN, M. KOBY, B.C.P. LEE, et al. Visual Search Following Childhood Stroke.
Visual search performance following childhood onset stroke was examined using tasks modeled after Treisman & Gelade. Individuals with unilateral left ($n = 12$), unilateral right ($n = 5$), and bilateral ($n = 11$) infarcts were compared to 17 healthy, age-matched children. Both groups with unilateral injury showed a parallel search pattern for color and a serial search pattern for shape in the visual field contralateral to their injury. When searching for targets based on both color and shape, both unilateral injury groups showed a slowing of visual search rate contralateral to their injury. Children with bilateral injury showed serial visual search for both color and shape. For the conjunctive search condition, children with bilateral injury showed bilateral slowing of their search rate. The data suggest children, like adults, show visual neglect for the side opposite their injury. The children with unilateral injury in the present study showed selective disruption of shape, but not color, whereas in previous studies of adults with unilateral injury selective disruption for particular types of stimuli have not been reported for single feature search.
Correspondence: *Jeffrey Schatz, Psychology Service (116B), VAPAHCS, 3801 Miranda, Palo Alto, CA 94304, USA.*

Paper Session 4/11:00 a.m.–12:30 p.m.

SCHIZOPHRENIA

C. KARATEKIN & R.F. ASARNOW. Components of Visual Search in Childhood-Onset Schizophrenia and Attention-Deficit/Hyperactivity Disorder (ADHD).
When schizophrenic individuals search for a visual target, their performance may be reflecting a core cognitive dysfunction. Guided by feature integration theory, we determined if delays in rate or initiation of search or limitations in breadth of attention could explain this dysfunction. We administered parallel and serial search tasks to normal adults in Experiments 1 and 2, and to schizophrenic, ADHD, and normal children in Experiment 3. To measure the three components of search, we used eye movement measures in conjunction with behavioral measures. We failed to find evidence for impairments in initiation or breadth of attention in either group. Parallel search rate was normal but serial search rate was delayed in both clinical groups, and this impairment was greater in schizophrenic children.
Correspondence: *Canan Karatekin, Department of Psychiatry, Neuropsychiatric Institute & Hospital, UCLA, 760 Westwood Plaza, Los Angeles, CA 90024-1759, USA.*

P. SZESZKO, R. STROUS, R. BILDER, T. LENCZ, B. BOGERTS, M. ASHTARI, H. WU, & J. LIEBERMAN. Neuropsychological Correlates of Mesiotemporal Volumes in First-Episode Schizophrenia.
Although mesiotemporal (MT) structural abnormalities have been reported in patients with schizophrenia, few studies have investigated their neuropsychological (NP) correlates. We report findings from a study that investigated MT lobe volumes computed from magnetic resonance images in relation to an extensive NP battery in a sample of patients studied soon after the onset of their first episode of schizophrenia. In dextral males anterior hippocampal volumes were positively correlated with performance on tests of executive and motor functions. In dextral females amygdaloid volumes were positively correlated with performance on tests of attention and visual–spatial functions. No significant correlations were obtained between MT lobe volumes and NP functions in nondextral patients. This study suggested that volume reductions in certain MT regions are associated with specific NP deficits and have implications for neurodevelopmental hypotheses of schizophrenia.
Correspondence: *Philip R. Szeszko, Hillside Hospital–Research, P.O. Box 38, Glen Oaks, NY 11004, USA.*

C. EVANS, T. WALDECK, S. BURNS, S. MILLER, & L.S. MILLER. Self-Ordered Pointing Task and Hypothetical Risk for Schizophrenia: Evidence of Frontal Lobe Dysfunction.
Empirical evidence has suggested that frontal-lobe deficits are characteristic of both patients with schizophrenia and populations hypothetically at risk for the disorder, supporting the idea of an underlying neuropathology common across a schizophrenic spectrum. However, the majority of studies have used the Wisconsin Card Sort Test, which has recently been questioned as a selective measure of frontal functioning. The present study compared the performance of psychometrically identified positive and negative symptom psychosis-prone individuals with a matched control group on a well validated, selective measure of frontal-lobe functioning: the Self-Ordered Pointing Task (SOPT). Analyses revealed that the negative symptom group made significantly more total errors on the SOPT than the control group, with no differences found between positives and controls. Results are discussed in relation to possible neurodevelopmental mechanisms involved in the manifestation of schizophrenia.
Correspondence: *L. Stephen Miller, Department of Psychology, University of Georgia, Athens, GA 30602-3013, USA.*

J. POOLE, F. CORWIN, & S. VINOGRADOV. Cognitive & Clinical Correlates of Inaccurate Affect Recognition in Schizophrenia.
Using facial and prosodic stimuli, 40 schizophrenics were tested for affect recognition, non-affective stimulus discrimination, and on the WAIS–R. Prosodic affect-recognition correlated significantly with nonemotional prosody discrimination, verbal comprehension, and attentional control. Facial affect recognition correlated with verbal comprehension. Based on clinical interview (PANSS), inaccurate affect recognition (visual and auditory) correlated significantly with: Disorganized Symptoms (conceptual and behavioral), Positive Symptoms (hallucinations, delusions, unusual thoughts), and Cognitive Symptoms (attention, stereotyped thinking)—but not with mood symptoms. Partialling for nonaffective perceptual accuracy and IQ had little effect on the association with Disorganized Symptoms, and only partially attenuated the relation with Positive and Cognitive Symptoms. These findings indicate that, while general cognitive factors influence affect perception, a core disturbance of affect recognition exists in schizophrenia—independent of general cognitive impairment and associated with specific psychopathologic symptoms.
Correspondence: *John Poole, Psychiatry Research (116W), University of California at San Francisco, 4150 Clement Street, San Francisco, CA 94121, USA.*

D. VELLIGAN, R. MAHURIN, P. DIAMOND, B. HAZLETON, S. GIESECKE, & A. MILLER. Two Studies of the Functional Significance of Symptomatology and Cognitive Function in Schizophrenia.
The functional significance of positive symptoms, negative symptoms, and cognitive deficits in schizophrenic patients was examined in two studies ($N = 112$ and $N = 41$) utilizing multiple regression and path analysis. Results revealed that symptomatology predicted minimal variance in the ability to perform basic activities of daily living. In contrast, cognitive function predicted over 40% of the variance in scores on a functional assessment measure. A path analysis model in which cognition predicted both concurrent symptomatology and activities of daily living fit the data. Results suggest the strong influence of cognition on functional skills and potentially on psychiatric symptomatology. These findings have relevance to use of compensatory strategies in psychosocial rehabilitation and theoretical models of role impairment and symptomatology in chronic schizophrenia.
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R. FUCETOLA, J.W. NEWCOMER, S. CRAFT, & T. HERSHEY. Dose-Dependent Glucose-Induced Improvement in Spatial Memory Performance in Schizophrenia.
Recent investigations have shown that elevating circulating glucose levels can improve memory performance in animals, healthy humans, and patients with Alzheimer's disease and schizophrenia. In this study, schizophrenics ($n = 20$) and healthy age-matched controls ($n = 20$) participated in a within-subjects, double-blind comparison of multiple, fixed-dose oral dextrose administration on memory performance, consuming a 453.5 g (16 oz) orange-flavored beverage with either 25 g, or 75 g of dextrose, or 64 mg of saccharin, on four different mornings. Spatial delayed (120s) recall performance was dose-dependently increased by glucose treatment in patients with schizophrenia. These results (1) replicate our previous report of glucose-induced increases in memory performance in schizophrenia, and (2) provide evidence of a dose-dependent effect on spatial memory.
Correspondence: *John W. Newcomer, Department of Psychiatry, Washington University, Box 8134, 4940 Children's Place, St. Louis, MO 63110, USA.*

Paper Session 5/11:00 a.m.–12:30 p.m.

DEMENTIA—2 (ALZHEIMER'S DISEASE)

J. GREEN, A.I. LEVEY, B.E. SIROCKMAN, & S.C. HARPER. Event-Related Potential P3 Abnormalities in Individuals at Risk for Alzheimer's Disease.
Since the P3 event-related brain potential reflects cognitive processes and is sensitive to cholinergic manipulations, it may be sensitive to changes in cognition and cholinergic function as are characteristic early in the course of Alzheimer's disease (AD). We compared the P3 of 24 middle-aged asymptomatic individuals (mean age = 55 years) with a family history of AD (FH+) to that of 23 controls without a family history (FH−). The P3 was assessed using a standard auditory oddball paradigm recording at electrode location P_z. Although the two groups did not differ on neuropsychological measures, the P3 latency of the FH+ group was significantly longer in comparison to the FH− group. The results suggest that the P3 may be sensitive to subtle neurologic dysfunction signalling the early phases of AD.
Correspondence: *Joanne Green, Emory University Department of Neurology, and Wesley Woods Center, 1841 Clifton Road, Atlanta, GA 30329, USA.*

D. KAUFER & J. CUMMINGS. Neuropsychological Concomitants of Extrapyramidal Signs and Psychosis in Alzheimer's Disease.
The relationship of extrapyramidal signs and psychosis, hallmarks of Lewy body dementia, to cognitive status was examined in 55 subjects with probable Alzheimer's disease. Sixteen subjects had one or more extrapyramidal signs (+EPS) and 20 had either delusions, hallucinations, or both (+D-H). No differences were observed in +D-H and −D-H patients in demographic, cognitive or functional status. +EPS patients were older and had a greater degree of overall cognitive impairment than −EPS patients, particularly evident on tests of verbal fluency and confrontational naming. Whereas delayed spontaneous and cued recall were equally impaired in +EPS and −EPS subjects, immediate recall and learning across trials were significantly lower in the former group. These data suggest possible neuropsychological concomitants of Lewy body dementia.
Correspondence: *Daniel Kaufer, 4 West, ADRC, Montefiore University Hospital, 200 Lothrop Street, Pittsburgh, PA 15213, USA.*

S. STARKSTEIN, L. SABE, E. CHEMERINSKI, L. JASON, & R. LEIGUARDA. Two Domains of Anosognosia in Alzheimer's Disease.
We examined the presence of different dimensions of unawareness in a consecutive series of 151 patients with probable Alzheimer's disease (AD). Patients were assessed with the Anosognosia Questionnaire–Dementia (AQ–D) which includes items related to cognitive deficits and behavioral problems. A factor analysis of the AQ–D produced 2 factors: a "cognitive-unawareness" factor, which loaded on items of memory, spatial and temporal orientation, calculation, abstract reasoning, and praxis, and a "behavioral-unawareness" factor, which loaded on items of irritability, selfishness, inappropriate emotional display, and instinctive disinhibition. A stepwise forward-regression analysis showed significant correlations between the cognitive-unawareness factor and more severe cognitive deficits, delusions, and apathy, but less depression. On the other hand, the behavioral-unawareness factor correlated significantly with higher mania and pathological laughing scores. Finally the cognitive-unawareness factor showed a significant correlation with cognitive tests assessing verbal comprehension and long-term memory.
Correspondence: *Sergio E. Starkstein, Raúl Carrea Institute of Neurological Research, Department of Neuropsychiatry, Montañeses 2325, 1428 Buenos Aires, Argentina.*

A. CHAN, D.P. SALMON, & J. DeLaPENA. Story-Reading in Patients With Alzheimer's Disease: Dissociation of Conceptual and Perceptual Processing.
Two experiments examined the retention of text-specific reading skill in Alzheimer's disease (AD) patients, and explored the processes that might underlie this skill. In Experiment 1, AD and normal control (NC) subjects reads two passages three times, and then again after 1-min and 10-min delays. AD patients demonstrated normal acquisition, but impaired retention, of the reading skill. Experiment 2 followed the same procedures, but the degree of perceptual or conceptual processing required by the stories was manipulated. AD patients demonstrated intact acquisition and retention of the reading skill in a perceptual-driven, but not in a conceptual-driven condition. These results are consistent with the notion that conceptual processing in AD patients is impaired while perceptual processing is relatively intact.
Correspondence: *Agnes Chan, Alzheimer's Disease Research Center, UCSD, 9500 Gilman Drive, La Jolla, CA 92093-0948, USA.*

G. GLOSSER, P.K. GRUGAN, & R.B. FRIEDMAN. Patterns of Lexical Semantic and Associative Priming in Alzheimer's Disease.
Semantic memory impairment in Alzheimer's Disease (AD) was investigated using a threshold oral reading task to assess priming of different lexical relationships: associative relationships between word *sounds* and semantic relationships between word *meanings*. Elderly controls showed significant priming effects for both associatively related words and words that were semantically related, either because both designated subordinate exemplars of a common superordinate category or because the target named the superordinate category of the prime. AD patients showed preserved priming of lexical associates, but impaired priming of certain semantic relationships. Semantic priming between words designating subordinate exemplars was impaired, but priming between a subordinate exemplar and its superordinate category was preserved. Results are consistent with the view that the semantic memory impairment in AD is selective for certain types of lexical knowledge.
Correspondence: *Guila Glosser, Department of Neurology (3W Gates), University of Pennsylvania Medical Center, 3400 Spruce St., Philadelphia, PA 19104-4283, USA.*

D. MARSON, B. McINTURFF, L. HAWKINS, & L. HARRELL. Two Neuropsychological Models of Physician Competency Judgments in Mild Alzheimer's Disease (AD).
Background: Cognitive models of physician competency judgments are needed to develop better competency assessment measures. Methods: 45 subjects (16 older controls and 29 mild AD patients) were evaluated for competency by four experienced physicians, and independently administered a neuropsychological battery empirically linked to competency function. For each physician, discriminant function analysis (DFA) identified cognitive predictors of competency outcome (competent, incompetent) using the full sample ($N = 45$). Results: Competency judgments differed significantly for AD patients but not controls. Physicians 1 and 2 found AD patients incompetent (94% and 52% of cases, respectively), while Physicians 3 and 4 found them competent (76% and 86%, respectively). Under stepwise DFA, Logical Memory II ($R^2 = .57, p < .0001$) and Logical Memory I ($R^2 = .43, p < .0001$) predicted the judgments of Physicians 1 and 2 (respectively), and CFL ($R^2 = .27, p < .001$) and Trails A ($R^2 = .31, p < .001$) predicted the judgements of Physicians 3 and 4 (respectively). These single predictor solutions correctly classified 93%, 87%, 87%, and 96% of cases (Physicians 1–4 re-

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spectively). Conclusions: We identified two general cognitive models of physician competency judgments: (1) verbal recall, and (2) simple executive function. The verbal recall model predicted judgments of physicians finding mild AD patients incompetent, while the executive function model predicted judgments of physicians finding such patients competent.
Correspondence: *Daniel Marson, Department of Neurology, University of Alabama at Birmingham, Birmingham, AL 35294, USA.*

Special Topic Speaker/11:00 a.m.–12:30 p.m.

BIOLOGICAL BASIS OF VIOLENCE

Adrian Raine

THURSDAY AFTERNOON, FEBRUARY 6, 1997

Symposium 1/1:30–3:20 p.m.

PHENOTYPIC CORRELATES OF APOLIPOPROTEIN E

Organizer and Chair: Brenda L. Plassman

B.L. PLASSMAN. Phenotypic Correlates of Apolipoprotein E.
The discovery of apolipoprotein E ϵ4 (apoE) as a risk factor for Alzheimer's disease (AD) has lead to intensive efforts to identify phenotypic correlates of this genotype. Knowledge of the neuropsychological, physiological, and pathological correlates of apoE ϵ4 may lead to identification of the early signs of AD, a time when treatments (if available) will likely be most effective. This symposium will discuss the most recent findings on the phenotypic correlates of apoE and their relevance to neuropsychologists. The presentations will cover: (1) an overview of apoE ϵ4 and its use in the diagnosis and prediction of AD, (2) the neuropsychological phenotype of ϵ4, (3) the neuroimaging correlates of ϵ4, and (4) the role of apoE ϵ4 in traumatic head injury and how it may relate to AD.
Correspondence: *Brenda L. Plassman, Duke University Medical Center, Box 41, 905 W. Main St., Durham, NC 27701, USA.*

K.A. WELSH-BOHMER, A.M. SAUNDERS, C.M. HULETTE, M. GEARING, S. MIRRA, A.D. ROSES ET AL. Apolipoprotein E in the Diagnosis and Prediction of Alzheimer's Disease.
Allelic variation in the apolipoprotein E gene (APOE) is associated with the risk of developing Alzheimer's disease (AD) as well as the age of symptom onset. In this paper, we review the findings from a series of ongoing clinical–neuropathological investigations of AD that have focused on the clinical utility of APOE genotype information in the differential diagnosis of the disorder. The data suggest that in symptomatic individuals, genotype information may enhance diagnostic certainty, but that in asymptomatic people the information is very limited in predicting future disease occurrence. Understanding the difference in the use of APOE information in the "diagnosis" and in the "prediction" of AD is critical for neuropsychologists and other clinicians who will be in the position to guide patients in the future when genetic testing becomes more widely available.
Correspondence: *Kathleen A. Welsh-Bohmer, Bryan ADRC, 2200 West Main St., Suite A230, Durham, NC 27705, USA.*

G.E. SMITH. APOE ϵ4 and Neuropsychological Test Performance: Evidence for a Cognitive Phenotype?
This paper describes recent research findings regarding the association of apolipoprotein E (APOE) genotype and neuropsychological test performance. Studies on differences in cognitive test performance and rates of cognitive decline in dementia patients are described. The association of APOE genotype with the outcome of dementia in persons with mild cognitive impairment is discussed. Finally, studies on differences in neuropsychological test scores among ostensible normals of varying APOE genotypes are reviewed. Methodological issues including the problem of "preclinical cases" in studies of normals and the restricted age range of APOE influence are considered.
Correspondence: *Glenn Smith, Division of Psychology, Mayo Clinic, Rochester, MN 55905, USA.*

E.D. BIGLER. Neuroimaging Correlates of APOE ϵ4.
Contemporary neuroimaging analysis techniques can be applied to epidemiologic studies of neurological diseases and disorders. Currently, most research has focused on Alzheimer's disease (AD) and related dementias. This presentation will overview current research findings, with an emphasis on detecting prodromal features of the disease process as well as diagnostic and severity tracking issues. The association of the apolipoprotein (APOE) ϵ4 allele with AD provides a model for testing a variety of hypotheses that can be addressed by neuroimaging techniques. Current large scale epidemiologic studies, wherein APOE genotype is known, along with neuropsychological tests and neuroimaging findings, will be reviewed. For example, quantitative MR (QMR) studies have demonstrated that hippocampal volume relates to APOE status in healthy elderly in that those with the ϵ4 allele have smaller hippocampi. Since APOE relates to memory status in healthy elderly (those with the ϵ4 allele have diminished memory performance), it may be that QMR and neuropsychological assessment may yield important prognostic indicators of the disease process in AD as well as track the progression.
Correspondence: *Erin D. Bigler, Brigham Young University, P.O. Box 25543, Provo, UT 84602, USA.*

J.T.L. WILSON. APOE ϵ4 and Traumatic Head Injury.
The link between a history of traumatic head injury and the development of Alzheimer's disease is well established. Evidence has recently been presented that the enhanced risk of development of AD after head injury occurs only in patients with ϵ4 genotype. In addition to playing a role in late degenerative changes ϵ4 may also influence acute and postacute outcome after head injury. Beta amyloid protein deposits occur in about a quarter of fatal head injuries, and such deposits are commoner in ϵ4 individuals. There is evidence of greater initial mortality among ϵ4 patients after acute brain injury. There is also evidence from animal work that APOE influences neural regeneration, and this would be expected to influence recovery from diffuse head injury.
Correspondence: *Lindsay Wilson, Department of Psychology, University of Stirling, Stirling FK9 4LA, Scotland, U.K.*

Paper Session 6/1:30–3:20 p.m.

ATTENTION—1

W. J. LOKEN, P.M. BUTLER, C.A. McGAVRAN, & N. RAZ. Manipulating Working Memory Demands Influences Visuospatial Attention: Evidence From Normal Aging.
Two neural systems—prefrontal and posterior parietal—are hypothesized to mediate visual attention. The former is also proposed as a substrate of working memory, whereas the latter is critically important in visuospatial attention. To evaluate the interaction between the proposed systems, we conducted two experiments in which the effects of concurrent working memory load on utilization of central and peripheral visuospatial cues were assessed in normal aging. Findings were consistent with the notion that functions related to the posterior attentional system can be affected by the

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manipulation of resources associated with anterior systems. In addition, findings suggest age differences in the time course of cue benefits, and in cue utilization. Finally, the evidence suggests that, at least in older adults, peripheral cues are not processed automatically.
Correspondence: *Wendy Loken, Department of Psychiatry and Psychology–P57, 9500 Euclid Avenue, Cleveland Clinic Foundation, Cleveland, OH 44195, USA.*

M. MENNEMEIER, T. MAYER, & S.Z. RAPCSAK. Troxler Fading for Visual Afterimages.
Objects in peripheral vision fade from awareness during fixation (i.e, Troxler fading). Objects in central vision require strict stabilization before fading. This difference has been explained by different sensitivities of the fovea and peripheral retina to stimulus movement. Afterimages remain stationary on the retina. If the above explanation is correct, then afterimages on the fovea should fade as quickly as those in the peripheral retina. We examined Troxler fading for visual afterimages located on the fovea and peripheral retina in 10 normal subjects. Foveal afterimages were reported to fade but peripheral afterimages faded 3 times faster.
Correspondence: *Mark Mennemeier, Department of Physical Medicine and Rehabilitation, University of Alabama, College of Medicine, 530 SRC 1717 6th Ave. S., Birmingham, AL 35233-7330, USA.*

M. DILLON, A. CHATTERJEE, & M. MENNEMEIER. An Unusual Disturbance of Panoramic Visual Attention.
We report a patient who recovered from acute disseminating encephalomyelitis but complained of objects in her vision disappearing. We wished to learn if her complaint was due to a visual or an attentional disturbance. She did well on tests of higher order visual processing but demonstrated abnormal rates of habituation to peripheral stimuli (Troxler Fading). She reported accelerated fading times for stationary stimuli in both inferior quadrants and prolonged fading times in the right upper quadrant. Her performance replicates previous reports regarding the role of frontal and parietal lesions in Troxler Fading. She had an attentional deficit of temporal aspects of panoramic visual attention which may lie on a continuum with Balint's syndrome.
Correspondence: *Melissa Dillon, Psychology Department, R530, Spain Rehabilitation Center, 1717 6th Ave. South, Birmingham, AL 35233-7330, USA.*

G. REBOK, C. SMITH, D. PASCUALVACA, B. ANTHONY, S. KELLAM, & A. MIRSKY. Developmental Changes in Attentional Performance in Urban Children From 8 to 13 Years.
An epidemiological sample of 216 urban children was administered the NTMH Attention Battery at ages 8, 10, and 13 years to assess developmental changes in specific aspects or elements of attentive function. Significant improvements in correct responses, percent correct omissions, and reaction times were found from ages 8 to 13 years on a visual degraded version of the Continuous Performance Task, a measure of sustained attention. Significant improvements across age also were found on measures of the ability to focus attention, shift attentional focus, and encode information in memory, with the most rapid changes generally occurring between ages 8 and 10 years.
Correspondence: *George Rebok, Department of Mental Hygiene, The Johns Hopkins University, Baltimore, MD 21205, USA.*

A.M. BARRETT, R.I. SCHWARTZ, G.P. CRUCIAN, & K.M. HEILMAN. Attentional Grasp in Far Extrapersonal Space After Thalamic Infarction.
The systems that mediate attention in near and far extrapersonal space may be functionally and anatomically segregated. After a left thalamic stroke, K.H., a 52-year-old right-handed woman, reported veering rightward toward distant objects. We tested line bisections in near and far extrapersonal space, with right- and left-sided distractors. In near space, she performed comparably to controls, but in far space she erred rightward (+15.9 mm far, −0.7 mm near; $p < .001$), outside controls' 95% confidence interval. K.H. also exhibited a strong rightward distractor effect in far space (left: −3.3 mm; right: +35.3 mm; $p < .001$). Frontal–thalamic attentional systems may malfunction after thalamic infarction, producing an attentional grasp specific to far extrapersonal space.
Correspondence: *Anna Barrett, Department of Neurology, University of Florida College of Medicine, P.O. Box 100236, Gainesville, FL 32610, USA.*

V.R. BREWER, J.M. FLETCHER, & M. HISCOCK. Attention Processing in Children With Hydrocephalus and ADHD.
Attention processing was evaluated in children with hydrocephalus and ADHD applying Mirsky's neuropsychological model. Measures of sustained attention (CPT), focused attention (Posner's Visual Orienting and Detection Task (VODT), and shifting attention (Wisconsin Card Sorting Test) were administered to school-age children in an attempt to elucidate the nature of differences in attention processing in children with hydrocephalus and ADHD. Children with hydrocephalus showed an impaired ability to shift attention as well as impairment in specific components of focused attention. Specifically, they had difficulty with the Disengage component of orienting to sensory events. Children with hydrocephalus were unable to disengage from invalid and null cues to detect targets in the left visual field, but not in the right visual field. Children with ADHD showed an intact ability to shift attention. They were unable to maintain focused attention over time. Results suggest that children with ADHD have difficulty sustaining attention when multiple distracters are present (VODT) but not when targets are presented singly without simultaneous distracters (CPT). These results show that hydrocephalus is associated with deficiencies in posterior attention system, while ADHD is associated with deficiencies in anterior attention systems.
Correspondence: *Vickie R. Brewer, University of Tennessee, Department of Psychiatry, Ste. 633, 66 N. Pauline, Memphis, TN 38105, USA.*

Paper Session 7/1:30–3:20 p.m.

PSYCHOPATHOLOGY—2

M. BASSO & R. BORNSTEIN. Relative Memory Deficits in Recurrent *Versus* First-Episode Major Depression.
Individual differences seem to mediate memory deficits in depression. Yet few studies have identified what patient characteristics predict memory impairment. Since recurrent depression is related to increasing cerebral dysfunction, the present study tested whether recurrent depressives have worse memory function than first-episode depressives. Two groups of nonpsychotic depressed inpatients, 19 first-episode (SE) and 53 recurrent-episode (RE), were administered a brief screening battery. The RE group had acquisition, retrieval, and retention deficits relative to both the SE group and normals. These data indicate that recurrent depression predicts abnormal memory performance, whereas memory deficits are not prominent in first-episode depressives. Relative to previous findings, these data suggest that recurrent depression may be associated with a decline in memory function over time.
Correspondence: *M.R. Basso, Department of Psychiatry/Neuropsychology Program, The Ohio State University, 473 W. 12th Ave., Columbus, OH 43210-1228, USA.*

L. ERCOLI, R. HEATON, J. PETERKIN, & S. ZISOOK. Neuropsychological Impairment in Unipolar Depression: Nature, Severity, and Stability of Deficits in Outpatients.
A longitudinal study compared 50 unmedicated, unipolar, nonpsychotic outpatients to 50 normal controls on 13 neuropsychological tests. Depressives were assessed before and after pharmacotherapy (or placebo). At baseline, depressives performed significantly worse than controls on speed of information processing/perceptual–motor speed tests (SIP/PMSP), but not on measures of attention, learning, or retention. Both at baseline and at retest, depressives who did not recover were impaired relative to controls

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in SIP/PMSP. Depressives who did recover were unimpaired relative to controls. These findings suggested that, in a subset of unmedicated, nonpsychotic, ambulatory unipolars, depression may be associated with stable, mild deficits of speed of information processing/perceptual–motor speed.
Correspondence: *Linda Ercoli, Neuropsychiatric Institute–University of California, Los Angeles, 760 Westwood Plaza, Rm. 37-432, Los Angeles, CA 90024-1759, USA.*

D. SCHRETLEN, G. JAYARAM, P. MAKI, H. ROBINSON, & C. DEVILLIERS. Functional Correlates of Neurocognitive Deficits in Adults With Severe Mental Disorders.
Although there is abundant evidence of cognitive deficits among psychiatric patients, the functional consequences of those deficits remain poorly understood. This study examined the relationship between neuropsychological test performance and observer ratings of functional competence based on the Milwaukee Evaluation of Daily Living Skills (MEDLS). Seventy-six psychiatric inpatients with severe mental disorders received neuropsychological and occupational therapy evaluations. MEDLS performance was significantly and positively correlated with measures of intelligence, verbal fluency, divided attention, and verbal learning/memory. A multiple regression analysis revealed that performance on a test of auditory divided attention accounted for significant additional variance in MEDLS ratings after age and education were forced into the model. These results underscore the utility of neuropsychological measures in predicting daily functioning in psychiatric patients.
Correspondence: *David Schretlen, Johns Hopkins Hospital Meyer 218, 600 N. Wolfe St., Baltimore, MD 21287, USA.*

D.R. GREENBERG, L.M. GRATTAN, J.E. HERRON, E.F. ALDRICH, D. RIGAMONTI, & P. J. ESLINGER. The Role of Depression in Outcome After Subarachnoid Hemorrhage.
The contribution of depression (CES–D) relative to other demographic, medical, and cognitive variables to outcome (Glasgow Outcome Scale) after subarachnoid hemorrhage (SAH) was investigated in a consecutive series of 78 patients. Data was collected during acute hospitalization and 4 months post discharge. Results indicated (1) Hunt and Hess grade at admission and CES–D score during hospitalization were the strongest predictors of outcome at 4 months, explaining 39% of the variance ($p < .002$); (2) the strongest concurrent outcome predictors at 4 months were CES–D score and Full Scale I.Q., explaining 53% of the variance ($p < .001$); and (3) the poor outcome group was more depressed than the favorable outcome group ($p < .01$). Thus, depression may be a significant problem after SAH, and contribute to poor outcome.
Correspondence: *Lynn M. Grattan, Department of Neurology, University of Maryland Medical School, 22 S. Greene Street, Baltimore, MD 21201, USA.*

R.S. ZIEGLER, T.L. BAUMGARDNER, & L.A. LOCKMAN. Acquired Tourette-Like Syndrome Following a Stroke Involving the Basal Ganglia in a Child.
Some patients with Tourette Syndrome (TS) have been reported to have asymmetrical or small basal ganglia using magnetic resonance imaging (MRI). In addition to the tics, executive dysfunction, attention deficits, and obsessive and compulsive behaviors are often found. An 8-yr-old boy suffered a hemorrhagic stroke which involved the right occipital lobe, internal capsule, and basal ganglia. Neuropsychological assessment prior to the development of Tourette symptoms revealed prominent executive dysfunction in the context of normal Verbal IQ and normal receptive and expressive language skills. The patient began showing complex motor and vocal tics and compulsive behaviors 4 months after the stroke. This case report provides further evidence supporting the role of basal ganglia and frontal circuitry in the motor and neurocognitive deficits associated with TS.
Correspondence: *Richard Ziegler, Division of Pediatric Neurology, University of Minnesota Medical School, Box 486, 420 Delaware ST. S.E., Minneapolis, MN 55455, USA.*

J. ROVET, I. NULMAN, G. KOREN, D. STEWART, & N. KULIN. Neurodevelopment of Children With Antidepressant Exposure *In Utero*.
To determine whether intrauterine antidepressant exposure harms neurocognitive development, and to separate effects of maternal depression from medication, we assessed offspring of mothers who sought counseling during their pregnancy for exposure to tricyclic antidepressants, fluoxetine (Prozac), or a nonteratogenic substance. Children were assessed with age-appropriate tests of intelligence, language, temperament, and behavior. Fluoxetine-exposed did slightly poorer than tricyclic-exposed in expressive language, spatial, sequencing, and gross motor skills, and exposure throughout pregnancy was worse than first trimester only. However, there were no differences between exposed and control groups in global intelligence, behavior, or temperament. These results suggest few effects of antidepressant drug exposure on abilities or behavior and so indicate that chemicals that alter maternal neurotransmitter function do not adversely affect fetal brain development.
Correspondence: *Joanne Rovet, Psychology Department, Hospital for Sick Children, Toronto, ON M5G 1X8, Canada.*

Poster Session 3/1:30–4:30 p.m.

ASSESSMENT—1 (Malingering)

G. MARTIN, T. MELILLO, & B. LAYTON. Speed and Capacity of Language Processing Test (SCLPT) Performance Association to Motivation and Financial Incentives.
We investigated the potential utility of the SCLPT in detecting motivation for poor performance on cognitive tests as a function of litigation and other financial incentives. Thirty-eight patients referred for neuropsychological evaluation completed the SCLPT and an abbreviated form of the Portland Digit Recognition Test (PDRT) as part of a full evaluation. As predicted, patients with good test effort, as estimated by the PDRT, made few errors on the SCLPT. However, those with poor PDRT performance were almost equally likely to have elevated SCLPT errors. Furthermore, patients without claims, who had no financial incentive to perform poorly, also were equally likely to have elevated SCLPT error rates. Of note, number of correct SCLPT responses was a good predictor of PDRT performance.
Correspondence: *Gregg Martin, Department of PM&R, MetroHealth Medical Center, 2500 MetroHealth Drive, Cleveland, OH 44109-1998, USA.*

J. CORWIN. Response Bias and Accuracy in Suspected Malingering.
Theoretical and pragmatic aspects of response bias as a tool in the differential diagnosis of feigned poor performance are introduced and discussed systematically. Cases of malingering are presented in which measures of response bias, the decision rule under uncertainty, as well as measures of discrimination (accuracy) yielded results supportive of this diagnosis. Discrepancies between expected and observed performance on recall and recognition memory accuracy in these patients' protocols are also reviewed. Thus, response bias is another useful tool in the differential diagnosis of suspected malingering *versus* organic memory dysfunction.
Correspondence: *June Corwin, Psychiatry Service (116A), New York VA Medical Center, 423 East 23rd Street, New York, NY 10010, USA.*

J. ELLWANGER, W.N. TENHULA, J. J. SWEET, & J.P. ROSENFELD. Identifying Malingerers Through the Use of the Category Test (CT) and Event-Related Potentials (ERPs).
Ten subjects instructed to simulate brain injury and 11 control subjects completed two tests that have been used to identify malingering. On the CT, the clinical decision rules developed by Tenhula & Sweet resulted in correct classification rates ranging from 66.7% to 95.2%. Using ERPs as a measure of intact recognition on a forced-choice test of memory for digits, 76.2% of subjects were correctly classified. Combination of these two tests resulted in 100% correct classification.
Correspondence: *J.J. Sweet, Department of Psychiatry, Evanston Hospital, 2650 Ridge Avenue, Evanston, IL 60201, USA.*

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J.W. ELLWANGER, J.P. ROSENFELD, R.G. BERMAN, K. NOLAN, & J. J. SWEET. Modified P300-Enhanced Version of the Hiscock Forced-Choice Procedure for Detection of Malingering.
We previously described a paradigm in which the P300 (P3) EEG potential evoked by a "match" (accurate recognition of digit string) is greater than that to a "mismatch," despite subjects' recognition denial. With one test item for each sample, P3 match–mismatch amplitude differences accurately identified about 70% of malingering simulators. In the present modification, each sample is followed by a series of nine items (one match and eight mismatches), with the position of the match varying randomly from the second to the seventh test items. Using standard event-related-potential recording procedures and within-subject 'bootstrap' and *t*-test comparisons, the current P3 match-mismatch data accurately identified approximately 85% of simulators and 95% nonsimulators, for an overall hit rate of approximately 90%.
Correspondence: *J.P. Rosenfeld, Department of Psychology, Northwestern University, Evanston, IL 60201, USA.*

T. BALDEWICZ, H. KATZEN, & R. KADERMAN. Psychosocial and Neuropsychological Factors Associated With Suspected Malingering on a Neuropsychological Exam.
This study examined 50 patients litigating for a mild closed head injury, 25 with documented injury and 25 suspected malingerers (no documented injury), matched on age, sex, and education. Subjects completed a neuropsychological exam, the MMPI–2, and a comprehensive interview. *T* tests between the groups revealed that suspected malingerers reported more cognitive complaints ($p = .004$) and performed more poorly on the neuropsychological battery, including alphabet recitation, recall of simple information, and digits and months backwards ($p \leq .01$ for all measures). In addition, suspected malingerers reported more affective complaints ($p = .004$) and exhibited more MMPI–2 elevations ($p = .008$). A discriminant analysis using a combination of psychosocial and neuropsychological data correctly classified 86% of subjects with regard to suspected malingering status. These findings indicate that an integrative approach can be used to detect malingering.
Correspondence: *Teri Baldewicz, Division of Neuropsychology, 1150 N.W. 14th St., Suite 715, Miami, FL 33136, USA.*

D. BERRY, C. VICKERY, T. INMAN, D. LAMB, J. ALLEN, S. OREY, & C. EDWARDS. Detection of Feigned Memory Impairment Using Novel Manipulations of Face Difficulty Level.
The utility of the DMT and the PDRT for detection of motivational impairment may rest at least partially on manipulations of face difficulty level that have minimal or no effect on actual difficulty. Based on this principle, a new motivational test was developed using a novel manipulation of face difficulty level. The Letter Memory Test (LMT) uses consonants as stimuli in a forced-choice recognition paradigm, and changes face difficulty level by increasing the number of stimuli to be recalled, as well as the number of choices across trials. Results from several studies show that the LMT is relatively insensitive to head injury or depression. Performance of analog community feigners and verified cases of motivational impairment from a forensic setting suggest that the test is sensitive to inadequate effort during testing.
Correspondence: *D.T.R. Berry, Psychology Department, University of Kentucky, Lexington, KY 40506, USA.*

ASSESSMENT—1 (Cross-Cultural)

S.C. MARSHALL & D. MUNGAS. Differential Item Functioning in the Mini-Mental State Exam in English- and Spanish-Speaking Elderly.
The purpose of this study was to determine if the Mini-Mental State Exam (MMS) demonstrates item bias with respect to measuring cognitive functioning of elderly Hispanics and non-Hispanics. Assessment of differential item functioning (DIF) of individual MMS items across three ethnicity/language groups (English interview, non-Hispanic; English interview, Hispanic; and Spanish interview, Hispanic) was performed using a logistic regression procedure. Eighteen of the 30 MMS items were shown to provide unbiased measurement across the three groups. Normative data is presented for elderly Hispanics ($N = 365$) and non-Hispanics ($N = 388$) on the raw MMS, an 18-item version in which items with significant DIF were eliminated, and a total score statistically adjusted for effects of education and age.
Correspondence: *Sarah C. Marshall, Department of Neurology, University of California, Davis, 1771 Stockton Blvd., Suite 2005, Sacramento, CA 95816, USA.*

P. MONTAÑES, H. KREMIN, A. CABRERA, A. DIAZ. Naming of Figures: Standardization of the European Community Naming Test in a Latin American Population.
The object of this study was to obtain a standardization of the European naming test in a Latin American population. A sample was selected consisting of 60 men and 60 women in three age ranges and two educational levels. As expected, as educational level rises, so does the percentage of correctly named objects, and as age increases, so do the number of errors. No gender effect was found, but a significant category effect in favor of the nonliving category was found.
Correspondence: *Patricia Montañes, Servicio de Neuropsicologia, Instituto Neurologico de Colombia, Cra 16 n. 84 A-09 cons 617 Bogotá, Colombia.*

D. WEISS, W. BONDAREFF, I. HAN, M. CHO, K. LEE, F. CHIN, M. DUNN, & E. PI. The Use of Validated Tests for the Korean Population in the U.S.: A Comparison Between The Standardized and Translated Mini-Mental State Examinations.
The validation of neuropsychological tests is beginning to emerge for certain cultural groups. However, surprisingly little attention has been directed toward the formulation of standardized tests for the Korean population. Direct translation of tests normed for English-speaking individuals neglects the pertinent issues considered in appropriate test validation including language/linguistic differences, different alphabet characters, and culturally-sensitive items. Twenty-nine Alzheimer's patients and healthy, older adults were administered both the standardized MMSE–K and Korean-translated MMSE. Results indicated significant group differences ($p = .008$), demonstrating the enhanced validity of the standardized MMSE–K. The present study provides further support for the use of a validated cognitive screening tool for the accurate cognitive assessment of the growing Korean population in the U.S.
Correspondence: *Dorothy Weiss, University of Southern California School of Medicine, Department of Psychiatry, MOL 202, Los Angeles, CA 90033, USA.*

D. TATE, J. TATE, S. JOHNSON, & E. BIGLER. Ethnic and Socioeconomic Differences on the Developmental Test of Visual–Motor Integration: A Study of South Indian School Children.
This study of Indian school children compared the performance of 472 children ($M = 279$, $F = 193$) from the state of Tamil Nadu, India with the performance of normative data for the Revised Developmental Test of Visual–Motor Integration (VMI). Indian children, with a mean age of 8–9 years, had an average standard score of 107.93 ($SD = 16.07$), which is significantly higher than the normative data ($t = 10.72$, $p < .001$). There was also a statistically significant difference between males and females ($t = 2.48$, $p = .014$) with males slightly outperforming females. Furthermore, a significant *F*-score of 102.07 ($p < .001$) was found when comparing students from differing socioeconomic status, those from the lower strata performing significantly lower. This study implies a need for further normative analysis.
Correspondence: *David F. Tate, Department of Psychology, Brigham Young University, 1001 SWKT, Provo, UT 84602, USA.*

L.L. CONANT, P.S. FASTENAU, B. GIORDANI, M. J. BOIVIN, B. OPEL, & D.D. NSEYILA. Developmental Trends in Visual and Verbal Memory Span in Zairian Children.
This study explores the modality specificity of a visual memory span task with 139 Zairian children. Separate factor analyses of K–ABC data for younger children (6.1–8.5 years) and older children (8.7–12.8 years) yielded

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two-factor solutions in both cases, which appear to represent verbal and visual–spatial abilities. Modality specificity of the visual span task is supported in both age groups. Findings of modality specificity in both Zairian age groups provides support for the theoretical distinction between verbal and visual memory span. Continued modality specificity of visual memory span tasks in older Zairian children suggests that the increased verbal loadings of these tasks seen for older American children may reflect differences in written language development.
Correspondence: *Lisa Conant, Neuropsychology Division, University of Michigan, 480 Med Inn Bldg., Box 0840, 1500 E. Medical Center Dr., Ann Arbor, MI 48109, USA.*

M.O. PONTÓN & G. ROID. Standardization and Neuropsychological Utility of the Leiter–R: Clinical and Cross-Cultural Applications.
Normative data for a national stratified sample of 1800 subjects (ages 2–21 years) is presented for the Leiter Revised Edition (Leiter–R). The new battery consists of 20 nonverbal tests, developed along the crystallized factors of intelligence: fluid reasoning, general visualization, and memory. Stratified data were collected for five ethnic groups, as represented in the U.S. population: Caucasian, Hispanic, Black, Native American and Asian. Results suggest that the battery behaves consistently across ethnic groups. To assess its clinical validity, 725 children with developmental delays, ADHD, LD and TBI were evaluated. Results from the clinical studies indicate that the new Leiter–R is a sensitive and valid tool in differentiating between clinical and normal samples. Its utility as a clinical and cross-cultural tool is discussed.
Correspondence: *Marcel Pontón, Building F-9, Harbor-UCLA Medical Center, 1000 W. Carson Street, Torrance, CA 90509, USA.*

M.O. PONTÓN & J. GONZALEZ. Hispanic Neuropsychology in the United States: Current Problems, Future Solutions.
The history of neuropsychology with Spanish-speaking populations in the United States is reviewed. Discussion of current shortcomings of neuropsychology with cross-cultural populations is presented within a historical perspective. Contributions of Hispanic neuroscientists to the discipline are presented. The efforts from different research groups in the United States are reviewed (Miami, New York, Los Angeles, Sacramento, San Diego). Current measures available along with norms that have been developed are presented as tools and aids for the neuropsychologist in clinical and private practice settings. Guidelines for research with this population and a discussion of the relevant variables in the assessment of this population are presented.
Correspondence: *Marcel Pontón, Building F-9, Harbor-UCLA Medical Center, 1000 W. Carson Street, Torrance, CA 90509, USA.*

E. MATUTE VILLASEÑOR. La Neuropsicología en México: Anthropological or Linguistic?
Mexican scientists from the disciplines of psychology, linguistics, neurology and special education trained in well established neuropsychological laboratories around the world and returned to Mexico with a diverse but strongly research-oriented background. There are at least two identifiable trends of neuropsychology in Mexico: one studying the impact of sociocultural variables on cognitive functioning, and another focusing on linguistics. Most of the assessment materials developed in Mexico have been designed either as a part of particular research projects or for clinical purposes; in both cases the development of materials is closely related to the actual research being done. Tests and norms available are presented. From its inception, Mexican neuropsychology has been characterized by ongoing collaborative research with Europe, Latin America, and the United States.
Correspondence: *Esmeralda Matute Villaseñor, Sociedad Mexicana de Neuropsicología, Buenos Aires #2323, Guadalajara, Jalisco, CP 44680, Mexico.*

J. LEÓN-CARRIÓN. Neuropsychology in Spain: Qualitative or Quantitative?
Spain has a rich heritage in the neurosciences. Eminent neurologists such as Ramón y Cajal and others have contributed universally to the neurosciences and to Spanish neuropsychology specifically. Current research efforts in the country revolve around the study of language functioning, traumatic brain injury, neuroimaging and hemispheric specialization. There is a strong school that uses a more qualitative approach to neuropsychology (like most of Europe) and that can trace its roots to Luria. There is also a quantitative school of neuropsychology in Spain that has done a significant amount of psychometric work (developing batteries, norms, etc.) and that has been influenced by American neuropsychology. Neuroimaging work and data on the Batería Sevilla de evaluación neuropsicológica computerizada are presented. Spain has been committed and is open to international collaborative research in neuropsychology.
Correspondence: *José León-Carrión, Facultad de Psicología, Universidad de Sevilla, Avenida San Francisco Javier, s/n, Sevilla, C.P. 41018, Spain.*

V. FELD. South American Neuropsychology: The Future is Here.
Hécaen trained the Mendilaharsus, who in turn sowed the seeds of neuropsychology in South America at the Montevideo Neurological Institute. Several neuropsychologists who also trained in Europe have developed separate research groups. It was not until the International Congress of Neuropsychology held in Bogotá (1981) that neuropsychology began to grow in South America as an organized discipline. Currently, the Sociedad Latinoamericana de Neuropsicología (SLAN) is a strong international group that promotes and facilitates the growth of the discipline throughout Latin America. It has its own journal (Neuropsychologia Latina) which is published jointly with European and Latin American organizations. Several tests and normative efforts have been undertaken throughout the continent. Data on published reports is presented. International collaboration has been an ongoing emphasis of Latin neuropsychologists.
Correspondence: *Victor Feld, 189 Vernet, Buenos Aires, Capital Federal, CP 1424, Argentina.*

ASSESSMENT—1 (Methodology)

J.L. WOODARD, F.C. GOLDSTEIN, V.J. ROBERTS, & C. McGUIRE. Convergent and Discriminant Validity of the CVLT (Dementia Version).
The present study investigated the convergent and discriminant validity of the nine-item "dementia version" of the California Verbal Learning Test (CVLT–9) in a sample of 138 geriatric patients evaluated for memory complaints. Moderate correlations were observed between the CVLT–9 and the immediate and delayed Logical Memory (LM) and Visual Reproduction (VR) subtests from the Wechsler Memory Scale–Revised. However, significant correlations were also observed between the CVLT–9 (sum of words recalled for Trials 1–5 and long delay free recall) and language and visuospatial measures, whereas no significant correlations with nonmemory measures were noted for the delayed recall components of LM and VR. We conclude that the CVLT–9 demonstrates low discriminant validity, suggesting diminished specificity as a memory measure.
Correspondence: *John L. Woodard, Department of Neurology, Emory University School of Medicine, 1841 Clifton Rd., NE., Atlanta, GA 30329, USA.*

J. BARRASH, S. ANDERSON, R. JONES, & D. TRANEL. The Iowa Rating Scales of Personality Change: Reliability and Validity.
The IRSPC quantifies 25 aspects of personality that may become disturbed with brain disease. Collaterals rate LEVEL and CHANGE on 7- and 5-point scales, respectively. Control scales assist bias detection. Brain-damaged individuals were rated a mean of 4.2 years postonset. Weighted interrater agreement ($N = 15$) was high (means: LEVEL, .86; CHANGE, .87). Weighted Kappa, correcting for chance agreement, was fair overall (means: LEVEL, .48; CHANGE, .52). It was predicted that 11 patients with ventromedial frontal damage would show change on 14 dimensions. They did show greater change on 10 of 14 scales compared to 50 patients with focal damage elsewhere ($p < .05$), and these groups did not differ on 10 of 11 remaining scales. In another study, IRSPC ratings were significantly correlated ($p < .01$) with clinicians' ratings on eight of nine dimen-

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sions rated by clinicians ($N = 31$). The IRSPC holds promise for reliable and valid assessment of acquired personality changes.
Correspondence: *J. Barrash, Department of Neurology, University of Iowa College of Medicine, Iowa City, IA 52242, USA.*

A. WELLS, B. COOPER, J. KRAMER, & J. COLE. Age and Experience Effects on the Complex Figure.
This study investigated the effects of age and visuospatial experience on visuospatial ability, as measured by the Rey–Osterrieth Complex Figure. Fifty-seven architects (a profession requiring visuospatial skills) and 62 attorneys (a more verbally-grounded profession), aged 22–83 years made up the sample; however, experience was determined by questionnaire. Results indicated that recent experience moderated mild age effects found on the copy trial, but neither recent nor cumulative experience lessened more severe age-related declines evident on recall trials. The study's outcome provides support for the disuse theory (i.e., practiced abilities may decline less with aging).
Correspondence: *Anne Wells, Healthsouth, 3251 Proctor Road, Sarasota, FL 34231, USA.*

L.W. DROZDICK, M.L. BOONE, & D.A. WARREN. Rey–Osterrieth Complex Figure Organization and California Verbal Learning Test: Measures of Executive Function?
The WCST is a widely accepted measure of executive function. While WCST provides useful information into specific executive abilities, it may not be a complete measure of the abilities that comprise executive functions. This study examined the relationships among WCST, CVLT, and organizational quality of the Rey–Osterrieth Complex Figure (ROCF) in order to determine the utility of standardized and qualitative measures to more completely evaluate executive functions. While correlations may have been attenuated by restricted range of variables, results indicated modest but significant ($p < .01$) relationships between WCST and ROCF organizational variables. Moreover, WCST conceptual level responses accounted for the most unique variance in organization of the ROCF. Also, modest but significant relationships were found among CVLT and WCST. Results are discussed in terms of implications for more thorough analysis of executive function and ecological validity.
Correspondence: *Martin L. Boone, Department of Behavioral Medicine/Psychiatry, West Virginia University School of Medicine, 930 Chestnut Ridge Road, Morgantown, WV 26505-2854, USA.*

G.C. BEDI. Concurrent Validity of the Boder Test of Reading and Spelling Patterns.
Boder identified three distinct subtypes of dyslexia: dyseidetic, dysphonetic, and alexic. This classification is probably the most widely used and researched model to date. The Boder Test of Reading and Spelling Patterns (BTRSP) was developed to assist clinicians in identifying and classifying dyslexics into one of these three subgroups on the basis of their pattern of reading and spelling errors. The purpose of this study was to determine whether dyslexics could be differentiated from age-matched normal readers on the basis of BTRSP results and whether BTRSP identified dyslexic subtypes could be distinguished from each other on the basis of auditory and/or visual processing deficits. Application of the Boder classification criteria resulted in misclassification of one half of the normal readers as dysphonetics. All readers classified as dysphonetic (dyslexic *and* normal) were found to have auditory temporal processing difficulties, suggesting that the dysphonetic criteria may identify auditory temporal processing difficulties regardless of reading impairment.
Correspondence: *Gail C. Bedi, Child Psychiatry, Mount Sinai Hospital, 19 E. 98th St., New York, NY 10029, USA.*

J. SCOTT, G. TREMONT, & R. HOFFMAN. Age and Education Correction in Neuropsychological Test Performance: Correlation and Common Sense.
Recent reports have been critical of correcting neuropsychological test performance for age and education. The current study examines the change in correlation between age, education, WAIS–R and Halstead Impairment Index (HII) scores following brain injury. Brain injured subjects showed a decline in the correlation between age and education and their performance on neuropsychological tests compared to control subjects. When patients were further divided by severity of injury, further decline in correlations were observed. This study concludes that change in correlation is attributable to restriction in the range of scores and not due to any change in the relationship between age, education, and neuropsychological test performance. This study advocates age and education correction in tests that have demonstrated sensitivity to age and education effects in the normal population.
Correspondence: *Jim Scott, Department of Psychiatry and Behavioral Sciences, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73190, USA.*

B. J. CANNON. Like Deer in the Headlights: Relative Impairment on Logical Memory Story A *Versus* Story B of the Wechsler Memory Scale–Revised (WMS–R) in a Clinical Sample.
Prior research found Logical Memory Story A and Story B of the WMS–R to be equivalent in difficulty, with no effect of administration sequence. Following clinical impression of patients "freezing" on Story A and recovering on Story B, Logical Memory and concurrent MMPI data from 88 randomly selected clinical cases were examined. Results reflected a significantly poorer performance on Story A *versus* Story B, for both Logical Memory I and II. No significant correlations were found with individual MMPI clinical scales; however, a significant difference was found on Story A, but not Story B, between those cases with one or more clinical scales greater than or equal to 70 T and those without. "Predicted" age-corrected percentile ranks were computed, resulting performance category shifts examined, and implications for clinical interpretation were discussed.
Correspondence: *Brooke J. Cannon, Graduate Psychology Department, Marywood College, Scranton, PA 18509, USA.*

K. PERRINE, & the Bozeman Epilepsy Research Consortium. Relationship of Fine Motor Speed to Psychomotor and Cognitive Speed.
We examined the relationship of fine motor speed (FMS; dominant-hand Grooved Pegboard) to psychomotor (Trails A, Digit Symbol) and cognitive (Stroop Words, FAS) speed in a large multicenter sample of patients with epilepsy. FMS correlated significantly ($p < .0001$) with all of the variables, with magnitudes ranging from $r = .26$ to $r = .52$. Age correlated the strongest with FMS. A factor analysis yielded a first factor comprised of FSIQ and cognitive speed scores, while a second factor had contributions from age and from tests with a motor component. Although fine motor speed relates to higher order cognitive speed, the two types of rapid performance may be partially dissociable neuropsychological processes with motor speed more associated with age.
Correspondence: *Kenneth Perrine, Department of Neurology, HJD-NYU School of Medicine, New York, NY 10003, USA.*

A.D. BLAU, R. TARAZI, & B.T. VOLPE. Configural Copying Strategy of the Rey–Osterrieth Complex Figure (ROCF) Improves Immediate Recall in Patients With Traumatic Brain Injury (TBI).
The Rey–Osterrieth Complex Figure (ROCF) assessed the visuospatial/constructional skills and visual memory in 29 patients with Traumatic Brain Injury (TBI) [mean age of 33.4 (12.8)]. The ROCF was scored for accuracy and for the use of a configural strategy. Patients who adopted the configural strategy (C[+]) were no better than those without a strategy (C[−]) on accuracy scores during the copy trial [31.9 (4.1) *vs*. 29.1 (8.5); $t = 1.16$, df = 27, NS]. C[+] patients however had improved recall accuracy [16.4(7.7) *vs*. 10.2(6.8); $t = 2.20$, df = 27, $P < .04$). Both groups performed poorly on the WCST. Thus, the adoption of a configural copying strategy produced significantly greater recall of visual information possibly through enhanced encoding despite impaired "executive" functioning.
Correspondence: *Alan D. Blau, Department of Psychiatry, Cornell University Medical College at the Burke Rehabilitation Hospital, 785 Mamaroneck Ave., White Plains, NY 10605, USA.*

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P.S. FASTENAU & N.L. DENBURG. Wisconsin Card Sorting Test Performance Among Older Adults: Effects of Age and Education.
In this study we administered the WCST to a sample of 100 community-dwelling older adults ranging in age from 55–85 years ($M = 72.9$, $SD = 7.0$) and ranging in education from 8 to 20 years (*Mn* and $Md = 12.0$). For Total Correct, there were no effects for age or education ($p > .05$). For Perseverative Responses, only age was significant (Multiple $R = .26$, $p = .02$). Both for Total Errors (Multiple $R = .35$, $p = .001$) and for Categories Achieved (Multiple $R = .30$, $p = .005$), education alone was significant. There was no Age × Education interaction for any variable ($p > .05$). Age- and education-appropriate norms for a healthy reference group are provided.
Correspondence: *P.S. Fastenau, Department of Psychology, LD 124, 402 N. Blackford St., Indiana University Purdue University Indianapolis (IUPUI), Indianapolis, IN 46202-3275, USA.*

J. DONDERS & S. WARSCHAUSKY. Confirmatory Factor Analysis of the WISC–III in Children with Traumatic Head Injury.
The construct validity of the WISC–III was evaluated in a sample of 171 children with traumatic head injury (THI). Confirmatory factor analysis was used to compare the relative fit of eight theoretical models concerning constructs that are measured by the WISC–III. The four-factor model, as proposed by the WISC–III manual (composed of Verbal Comprehension, Perceptual Organization, Freedom From Distractibility, and Processing Speed), outperformed the other seven models in terms of model fit and parsimony. It is concluded that this four-factor model is the most accurate predictor of WISC–III subtest variability in children with THI.
Correspondence: *Jacques Donders, Mary Free Bed Hospital, 235 Wealthy SE, Grand Rapids, MI 49503, USA.*

P. JOHNSON, L. RAPPORT, S. MILLIS, & P. SIPLE. Psychometric Properties of the Visual Object and Space Perception Battery.
Examined psychometric properties of the Visual Object and Space Perception Battery among 111 healthy, elderly Americans. The potential for culture-related differences and other idiosyncrasies in the standardization samples of British medical patients compelled evaluation of the normative data for use in the United States. Using the normative data provided by the test manual, specificity of the subtests ranged from 68–98%. MANOVA revealed age-related differences on five of the eight subtests, with subjects age less than 70 years outperforming subjects age 70 years or older ($p < .001$); normative data are provided for these groups. Internal consistency reliabilities (coefficient alpha) ranged from adequate ($> .70$) to poor ($< .30$). Test users should be alert to potential errors in the test materials on the Position Discrimination subtest.
Correspondence: *Patricia Johnson, Department of Psychology, Wayne State University, 71 West Warren, Detroit, MI 48202, USA.*

M. WELSH, N. PETTERSON, T. CARTMELL, & M. STEIN. What Cognitive Processes Are Tapped by the Towers of Hanoi and London?
Disk-transfer tasks have become popular instruments in neuropsychology as putative measures of frontal lobe function. However, currently it is unclear the degree to which they measure the same cognitive processes and precisely what these cognitive processes are. The present study examined this question in a sample of 37 normal college volunteers (M age = 20 years). Subjects were administered the Tower of Hanoi (TOH), Tower of London (TOL), two working memory tests, and two tests of inhibition. The two tower tasks intercorrelated significantly, but only moderately. Both working memory and inhibition variables strongly predicted TOL performance; however, there was a relatively weaker contribution of inhibition and a "processing speed" variable to TOH performance.
Correspondence: *Marilyn Welsh, Psychology, University of North Colorado, Greeley, CO 80639, USA.*

T.P. ROSS, S.H. PUTNAM, K.M. ADAMS, & N.L. FICHTENBERG. Base Rates for WRAT–R and WRAT–3 Score Discrepancies With WAIS–R IQ in Brain-Injured Patients.
The relationship between WRAT–R and WRAT–3 performance to WAIS–R Full Scale IQ was examined in 491 adult patients with postacute traumatic brain injury (TBI). Similar results were observed for both WRAT–R ($N = 244$) and WRAT–3 ($N = 247$) performance when contrasted with WAIS–R IQ scores; correlations ranged from $r = .37$ to $r = .72$ and standard score discrepancies as large as 25 points were observed in 10% of the sample. These data challenge notions about the degree of variation between intelligence and core academic skills and their resiliency to TBI. Alternatively, these results may represent other moderating or mediating factors (e.g., quality of education or prevalence of learning disability in mild head injury). Limitations of the present study and directions for future research are presented.
Correspondence: *Thomas P. Ross, Department of Psychology, Rehabilitation Institute of Michigan, 261 Mack Blvd., Detroit, MI 48201, USA.*

M. VANIER, J. M. MAZAUX, J. LAMBERT, C. DASSA, & H.S. LEVIN. Assessment of Neuropsychological Impairments After Closed Head Injury: Construct Validity of a Revised Version of the Neurobehavioral Rating Scale.
We report the results of a construct validity study in head injured patients ($N = 286$) using a revised version of the Neurobehavioral Rating Scale (NRS). Factor analyses were used to study the construct validity; regressions and analyses of variance were used to study the relationships between the factor scores and the demographic and clinical characteristics. Anxiety and deficits in attention, memory, self-appraisal, initiative, conceptual organization, mental flexibility and planning were reported in more than 50% of the patients. The factor analyses disclosed five correlated factors. Statistically significant relationships, found between the factors and the demographic (education) and clinical (coma duration) characteristics ($p < .05$), support the construct validity of the factors. Differences between the present results and those obtained with the original NRS are discussed.
Correspondence: *Marie Vanier, Centre de Recherche, Institut de Réadaptation de Montréal, 6300 ave. Darlington, Montréal, QC H3S 2J4, Canada.*

A. McSWEENY, R. IVNIK, J. MALEC, & G. SMITH. Regression-Based Standard Scores for Measuring Memory Retention in the WMS–R With the Elderly.
Seven hundred and twenty-seven subjects from the Mayo Older Americans Normative Study were randomly assigned to a standardization sample of 627 subjects and a demographically equivalent cross-validation sample of 100 subjects. Verbal, nonverbal and general indices of memory retention were developed for the WMS–R using regression techniques. The indices were converted into standard scores ($M = 100$, $SD = 15$) to increase their interpretability. Analyses indicated that the new memory retention indices were related to other measures of memory retention but independent of immediate memory, IQ, age, education, or sex. The verbal and nonverbal indices measured separate dimensions of retention and were stable across two randomly-selected samples of normal subjects. Implications for clinical assessment and research are discussed.
Correspondence: *A. John McSweeny, Department of Psychiatry, Medical College of Ohio, P.O. Box 10008, Toledo, OH 43606, USA.*

L. RAPPORT, R. CHARTER, T. FARCHIONE, R. DUTRA, & J. KINGSLEY. Internal Consistency Reliabilities of the Rey Figure: Lezak *Versus* Denman Scoring Systems.
Computes and compares internal consistency reliabilities of the Lezak and Denman scoring systems using the averaged item scores of three independent raters ($N = 318$; copy and recall phases). Coefficient-alpha reliabilities for both scoring systems were high and equivalent ($\geq .90$). One item in the recall phase of both scoring methods failed to meet inclusionary criteria for scale retention. However, the poor items correspond to the same portion of the figure, and most likely reflect a low and restricted range of scores for that item. Exclusion of the item would not meaningfully improve the reliability of either scoring system and therefore does not warrant changes in the present protocols.
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G.D. BATEMAN & S. HALL. The Contribution of Arithmetic Ability to Performance on Three Tests of Information Processing Speed: The PASAT, VSPAT, and ASPAT.
The relationship between arithmetic ability and performance on the Paced Auditory Serial Addition Test (PASAT) has not been thoroughly investigated. The present study was designed to explore the relationship between arithmetic ability and performance on the PASAT and two newly devised measures of information processing speed: the Visual Sequential Paced Arithmetic Test (VSPAT) and the Auditory Sequential Paced Arithmetic Test (ASPAT). Correlations between arithmetic ability, as assessed by four different measures, and PASAT scores were computed. Sixteen of the 20 correlations were significant, with many correlations in the range of .40 to .50. In a separate group of subjects, no significant correlations were found between scores on the VPSAT or the ASPAT and arithmetic ability as measured by the Arithmetic subtest of the Wechsler Adult Intelligence Scale–Revised. These results suggest that performance on the VSPAT and ASPAT is much less influenced by arithmetic ability than on the PASAT. This, in turn, suggests that the VSPAT and ASPAT may be more pure measures of information processing ability than the PASAT. Further investigation and development of the VSPAT and ASPAT is warranted.
Correspondence: *Stuart Hall, Department of Psychology, University of Montana, Missoula, MT 59812-1041, USA.*

M. THEISEN, L. RAPPORT, B. AXELROD, & B. BRINES. Practice Effects in Repeated Administrations of the WMS–R.
Examined practice effects over four repeated administrations ($N = 64$) of the immediate (I) and delayed (II) portions of three subtests of the WMS–R: Logical Memory (LM), Verbal Paired Associates (VPA), and Visual Reproduction (VR). Large and significant ($p < .001$) increases occurred in the prorated GM and DR indices, and in the LMI, LMII, and VPAI subtests (Effect Sizes = .70–.87). Small but significant ($p < .001$) increases occurred in VRI (ES = .24) and VRII (ES = .43). Most score change occurred at the first retest. Ceiling effects occur in subtests (VPAII, VRI, and VRII) on which individuals score most of the total possible points at the first session, making interpretation of practice effect difficult. These score changes should be considered when interpreting performance at retest.
Correspondence: *Mary Theisen, Department of Psychology, 71 West Warren, Wayne State University, Detroit, MI 48202, USA.*

T.P. KELLY & C. WALTON. Construct Validity of Tests of Attention: A Normal British Sample.
Ninety-six British school children completed tests of attention that replicated and extended those used by Mirsky et al. Confirmatory factor analysis using the tests from Mirsky's adult battery replicated the four factor solution. However, when the scores from Mirsky's child battery were used, a three factor solution was obtained with the focus–execute and encoding tests producing a single factor. A further factor analysis was also undertaken using additional variables generated from the extra tests of attention used. This produced a five factor solution that matched Mirsky's four factor model with the addition of an "errors in processing" factor. The results suggest that caution is needed in using Mirsky's four factor model of attention given that subtle changes in the attention scores used produce differing factors.
Correspondence: *T.P. Kelly, Room 432, Ricely Building, University of New Castle upon Thyme, New Castle upon Thyme, England.*

J. ROSENBAUM & C.A. LEAVELL. Attention Capacity Test (ACT) in Right Hemisphere Stroke: Validity, Utility and Future Directions.
ACT has been explored as a valid and reliable measure of attention in various populations. However, relatively little study has occurred of its utility in more focal cases such as right CVA, where patients also tend to be older. In our changing health care environment it is becoming increasingly important to demonstrate our instruments' clinical utility and under what circumstances their use is appropriate. This study examines and establishes ACT's validity and utility as an attention capacity measure providing normative data on 154 persons who have suffered unilateral right CVAs. ACT correlated highly with tasks where control and capacity of attention were greater. ACT also offers utility in predicting total Functional Independence Measure score at discharge from acute inpatient rehabilitation stay in this population.
Correspondence: *Joel Rosenbaum, Neuropsychology Department, Braintree Hospital Rehabilitation Network, 250 Pond Street, Braintree, MA 02185, USA.*

J. JAEGER & S.M. BERNS. Measurement of Functional Disability in Neuropsychiatric Populations.
Neuropsychological deficits in patients with major psychiatric disorders may explain much of the variability in role functioning outcome in these patients, suggesting an increasing role for neuropsychologists in neuropsychiatric rehabilitation. Research attempting to clarify these relationships is seriously hampered by difficulties in the assessment of role functioning outcome. We provide a critical review of the available outcome assessment instruments used in psychiatric and brain-injured populations, and conclude that existing instruments are found wanting. We report on a new instrument, the Multidimensional Scale of Independent Functioning (MSIF), a valid and reliable instrument, designed to overcome limitations in available scales. It is hoped that a more robust instrument universally applicable for the measurement of outcome will contribute to the growing literature studying the relationships between neuropsychological deficits and functional disability.
Correspondence: *Judith Jaeger, Hillside Hospital, Long Island Jewish Medical Center, 75-59 263rd Street, Glen Oaks, NY 11004, USA.*

M.K. JÓNSDÓTTIR. Validity of the Hooper Visual Organization Test: A Question of an Unavoidable Strategy?
The Hooper Visual Organization Test (HVOT) has been described as a "mental object assembly test" and is generally used as such. However, the test's construct validity is unknown. Thus, it is not known to what degree the test requires perceptual organization and mental assembly. One hundred and forty-three healthy volunteers took an experimental version of the test where only the most informative piece of each item was presented. On this version the subjects obtained a borderline raw score (men = 20.1, women = 21.3). It is argued that the HVOT has more in common with a naming test than a mental object assembly test and that identification of the single most informative piece may be an automatic and unavoidable response upon seeing the test items.
Correspondence: *María K. Jónsdóttir, Reykjavík Hospital, Departments of Neurology, Rehabilitation Medicine and Gerontology, Grensásvegi 62, 108 Reykjavík, Iceland.*

ASSESSMENT—1 (Diagnosis)

S. CAUDLE & K. KRULL. WISC–III Processing Speed and Freedom From Distractibility Factor Scores in Children With Attention-Deficit/Hyperactivity Disorder.
The Processing Speed (PS) and Freedom from Distractibility (FD) factor scores from the WISC–III were used to predict group membership for children identified as Attention-Deficit/Hyperactivity Disorder (ADHD), either inattentive or overactive, and control children. Comparison groups included 29 children identified as ADHD–inattentive type, 31 children identified as ADHD–overactive type, and 35 control children. Both the PS and FD factor scores were found to predict a significant amount of the variance for group membership; moreover, the amount of variance accounted for was increased when factors were combined to predict group membership. While these factors appear useful in the identification of both types of attention deficits, scores on these indices do not appear useful in differentiating between the two types, as no measures of gross motor activity level are included.
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L.A. BIELIAUSKAS, M.A. LACY, P.S. FASTENAU, & B.L. ROPER. The Application of the Odds Ratio to Neuropsychology: Prediction of Dementia.

The purpose of this study was to evaluate the application of odds ratio analysis to performance on standard clinical neuropsychological tasks in groups of clearly defined elderly individuals, with and without dementia, and to compare it to more standard parametric approaches. The performances of 25 currently healthy volunteers were compared to 26 patients who met NINCDS/ADRDA criteria for possible or probable Alzheimer's disease. Results showed that the odds ratio values for the same measures show considerable differences in predictive magnitude that could not be discerned from the *t* tests alone. The clinical and research applications and implications of this statistic will be addressed.

Correspondence: *Linas Bieliauskas, University of Michigan Medical Center, 480 Med Inn Bldg., Box 0840, Ann Arbor, MI 48109-0840, USA.*

T. FLYNN & W. BARR. Validation of Predicted Wechsler Memory Scale–Revised Scores in an Epilepsy Sample.

Equations developed by Woodard and Axelrod to estimate the Wechsler Memory Scale-Revised (WMS–R) General Memory and Delayed Recall index scores were applied to a sample of 123 subjects with intractable epilepsy with an identified epileptogenic focus in either the right or left anterior temporal lobe. The prediction equations, entering raw scores for the WMS–R's immediate and delayed Logical Memory, Visual Reproduction, and Verbal Paired Associates subtests were used to predict General Memory and Delayed Recall index scores. Difference scores between actual and predicted General Memory and Delayed Recall index scores did not differ significantly from zero at the .05 level. Predicted scores were within $\pm$ 6 points of actual performance for 93% of the sample for General Memory index score and for 92% of the sample for Delayed Recall index score. Multiple regression analyses were conducted, yielding a multiple R^2 of .94 for the sum of weighted raw scores for General Memory and .97 for the sum of weighted raw scores for Delayed Recall. The unstandardized regression coefficients were comparable to those reported by Woodard and Axelrod and subsequently cross-validated. This study demonstrates the validity of Woodard and Axelrod's prediction equations in a new sample with a known neurologic disorder.

Correspondence: *William Barr, Hillside Hospital, Glen Oaks, NY 11004, USA.*

B. J. KAPLAN, G.C. FISHER, S.G. CRAWFORD, & D.M. DEWEY. Usefulness of Parent Report of ADHD.

Few clinicians or researchers are able to carry out lengthy structured interviews in order to arrive at a diagnosis for ADHD. Consequently, there is much demand for information about the validity of brief measures based on parent report. We have assessed the sensitivity (the probability of testing positive if the disorder is truly present) and specificity (the probability of testing negative if the disorder is truly absent) of several parent report measures in a sample of 167 children (124 boys, 43 girls; average age 11.89 years, $SD = 2.16$). The sensitivity and specificity of each measure was compared to the Diagnostic Interview Schedule for Children (DISC). Overall, the Abbreviated Symptom Questionnaire of Conners displayed the highest combination of sensitivity and specificity.

Correspondence: *Bonnie J. Kaplan, Behavioural Research Unit, Alberta Children's Hospital, 1820 Richmond Rd. S.W., Calgary, AB T2T 5C7, Canada.*

A.H. RISSER & J. ANDRIKOPOULOS. Facial Recognition Test Performance in Traumatic Brain Injury.

FRT was analyzed in a heterogeneous sample of 128 head-injured patients, contrasted with 53 psychiatric controls. FRT was related to head injury severity, with lowest group mean and highest individual failure rate for patients with loss of consciousness greater than 24 hr, consistent with the 1977 findings of Levin and colleagues. Among this most-impaired group, however, lowest group mean and highest individual failure rate were associated with posttraumatic dementia (PTD). The majority of severely head-injured patients without PTD performed within normal limits, albeit at a lower level. Mild head-injured patients and psychiatric controls performed at levels equivalent to the FRT normative sample.

Correspondence: *Anthony H. Risser, Consulting Neuropsychology Services, 1235 66th St., Des Moines, IA 50311, USA.*

J. DONDERS. WISC–III Factor Index Scores After Traumatic Head Injury: Sensitivity to Injury Severity.

The relative sensitivity of the WISC–III factor index scores to injury severity was evaluated in a sample of 88 children with traumatic head injury (THI). The Perceptual Organization (PO) and Processing Speed (PS) indexes, but not the Verbal Comprehension (VC) or Freedom from Distractibility (FD) indexes, were able to discriminate between groups with mild, moderate, and severe injuries. Furthermore, only the PO and PS indexes, and not the VC or FD indexes, had acceptable correlations with length of coma. It is concluded that the PS index is a valid measure, but that caution is needed in interpreting the FD index in the assessment of children with THI.

Correspondence: *Jacques Donders, Mary Free Bed Hospital, 235 Wealthy S.E., Grand Rapids, MI 49503, USA.*

D.W. DESMOND, E. BAGIELLA, J.T. MORONEY, M. SANO, & Y. STERN. Superior Performance of a Neuropsychological Paradigm-Based Method for the Diagnosis of Dementia in the Prediction of Adverse Outcomes Following Stroke.

We applied three methods widely used in the diagnosis of dementia to a cohort of 251 patients assessed three months after ischemic stroke and examined the ability of diagnoses based on those methods to predict stroke recurrence and death during long-term followup. Those methods included modified DSM–III–R criteria based on neuropsychological and functional assessments (NP), Mini-Mental State Examination score less than 24 (MMSE), and neurologists' clinical judgment (CJ). Survival analyses determined that NP best predicted recurrent stroke and death, with the utility of MMSE and CJ only marginally improved by the addition of information regarding functional impairment. Our results suggest that dementia diagnosis based on neuropsychological assessment can identify patients at elevated risk for adverse outcomes following stroke and provide the opportunity for the initiation of targeted interventions.

Correspondence: *David W. Desmond, Neurological Institute, 710 West 168th Street, New York, 10032, USA.*

C. McCARTHY & U. KIRK. Developmental Differences in the Relationships Among Stroop Test Performance, Attention and Reading Skill.

The contributions of reading skill to Stroop Test performance in child and adult samples are compared. Word recognition skills significantly affected performance on a modified Stroop Test in first-grade children. Correlations between the interference scores and reading skill level were significant ($p < .01$). Not one of the relationships among the three measures of reading skill on the Nelson-Denny Reading Test and the Stroop interference scores were significant for an adult population. Further investigations will identify the point in development at which reading skill ceases to significantly determine Stroop Test performance. This modified version of the Stroop Test would be a very sensitive tool for the early identification of reading skill weaknesses.

Correspondence: *C. McCarthy, Department of Education, Long Island University, Brooklyn, NY 11201, USA.*

D. J. CONNOR, J.A. BAUER, D.P. SALMON, R.G. THOMAS, L. J. THAL, & N. BUTTERS. Performance of Three Clock Scoring Systems Across Different Ranges of Dementia Severity.

This study examined the utility of three different clock drawing systems to differentiate between 50 AD patients and 50 pair-matched control subjects over five DRS ranges (100–125). All three systems demonstrated good intercorrelation and correlated well with DRS scores. Optimal cut points derived from the total groups demonstrated fair to good sensitivity at the lower DRS ranges, but poor prediction at the milder range of dementia (e.g., > 115). This brings into question the utility of the clock drawing test as a screening tool for the early detection of dementia.

Correspondence: *Donald J. Connor, ADRC/UCSD-0948, 9500 Gilman Dr., San Diego, CA 92093-0948, USA.*

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R.K. ECKERT & M.M. BURNETTE. Auditory-Verbal *Versus* Visual–Figural Learning and Memory Patterns in Learning-Disabled Adults: The California Verbal Learning Test (CVLT) and Rey Visual Design Learning Test (RVDLT).
The validity and utility of the CVLT and RVDLT in Learning Disabled (LD) adults was investigated by administering the CVLT and RVDLT to 22 college students with confirmed learning disabilities, and a control group of 22 students matched for age, sex, estimated WAIS–R intelligence, socioeconomic status, and educational level. Results indicated that the LD group displayed lower recall consistency and generated more intrusion errors on the CVLT than the control group. On the RVDLT the LD group reproduced fewer correct designs by the fifth learning trial and after a 20-min delay. The LD group also showed a trend toward significantly more erroneous reproductions across trials. The CVLT and RVDLT indices produced 32 of 252 (13%) significant intercorrelations. The CVLT and RVDLT appear to be sensitive measures of learning and memory ability and style in LD college students.
Correspondence: *Robert K. Eckert, Neuropsychology Department, Braintree Hospital, Braintree, MA 02185, USA.*

P. WIEGARTZ, J. BAIR, J. BESYNER, M. COX, & M. SEIDENBERG. Assessment of Attention Deficit/Hyperactivity Disorder in Adult Alcoholics.
Forty-six male alcoholics were administered retrospective and current self-report measures assessing symptoms of attention deficit hyperactivity disorder (ADHD), objective attentional measures, and a measure of depressive symptomatology. Twenty-eight percent of the sample scored above established cutoffs for both retrospective and current symptom questionnaires. The self-report and objective measures of attention were not significantly correlated. Only 9% of the sample showed *both* high rates of self-reported attentional difficulties and objective attentional impairment. Depressive symptoms were associated with increased self-report of attentional problems. Presence of a DSM Axis I or Axis II diagnosis was also associated with increased retrospective self-report of ADHD symptoms.
Correspondence: *Pamela S. Wiegartz, Department of Psychology, FUHS/CMS, 3333 Green Bay Rd., Bldg. 51, North Chicago, IL 60064, USA.*

S. BELL & K. PODELL. Reanalyzing Focal Frontal Performance on the Wisconsin Card Sorting Test: Qualitative Features and Patterns Better Discriminate Performance.
Prior studies found that the Wisconsin Card Sorting Test is not specific to focal frontal lesions (FF). We present evidence to suggest that when compared to healthy controls (HC) and schizophrenics (SZ) there is a qualitative pattern that better classifies FF from HC. Maximal classification (discriminant analysis) between HC & FF was obtained with the percent of total perseverative responses that have a string length of 1 or 2 and the longest string of consecutive perseverative responses (21/24 HC and 18/20 FF). This combination of new variables was 50% better at classifying FF performance than total number of perseverative responses (12/20 FF). However, for SZ *versus* HC percent conceptual level of responses was the best discriminant variable (consistent with prior studies). Other variables and relationships between FF and SZ will be discussed.
Correspondence: *Kenneth Podell, Department of Psychiatry, Medical College of Pennsylvania, 3200 Henry Avenue, Philadelphia, PA 19129, USA.*

D.D. CORREA & F.W. BYLSMA. Quantitative and Qualitative Aspects of the Complex Figure Test (CFT) in Patients With Intracranial Tumors.
The study examined copy and recall CFT accuracy measures, as well as qualitative aspects of the organizational approach to the drawing in patients with brain tumors. Patients with right hemisphere (RH) tumors obtained significantly lower recall scores than did patients with left hemisphere (LH) tumors, despite equivalent accuracy scores on the copy trial. The findings on the qualitative measures suggested that the two groups also differed in the order and total number of units reproduced. Patients with tumors involving the frontal lobes (RH or LH) obtained lower CFT recall scores and displayed less efficient planning and organization on the copy trial, than did patients with nonfrontal tumors.
Correspondence: *Denise D. Correa, Memorial Sloan-Kettering Cancer Center, Department of Neurology/Psychiatry, 1275 York Ave., New York, NY 10021, USA.*

N. NIEBLER, H. KATZEN, H. GINART, & A. FRIEDMAN. The Symptom Checklist–90 as a Sensitive Measure of Affective Symptomatology in Parkinson's Disease.
Although affective changes are common in Parkinson's disease (PD), they are poorly understood. A limitation is that most studies employ a single measure to study a specific psychological symptom and do not examine the full spectrum of affective changes. We administered the Symptom Checklist–90 (SCL–90) to 45 patients with PD and compared them to 30 controls on the nine symptom subscales. Significant differences were found on seven subscales including Somatization, Obsessive Compulsive, Depression, Anxiety, Interpersonal Sensitivity, Phobic Anxiety, and Psychoticism. No differences were observed on Hostility and Paranoid Ideation. This study demonstrates that PD patients experience a broad range of affective symptoms, and that the SCL–90 is a sensitive measure of psychological changes in subcortical degenerative disorders.
Correspondence: *Heather Katzen, Division of Neuropsychology, 1150 N.W. 14th St., Suite 715, Miami, FL 33136, USA.*

H.A. WHITAKER, D. AUBERT, & C. LUZZATTI. The History of Clinicopathological Correlation From the 16th to the 19th Century.
The first case histories in neuropsychology to overtly use clinicopathological correlation (CPC) date from the 13th century. Its first application to refute functional brain models was in the 16th century. Although the CPC method has always been limited by the anatomical knowledge and the psychological theory of a particular epoch, its history shows a relatively steady development, refinement and acceptance from the 17th through 19th centuries. Medical researchers who launched modern neuropsychology from the 1980s onward, did not create the CPC method; they inherited it.
Correspondence: *Harry Whitaker, LNC, Université du Québec à Montréal, 500, boul. René-Lévesque est, Local WB-5110, Montréal, QC H2L 4Y3, Canada.*

E. MATUTE, F. LEAL, D. ZARABOZO, A. ROBLES, & C. CEDILLO. Influence of Literacy Level on Stick Constructions in Non-Brain-Damaged Subjects.
There is neuropsychological evidence suggesting that illiterate subjects may perform worse than literate subjects in some tasks. As part of a more general study involving illiterate, semiliterate and literate brain-damaged patients, the present paper compared the performance of these three groups in stick construction. The task was to reproduce four different stick constructions (two crooked lines, a star-shaped figure and a schematic house). Results revealing an influence of literacy level on performance quality were clearest at the global level (fidelity of reproduction of all figures), but there was also some intriguing evidence with regard both to the ways a model is misrepresented, and to the reproduction of particular figures.
Correspondence: *Esmeralda Matute, Instituto de Neurociencias, Universidad de Guadalajara, Rayo 2611, Guadalajara 44520, Jalisco, Mexico.*

ASSESSMENT—1 (Computerized Assessment)

M.H. KABAT, R.K. DIPINO, & R.L. KANE. Construct Validity of Selected Automated Neuropsychological Assessment Metrics (ANAM) Battery Subtests.
Although computerized and traditional tests may be based on the same general concepts, automation can lead to changes in the nature of tests. This study was designed to examine neuropsychological constructs measured by ANAM tests and to compare them with traditional analogue measures. Thirty-three male Persian-Gulf veterans were administered tests from ANAM along with traditional neuropsychological measures. Planned

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correlational analyses were conducted followed by discriminant function analyses to assess the relationship between traditional and analogue computerized measure. Results indicated significant relationships between traditional and computerized tests putatively measuring similar constructs. Findings suggested that similar tests measure the same general abilities despite the different method of administration. The results also supported the multifactorial nature of both traditional and automated neuropsychological tests.
Correspondence: *Robert L. Kane, Psychology Service (116B), Baltimore VA Medical Center, 10 North Greene Street, Baltimore, MD 21201, USA.*

E. KOSS. Computerized Testing in Clinical Trials.
Although clinical trials represent an obvious application for computerized testing, this new medium remains controversial. Obvious advantages of automated testing are standardization of presentation, ease of scoring, reduction of intertester and interclinic variability; hence decrease in errors of measurement. Less immediate, but not negligible advantages include decreased cost, and considerable potential for faster turnaround, two major issues in clinical trials. Applicability of computerized testing may vary in different populations. Computerized testing may be particularly valuable for quantifying sensory, perceptual and motor functions. Evaluation of cognition and memory requires more qualified endorsement.
Correspondence: *Alice A. Rahill, Department of Environmental Medicine, Box EHSC, University of Rochester Medical Center, Rochester, NY 14642, USA.*

A.A. RAHILL. Computerized Neuropsychological Testing in Cognitive Neurotoxicology: A Poison or a Remedy?
Historically, toxicology provided the basis for therapeutics and experimental medicine. The application of several computerized administrations of neuropsychological tests will be discussed, along with some stand-alone tests. A scorecard will be presented for determining the utility of computerized neuropsychological batteries in epidemiological and laboratory neurotoxicological research. The detection of cognitive effects at lower levels of exposures appears possible, however, the interpretation of results remains a professional challenge. Future directions and methodological questions will be explored. As demonstrated in toxicology, determining the right dose can distinguish between a poison and a remedy.
Correspondence: *Alice A. Rahill, Department of Environmental Medicine, Box EHSC, University of Rochester Medical Center, Rochester, NY 14642, USA.*

K. ADAMS. The Slippery Slope From Tool to Application.
There is little comparative data on the actual uses and the appropriateness of various roles the computer has come to play in applied neuropsychology. This paper presents the results of one stratified survey of neuropsychologists in four states (MA, MI, OR, and TX). There were clear generational differences in terms of recency of training and numbers of roles that computers play in neuropsychological work. This paper asserts that the preference hierarchies observed from this sample represent a far cry from what computers could bring to the betterment of neuropsychological research and practice. A scheme is proposed for the classification of computer tools based on the American Academy of Neurology's Committee on Assessment of New Technologies.
Correspondence: *Alice A. Rahill, Department of Environmental Medicine, Box EHSC, University of Rochester Medical Center, Rochester, NY 14642, USA.*

G.G. BROWN & J.L. WOODARD. Construct Validity of Selective Reminding Indices: A Computer Simulation Study.
Besides presenting stimuli, recording responses, and scoring protocols, other assessment applications of computers include test development, latent trait measurements, and construct validation. We used a Search of Associative Memory (SAM) simulation to examine the construct validity of the STR, CLTR, and RLTR constructs derived from the selective reminding task. STR, CLTR, and RLTR do not have a simple correspondence to underlying information processing constructs, at least as represented by SAM theory. However patterns of correspondence emerged that especially supported the construct validity of CLTR and RLTR. STR seems to more closely reflect reliance on immediate memory retrieval rather than reflect the number of words a subject can rehearse in short-term memory.
Correspondence: *Gregory G. Brown, Psychology Service (116B), VAMC, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

Symposium 2/3:40–5:30 p.m.

BEHAVIORAL EFFECTS OF EXPOSURE TO INDUSTRIAL TOXICANTS: METHODS AND INVESTIGATIONS

Organizer and Chair: Roberta F. White

R.F. WHITE. Behavioral Effects of Exposure to Industrial Toxicants: Methods and Investigations.
This symposium presents work carried out in the field of behavioral toxicology, specifically discussing the use of neuropsychological test measures to assess cognitive and affective effects of exposure to neurotoxicants. The first two papers address methodology, including methods of specifying and quantifying exposure. Both traditional test measures and the validation of computer-assisted tasks are discussed in the context of effect measurement, with an emphasis on hypothesis testing. The other three papers describe studies of adults who have a history of childhood lead poisoning, children with prenatal exposure to methylmercury, and workers exposed to solvents (mixed solvents in the silk screening industry and naphtha).
Correspondence: *Roberta White, Boston DVAMC–116B-4, 150 S. Huntington Ave., Boston, MA 02130, USA.*

R.F. WHITE. Methodological Issues in Behavioral Toxicology: Exposure Assessment and Outcome Measures.
A well-designed study seeking to uncover the behavioral effects of exposure to neurotoxicants must balance excellent methodology at both ends: the quantification of types and dosages of exposure and the assessment of behavioral effects. Use of precise methods of exposure quantification (allowing the investigation of dose–response relationships) are essential. Several types are available (e.g., biological monitoring, air monitoring). Similarly, the use of behavioral tests as assays into brain function can allow for active hypothesis testing about the underlying neuropsychological mechanisms of toxicity, especially when well-validated tasks are employed.
Correspondence: *Roberta White, Boston DVAMC–116B-4, 150 S. Huntington Ave., Boston, MA 02130, USA.*

M. KRENGEL, R.F. WHITE, R. DIAMOND, K. LINDEM, R. LETZ, & D. WEGMAN. Validation of the NES2 in Patients With Neurologic Disorders.
The Neurobehavioral Evaluation System (NES), a computer-assisted battery of tests, has been widely used to detect behavioral dysfunction in occupational and environmental settings. However, the relation of NES subtest performance to CNS function has not been documented in patients with neurologic disorders known to implicate specific brain substrates. A validation study of the NES2 was carried out in patients with multiple sclerosis (MS) and Parkinson's disease (PD), disorders exhibiting neuropathology at loci believed to be the sites of action of several neurotoxicants, and in patients with focal lesions. The results indicated that performance on some NES subtests was affected in expected ways in the patient groups.
Correspondence: *Maxine Krengel, Boston DVAMC–116B-4, 150 S. Huntington Ave., Boston, MA 02130, USA.*

S.P. PROCTOR, R.F. WHITE, R. DIAMOND, C. MOREY, & H. HU. Residual Cognitive Deficits 50 years After Lead Poisoning During Childhood.
In this study adult subjects with a documented history of lead poisoning before age 4 years and matched controls were examined with an abbrevi-

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ated battery of neuropsychological tests. The subjects exposed to lead were inferior to controls on almost all of the cognitive tasks. This pattern of widespread deficits resembles that found in children evaluated at the time of acute exposure to lead rather than the more circumscribed pattern typically seen in adults exposed to lead. Despite having completed as many years of schooling as controls, the subjects with lead poisoning were lower in lifetime occupational status. The results also suggest that subjects exposed to lead suffered acute encephalopathy in childhood which resolved into a chronic subclinical encephalopathy with associated cognitive dysfunction still evident in adulthood.
Correspondence: *Susan Proctor, Boston DVAMC–116B-4, 150 S. Huntington Ave., Boston, MA 02130, USA.*

P. GRANDJEAN, P. WEIHE, F. DEBES, R. LETZ, & R.F. WHITE. Cognitive Deficits in 7-Year-Old Children With Prenatal Exposure to Methylmercury.
To study possible neurobehavioral effects of intrauterine exposure to methylmercury, a cohort of consecutive singleton births was generated during a 21-month period in the Faroe Islands. Prenatal methylmercury exposure was assessed by the mercury concentrations in cord blood and maternal hair at the time of birth. The children were examined at age 7 years. Eleven neuropsychological tests were administered. The results indicate that prenatal exposure to methylmercury from seafood affects performance in several domains of higher cortical function, including language. The involvement of multiple cognitive domains suggests that prenatal methylmercury exposure causes widespread brain damage.
Correspondence: *Philippe Grandjean, Odense University, JB Winslowsvej 17, Odense 5000C, Denmark.*

R.F. WHITE, S.P. PROCTOR, D. ECHEVERRIA, & T. ROBINS. Behavioral Effects of Occupational Solvent Exposure.
This paper summarizes the results of two investigations of the behavioral correlates of occupational solvent exposure. Both studies used a 2-year prospective design. Air sampling methods were used to estimate acute and chronic exposure dose. Study 1 examined the effects of exposure to mixed solvents among silk-screening workers. Both acute and chronic exposure indices were found to be associated with relatively impaired performance on specific neuropsychological tests. Study 2 explored the effects of naphtha exposure in automotive workers. Results suggested that naphtha produces mild reversible effects on CNS function at or above daily exposures of 540 hr $\times$ mg/m^3 (about 90 ppm/hr).
Correspondence: *Roberta White, Boston DVAMC–116B-4, 150 S. Huntington Ave., Boston, MA 02130, USA.*

Paper Session 8/3:40–5:30 p.m.

MEDICAL ILLNESS—1

C. ARMSTRONG, C. HOPWOOD, B. CORN, J. RUFFER, A. PRUITT, K. JUDY, J. ALAVI, & J. MOLLMAN. A Prospective Study of the Long-Term Neurocognitive Sequelae of Cranial Radiotherapy in Adults.
Considerable controversy exists regarding the effects of therapeutic irradiation (CRT) on brain functions in adults, although the findings in children have indicated consistent behavioral and cognitive impairment. Adults ($N = 20$) with low-grade, primary brain tumors were tested trimonthly and then yearly. We replicate our original findings of a decrement and rebound in long-term memory retrieval during 1.5 to 9 months after completion of CRT. We describe early results on the late-delayed effects at 2 and 3 years post. We report on a validation study in which we compare verbal with visual long-term memory, to investigate the generalizeability of the early-delayed memory deficit. We also examined implicit strategic memory processes to understand the cognitive mechanisms of the treatment-related memory decrement.
Correspondence: *Carol Armstrong, Department of Neurology, University of Pennsylvania, 3 Gates, 3400 Spruce St., Philadelphia, PA 19104-4283, USA.*

D. MOSER, D.J. O'BRIEN, R.M. BAUER, R.J. POLLARD, T.D. MARTIN, & J.A. ALEXANDER. Cerebral Microemboli and Neuropsychological Test Performance After Open Heart Surgery: Comparison of Valve Replacement and Coronary Artery Bypass Procedures.
We investigated the relationship between cerebral microemboli (ME) produced during cardiac operations and neuropsychological impairment in valve replacement *versus* coronary artery bypass grafting (CABG) patients. Subjects underwent attention, vigilance, and memory testing 2 days before, 7–10 days after, and 30–42 days after surgery. ME counts were generated using transcranial Doppler sonography of the left and right MCA during surgery. Valve replacements and CABG resulted in demonstrable neuropsychological deficit that improved by the second postoperative assessment. Valve procedures produced significantly more ME than did CABG. Correlations between total ME counts and neuropsychological dysfunction were relatively weak. However, ME–neuropsychological correlations were found in valve patients, where ME count early in the surgical procedure was inversely related to postsurgical neuropsychological performance. Ongoing studies evaluate the effects of age and illness variables in mediating the effects of cerebral ME on cognitive outcome in cardiac surgery populations.
Correspondence: *Russell M. Bauer, Department of Clinical and Health Psychology, University of Florida Health Science Center, P.O. Box 100165 HSC, Gainesville, FL 32610-0165, USA.*

A.C. MILLER, G.R. ANTROBIUS, B. GIORDANI, M.N. STARKMAN, L.L. CONANT, D.E. SCHTEINGART, & S. BERENT. Metyrapone and Dexamethasone Differentially Affect Cognitive Performance in Cushing's Disease.
Cushing's disease (CD) is a neuroendocrine disorder associated with chronic, elevated cortisol levels. Fifteen patients with first episode, untreated pituitary ACTH-dependent CD received methyrapone (MET) and dexamethasone (DEX) on consecutive days following a placebo baseline (BL) and were concurrently evaluated with cognitive measures. As expected, both MET and DEX significantly lowered plasma cortisol levels from BL, while MET produced significantly greater cortisol suppression than did DEX. MET cognitive testing demonstrated significantly impaired long-term encoding and retrieval performance as compared to BL, while DEX had no effect on learning. No significant changes in word fluency or attention were found on either drug days relative to BL. The cognitive effects of suppressed cortisol levels are discussed in terms of possible interactions with other HPA axis hormones.
Correspondence: *Bruno Giordani, Neuropsychology Division, University of Michigan, Ann Arbor, MI 48109-0840, USA.*

E. GAUDINO, D.M. MASUR, & L.B. KRUPP. Cognitive Impairment in the Post Lyme and Chronic Fatigue Syndromes: Effects of Psychiatric History.
To more clearly define cognitive impairment in chronic illnesses, the present investigation subdivided Chronic Fatigue Syndrome (CFS) patients and patients with Post Lyme Syndrome (PLS) into those with (PP) and without (NP) premorbid psychiatric histories. Twenty-five CFS, 38 PLS and 56 healthy controls completed fatigue and depression surveys and standardized neuropsychological tests. CFS and PLS patients also completed a structured clinical interview for psychiatric history. Results showed that PLS patients performed significantly worse than controls on tests of attention and memory. CFS patients did not differ from controls. PLS–NP patients performed significantly worse than PLS–PP on tests of attention and motor speed. Thus, PLS patients with no premorbid psychiatric history present with a more clearly defined cognitive impairment than PLS patients with psychiatric histories.
Correspondence: *Elizabeth Gaudino, Department of Neurology, HSC T12-020, SUNY Stony Brook, Stony Brook, NY 11794-8121, USA.*

C. GROTE, S. PIERRE-LOUIS, & W. DURWAD. Amnesia and Anomia Following Cerebral Malaria.
Although 20 million new cases of cerebral malaria are recorded each year, there have not been any published reports of cognitive outcome. We present

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the neuropsychological test results of a 38-year-old man who contracted cerebral malaria 12 years ago. Testing illustrated very severe deficits in delayed memory and naming ability, in the context of otherwise intact cognition and behavior. These findings are consistent with those from studies finding hypoxia and demyelination only in the hippocampi and temporal lobes of animals infected with cerebral malaria. Our case, which appears to be the first study of outcome in a human, illustrates that survivors may face debilitating deficits as a result of this disease.
Correspondence: *Christopher Grote, Department of Psychology, Rush-Presbyterian–St. Luke's Medical Center, Chicago, IL 60612, USA.*

J. FISCHER, D. GOODKIN, R. RUDICK, K. PERKINS, D. BARILLA, M. DAUGHTRY, K. SCHWETZ, C. VAN DYKE, S. VANDERBRUG MEDENDORP, & T. GREENE. Neuropsychological Outcomes in the Clinical Trial of Methotrexate in Chronic Progressive Multiple Sclerosis: Traditional Pre–Post Analyses May Fail to Tell the Tale.
A comprehensive neuropsychological (NP) battery was administered at baseline and at yearly intervals to 40 chronic progressive multiple sclerosis (MS) patients enrolled in a 2-year clinical trial of oral methotrexate. A briefer set of measures was also administered to a subset of patients every 6 weeks for 6 months. MANCOVA of 2-year change scores on five variables approached, but did not achieve, statistical significance ($p = .07$), largely due to the fact that only one measure, Paced Auditory Serial Addition Test–2, showed striking treatment effects ($p = .002$). Box plots and curves fitted to individual patients' data revealed considerable heterogeneity in PASAT–2 performance within each group, as well as evidence of treatment effects early in the trial. In fact, PASAT–2 performance at baseline, 6 weeks, and 12 weeks predicted treatment group assignment with 80% accuracy ($p = .006$). Treatment group differences in PASAT–2 performance peaked at 1 year, diminishing slightly by the end of treatment. The implications of these findings for NP outcome assessment in clinical trials is discussed.
Correspondence: *Jill Fischer, Mellen Center (U-10), Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195-5244, USA.*

Paper Session 9/3:40–5:30 p.m.

HORMONES AND COGNITION

J.G. BUCKWALTER, T.W. WILSHIRE, C.A. SMITH, & D.K. PAYNE. Reproductive and Menstrual Characteristics of Elderly Women With and Without Alzheimer's Disease.
The loss of estrogen associated with menopause has been suggested to be a factor in the increased prevalence of Alzheimer's disease (AD) reported for women. Women's exposure to sex steroid hormones is affected by various reproductive and menstrual factors. We made comparisons on such factors based on information of 113 women diagnosed with AD and 97 nondemented comparison women. Women with AD were found to have had more children, had breast-fed more, and showed a trend toward an earlier age of menopause. Nondemented women had more preterm deliveries and irregular menstrual cycles and had a trend for having more therapeutic abortions. We conclude that reproductive and menstrual history may be relevant in determining the risk of AD in women.
Correspondence: *J. Galen Buckwalter, Andrus Gerontology Center, University of Southern California, University Park, MC-0191, Los Angeles, CA 90089, USA.*

N.Y. WEEKES & E. ZAIDEL. The Effects of Masculinity and Menstrual Stage on Cognition.
The separate and combined roles of psychological masculinity (i.e., stable hormones) and of menstrual stage (fluctuating hormones) on neuropsychological functioning were explored here for the first time. It was predicted that females would excel at "female-superior" tasks (e.g., verbal fluency) during high estrogen stages of the menstrual cycle, and at "male-superior" tasks (e.g., space relations) during low estrogen stages of the cycle. It was further predicted that high masculine females (as measured by the Bem Sex Role Inventory) would demonstrate better performance on male-superior tasks than would low masculine females, regardless of the stage of the menstrual cycle. Indeed, estrogen fluctuations were found to selectively affect female-superior or left hemispheric tasks, whereas degree of masculinity selectively affected male-superior or right hemisphere tasks. These findings provide both limited support for the estrogen fluctuation model which states that activational effects of hormones in adulthood will provide insights into the organizational effects of these same hormones perinatally, and a challenge to the strict linear effect of masculinity on male-superior task performance in females.
Correspondence: *Nicole Y. Weekes, University of California, Los Angeles. Department of Psychology, 405 Hilgard Avenue, 1282A Franz Hall, Los Angeles, CA 90095-1563, USA.*

K. McNULTY, R. AU, R.F. WHITE, R. MYERS, S. SESHADRI, J. KNOEFEL, A. BEISER, R.B. D'AGOSTINO, & P.A. WOLF. Estrogen Replacement Therapy in Association With Dementia in the Framingham Study.
It has been suggested that Estrogen Replacement Therapy (ERT) exerts a protective influence on dementia development in women. We assessed the effect of ERT in postmenopausal women and its relation to dementia incidence over a 25-year period in the Framingham Heart Study cohort, a prospective study of a general population sample. Subjects included 181 women with 3 years of continuous ERT use by age 65 and a 1,358 member comparison group. Dementia incidence comparisons showed no protective effect of past estrogen use ($RR = .99$, $p = .997$). Mini-Mental scores were significantly higher in the ERT group compared to non-ERT users ($p = .01$). Although use of ERT is related to higher levels of cognitive functioning, there is no evidence of a protective role for estrogen on development of dementia.
Correspondence: *Roberta F. White, Boston Environmental Health Center, 116B-4, 150 South Huntington St., Boston, MA 02130, USA.*

G. CIUPAK, T. QUATRIN, J. SHUCARD, & D. SHUCARD. Further Delineation of Cognitive Abilities in Turner Syndrome: Does Estrogen Play a Role?
Turner Syndrome (TS) provides an opportunity to study the effect(s) of reduced perinatal/postnatal estrogen exposure on cognitive development. The aims of this study were to examine the cognitive abilities of TS, and the possible effects of estrogen replacement on these abilities. The subjects were 15 TS and 15 prepubertal control girls matched for Verbal IQ. The findings indicated that the TS subjects scored significantly below that of the control subjects on most Performance IQ subtests, and half of the Verbal IQ subtests, and virtually all of the neuropsychological tests of spatial ability. Estrogen did not prove advantages with respect to spatial abilities in TS subjects.
Correspondence: *David Shucard, Division of Developmental and Behavioral Neurosciences, 100 High Street (D-6), Buffalo, NY 14203, USA.*

L.D. BAKER, S. CRAFT, E. AVERY, M.A. RASKIND, C. LOFGREEN, S.R. PLYMATE, & S. ASTHANA. Transdermal Estrogen Improves Attention in Postmenopausal Women with Alzheimer's Disease.
Recent evidence suggests that estrogen replacement therapy (ERT) in postmenopausal women may enhance cognition and reduce the risk of developing Alzheimer's Disease (AD). Phillips and Sherwin reported an effect of estrogen on cognition in surgically menopausal women, while Henderson et al. found that AD patients were less likely to have received ERT than controls matched for age and education. Using a placebo-controlled, double-blind, parallel group design we assessed effects of transdermal estrogen on cognitive function in postmenopausal women with probable AD. Ten subjects were randomly assigned to one of two treatment groups. For eight weeks, subjects received either 50 μg/day of 17- β estradiol ($n = 5$) through a transdermal (Estraderm™, Ciba-Geigy) or a placebo patch. Attention as measured by the number of self-corrections on the Stroop improved relative to baseline for subjects in the estrogen-treated group but not for the placebo group ($p < .05$). Trends for improved time to com-

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plete the task and reduced number of errors were also evident. These results suggest a neuromodulatory role of estrogen on cognition, in particular with respect to the monitoring and processing of incoming information.
Correspondence: *Laura Baker, GRECC 182B, VA Puget Sound HCS, American Lake Division, Tacoma, WA 98493, USA.*

J. J. RUCKLIDGE, B. J. KAPLAN, G.S. DITE, & J.L. HOPPER. No Evidence of Testosterone's Effect on the Development of Twins: A Replication in a Larger Sample.
Geschwind and Galaburda proposed that testosterone mediates development of immune disorders and developmental problems, both of which have been reported to have a higher prevalence in males. In twins, females of opposite-sex pairs and males of same-sex pairs may be exposed to elevated levels of testosterone *in utero*, and thus they should be more "masculinized" than twins exposed to lower levels. However, results reported at the 1996 INS meeting found limited support for this model. We have now replicated the study in a sample 3 times the size through the Australian Twin Registry (451 twins ages 8–20 years) and again, found no differences. Our replication of negative results challenges the hypothesis that elevated levels of testosterone significantly account for atypical development of immune and developmental problems.
Correspondence: *Julia J. Rucklidge, Department of Clinical Psychology, University of Calgary, Calgary, AB T2T 5C7, Canada.*

FRIDAY MORNING, FEBRUARY 7, 1997

Paper Session 10/9:00–10:40 a.m.

EPILEPSY—2

P.K. SHEAR, E.V. SULLIVAN, L. MARSH, M. J. MORRELL, K.O. LIM, & A. PFEFFERBAUM. Hippocampal Volumes Correlate With Nonmnemonic Abilities in Temporal Lobe Epilepsy.
Previous work has shown that declarative memory deficits in patients with temporal lobe epilepsy are associated with hippocampal volume decrements but not with the extrahippocampal cortical gray matter loss that these patients also show. This study examined the relationships between nonmnemonic cognitive abilities in these patients and both hippocampal and extrahippocampal tissue volumes. Results suggested that, similar to the pattern of the brain–behavior relationships previously observed in memory ability, better intellectual and confrontation naming scores were also significantly correlated with hippocampal volume but not with extrahippocampal cortical gray matter. Thus, the functional concomitants of hippocampal shrinkage may not be limited to declarative memory ability in these patients.
Correspondence: *Paula K. Shear, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 94305-5543, USA.*

R. MARTIN, E. BILIR, D. ROTH, R. KUZNIECKY, J. HUGG, F. GILLIAM, & E. FAUGHT. MRI Volumetry of Hippocampal and Extrahippocampal Limbic Structures: Relations to Postoperative Memory Outcome in Temporal Lobectomy Patients.
This study examined relations between MRI-based volumetry of hippocampal and extrahippocampal (EXH) limbic structures and memory outcome following temporal lobectomy (TL). MRI measurement of hippocampal, amygdala, fornix, and mammillary body structures was determined in 45 TL patients (23 left, 22 right). Hippocampal and EXH structural abnormalities were present in 42 patients. For left TL patients, verbal and visual memory change scores were related to hippocampal and EXH volume measurements. Left amygdala volume significantly correlated with visual memory change scores in right TL patients. These results suggest that EXH structural abnormalities commonly occur in temporal lobe epilepsy and may provide additional information regarding our understanding of memory outcome following TL.
Correspondence: *Roy Martin, UAB Epilepsy Center, University of Alabama at Birmingham, Birmingham, AL 35294-0021, USA.*

S. SAWRIE, R. MARTIN, D. ROTH, R. KUZNIECKY, E. FAUGHT, & F. GILLIAM. Neuropsychological and Demographic Data Predict Postoperative Seizure Control Following Temporal Lobectomy.
Previous studies examining the prediction of success following surgery for intractable focal epilepsy have often utilized neuropsychological variables in a singular and dichotomous fashion. The present study built upon the previous outcome research by providing empirically-derived prognostic statements based upon a multivariate methodology that is analogous to the evaluative methodology used by the clinician; i.e., based upon a *complete set* of demographic and neuropsychological variables rather than only those variables that individually discriminate between surgery outcome groups. A discriminant function for the left temporal lobectomy group yielded a hit rate of 86.44%, positive predictive power of 95.35%, and negative predictive power of 62.50%, while the function for the right temporal lobectomy group yielded a hit rate of 78.43%, positive predictive power of 82.35%, and negative predictive power of 70.59%.
Correspondence: *Stephen M. Sawrie, University of Alabama at Birmingham, University Hospital, Department of Neurology, Jefferson Towers (1216), Birmingham, AL 35294, USA.*

C. KUBU, A. PARRENT, M. HARNADEK, W. BLUME, & L. CARRIERE. Neuropsychological Outcome Following Stereotactic Amygdalohippocampectomy in Seizure Patients: Preliminary Findings.
We describe the preliminary seizure and neuropsychological outcome data on a series of patients who underwent stereotactic radiofrequency lesioning of the amygdala and hippocampus for the relief of intractable seizures arising from the mesial temporal lobe. The procedure resulted in improvements in all patients' seizure disorders. No cognitive changes were apparent following surgery in patients who underwent a nondominant procedure. Some dominant hemisphere cases demonstrated mild drops on specific verbal memory tests, but language skills were unchanged from preoperative levels. These data suggest that stereotactic amygdalohippocampectomy may provide adequate seizure relief with minimal cognitive risk.
Correspondence: *C. Kubu, Psychological Services, London Health Sciences Centre, University Campus, 339 Windermere Road, London, ON N6A 5A5, Canada.*

D.W. LORING, E. STRAUSS, B.P. HERMANN, K. PERRINE, M.R. TRENERRY, W.B. BARR, M. WESTERVELD, G. J. CHELUNE, G.P. LEE, & K. J. MEADOR. The Crowding Hypothesis in Non-Lesional Patients with Temporal Lobe Epilepsy: Data From the Bozeman Epilepsy Consortium.
We investigated the crowding hypothesis in 636 patients with complex partial seizures whose language dominance was established with Wada testing [right language dominant = 40 (6.3%); left language dominant = 596 (93.7%)], none of whom had lesions other than hippocampal sclerosis. No significant difference in WAIS–R Verbal IQ was present [right language = 87.1 (SD = 10.5) *vs*. left language = 89.6 (SD = 13.2)] although a significant group difference was present for Performance IQ [right dominance = 82.2 (SD = 12.7) *vs*. left dominance = 90.2 (SD = 13.4); $p < .0002$]. These results suggest that "crowding" may occur from relatively small lesions restricted to the mesial temporal lobe producing a shift in language dominance. However, a shift in cerebral language dominance is

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not associated with lowered verbal ability, suggesting that previously reported generalized cognitive-intellectual decline in right hemisphere language dominant patients may be secondary to the magnitude of initial insult.
Correspondence: *David W. Loring, Department of Neurology, Medical College of Georgia, Augusta, GA 30912, USA.*

K. LAFLAMME, I. ROULEAU, & J. ROBIDOUX. Unawareness of Motor Deficit Following Intracarotid Amobarbital Procedure (IAP): Anosognosia or Amnesia?
To investigate the potential role of memory on motor deficit recall, 50 epileptic patients undergoing intracarotid amobarbital procedure (IAP) were asked systematic questions about their awareness of motor deficit. Results show that the recall of motor deficit was equivalent after resolution of right (23%) and left (29%) hemisphere inactivation. Questioning the patient during right IAP did not facilitate recall of motor deficit after the barbiturate had worn off since equivalent rates were noted whether the patients were asked (28%) or not asked (23%) about their hemiplegia under the effect of amobarbital. Among the 10 patients aware of their arm weakness during right IAP (Group 1), 5 failed to report it later, thus reflecting a loss of information. Unexpectedly, about 50% of all patients, when asked, wrongly reported that the arm ipsilateral to the injection was weak instead of indicating the contralateral weakness. These results will be discussed from the viewpoint of methodological considerations.
Correspondence: *Isabelle Rouleau, Service de neurologie, Hôpital Notre-Dame, 1560 rue Sherbrooke est, Montréal, QC H2L 4M1, Canada.*

Paper Session 11/9:00–10:40 a.m.

LANGUAGE—1

J.A. SUHR & S.W. ANDERSON. Word Type, Error Type, and Awareness and Correction of Paraphasic Errors in Patients With Focal Left Frontal or Temporal Lesions.
An analysis of the nature of paraphasic errors was conducted in patients with lesions to language-related cortices. Speech samples of patients with well-defined left frontal and temporal lesions were taken from neuropsychological tasks with highly constrained response sets, allowing for precise knowledge of the target words the patient intended to speak. Speech samples were coded for noun and verb errors, semantic, phonemic, and neologistic errors, and awareness and correction of errors. Findings were consistent with the hypothesis that paraphasic error type varies according to lesion location, with left temporal damage interfering more with lexical retrieval, particularly for nouns, and correction of errors, while left frontal damage had greater impact on phonemic assembly. Results have implications for understanding of the neural substrates of language.
Correspondence: *J.E. Suhr, Department of Neurology, University of Iowa College of Medicine, Iowa City, IA 52242, USA.*

N.F. DRONKERS, B.B. REDFERN, & A. HENIK. Automatic and Controlled Conceptual and Semantic Priming in Aphasic Patients.
Conceptual and lexical–semantic knowledge was investigated in 39 aphasic patients with the semantic priming paradigm. In a series of eight experiments, we examined the relationships between elements of semantic and conceptual knowledge using both pictures and words as primes and targets at both short and long stimulus onset asynchronies (SOA). Results indicated that chronic severe Wernicke's aphasic patients with extensive left temporal lobe lesions showed abnormal priming for any prime–target pair that involved words, but that picture-picture priming was relatively normal in these patients. Broca's aphasics showed normal priming effects with both pictures and words, but only at the longer SOAs. The roles of different brain areas in processing automatic and controlled conceptual and lexical–semantic information will also be discussed.
Correspondence: *Nina F. Dronkers, VA Northern California Health Care System, 150 Muir Road (126s), Martinez, CA 94553, USA.*

R.E. HANLON, D. MATTSON, W.E. LUX, & A.W. DROMERICK. Global Aphasia Without Hemiparesis: Language Profiles and Lesion Distribution.
Global aphasia without hemiparesis (GAWH) is an uncommon stroke syndrome involving receptive and expressive language impairment, without the hemiparesis typically manifested by patients with global aphasia following large left perisylvian lesions. A relatively small number of cases of GAWH have been reported in the literature with conflicting conclusions regarding lesion localization. We present nine cases of GAWH with language profiles and detailed lesion analysis using a CT lesion tracing method with templates of regional arterial infarctions. Cluster analysis revealed three subtypes of patients with GAWH, based on language profiles and statistical analysis of the lesion data revealed a significant association between the manifestation of the GAWH syndrome and infarction of the middle temporal, posterior temporal, and angular branches of the left middle cerebral artery (MCA).
Correspondence: *Robert Hanlon, Department of Neurology, Washington University School of Medicine, 660 S. Euclid, Box 8111, St. Louis, MO 63110, USA.*

L.H. LU, B. CROSSON, L. J.G. ROTHI, A. RAYMER, R.L. GILMORE, K.L. PARGEON, B.K. LY, R.M. BAUER, S.E. NADEAU, K.M. HEILMAN, & S.N. ROPER. Verb and Noun Naming Deficits Following Temporal Lobectomy.
The present study challenges the hypothesis that noun retrieval is mediated by dominant temporal systems subserving concepts for objects, while verb retrieval is contiguous with dominant frontal regions subserving concepts for motion. Previous research supporting this hypothesis may have been confounded by word frequency differences between noun and verb stimuli. Using stimuli balanced for word frequency, we demonstrated impaired verb retrieval in left temporal lobectomy patients. Results suggest that left anterior temporal regions are not just important for noun retrieval but impact verb retrieval as well.
Correspondence: *Lisa H. Lu, Clinical and Health Psychology, University of Florida, Box 100165, Gainesville, FL 32610, USA.*

A.K. TROYER, M. MOSCOVITCH, & G. WINOCUR. The Effect of Focal Frontal- and Temporal-Lobe Lesions on Verbal Fluency Clustering and Switching.
We examined the hypothesis that on verbal fluency, clustering (i.e., generating words within subcategories) is related to temporal-lobe functioning, whereas switching (i.e., shifting between subcategories) is related to frontal-lobe functioning. Tests of phonemic and semantic fluency were administered to 17 patients with focal frontal lesions (FL), 19 patients with unilateral temporal lobectomies (TL), and 29 matched controls. On phonemic fluency, our hypothesis was generally confirmed. That is, FL patients switched less frequently and generated fewer words than controls; left TL patients produced smaller clusters than right TL patients, although there were no differences between TL patients and controls. In contrast, on semantic fluency, both FL and TL patients generated fewer words and switched less frequently than controls and produced normal cluster sizes.
Correspondence: *Angela Troyer, Rotman Research Institute of Baycrest Geriatric Centre, 3560 Bathurst Street, North York, ON M6A 2E1, Canada.*

P. BEESON, T. PATEL, & A. HOLLAND. The Nature of Semantic Information Available During Anomia in Individuals With Alzheimer's Disease and Aphasia.
Twenty-nine individuals with aphasia and 20 individuals with Alzheimer's disease were presented 34 black-and-white line drawings for a confrontation naming task. Naming failures were followed by a request for semantic information about the item. As expected, individuals with aphasia and AD were impaired in naming and provision of semantic information. However, the type of *correct* semantic information provided was surprisingly similar to that of a control group ($N = 11$). Natural or organic items were most often described by their attributes; artifacts were most often described by their function. Identification of the superordinate category was the third most common bit of semantic information provided by

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control subjects, but superordinate information was rarely provided by aphasia or AD groups. These findings challenge the notions that superordinate information is more readily available than subordinate information during anomia due to aphasia or AD, and that semantic deterioration is a bottom-up process in AD.
Correspondence: *Pelagie M. Beeson, National Center for Neurogenic Communication Disorders, Building 71, University of Arizona, Tucson, AZ 85721, USA.*

Special Topic Speaker/9:00–10:40 a.m.

EVOLUTION OF THE BRAIN

Christiana Leonard

Poster Session 4/9:00 a.m.–12:00 p.m.

HEMISPHERIC ASYMMETRY—1

P. BRYDEN, E. ROY, M.P. BRYDEN, F. ALLARD, S. WHITELAW, B. BULMAN-FLEMING, & P. ROY. Manual Asymmetries in Pegboard Performance: The Effects of Task Difficulty.
The magnitude of hand differences in both preference and performance are thought to relate to skill level. These experiments examined the effect of skill as reflected in the spatial precision demands of movement. In Experiment 1, using the Annett pegboard, spatial precision was manipulated by varying peg diameter. In Experiment 2, using the Grooved pegboard, spatial precision was manipulated by comparing performance in the peg placing phase to that in the peg replacing phase. Analyses confirmed these manipulations as movement time increased with spatial precision demands. While the preferred hand was always faster, the magnitude of this advantage was only affected in Experiment 2 in which the manipulation of spatial precision was maximal. The implications of these findings for the skill interpretation of handedness are discussed.
Correspondence: *Pamela Bryden, Department of Kinesiology, University of Waterloo, Waterloo, ON N2L 3G1, Canada.*

D. VOYER & M. MacDONALD. Relation Between Word Frequency and Laterality in Lexical Decision.
The purpose of the present study was to examine the value of three contradictory hypotheses concerning the relation between word frequency and laterality in a lexical decision task. The first hypothesis was based on conventional models of word recognition, and predicted no word frequency by visual field interaction. The second hypothesis was based on the Goldberg and Costa model concerning the development of laterality, and predicted a left hemisphere advantage for high-frequency words and a right hemisphere advantage for low-frequency words. Finally, the third alternative was based on speculations arising from the notion that lexical decisions involve a familiarity assessment process. This hypothesis predicted a left hemisphere advantage for low frequency words and no hemisphere advantage for high-frequency words. Twenty-four female and 24 male participants completed a lateralized lexical decision task including the presentation of low- and high-frequency words as well as nonwords. Results supported the third hypothesis. They are discussed in terms of the role of lexical access in lexical decision.
Correspondence: *Daniel Voyer, Department of Psychology, St. Francis Xavier University, P.O. Box 5000, Antigonish, NS B2G 2W5, Canada.*

M.W. O'BOYLE & H. SINGH. Interhemispheric Interaction During Global and Local Processing.
Participants viewed hierarchically constructed letters (i.e., sets of small letters arranged to form larger capital letters) and determined if they matched in global configuration or in the local elements comprising them. Letter stimuli were presented in pairs (one above the other) to the LVF/RH, RVF/LH, redundantly to both hemispheres, or with one member of each pair presented to each visual-field/hemisphere. For unilateral trials, the RH was faster than the LH when performing global matches, while the LH was faster when making local matches. On bilaterally redundant trials, for both global and local matches, performance resembled that obtained on unilateral RVF trials, suggesting that the LH may exert metacontrol in situations where both hemispheres have access to the visual information necessary to perform the task. On cooperative trials, for both global and local matches, performance resembled that obtained on unilateral LVF trials, suggesting that when cooperation is required between the two hemispheres, the RH bears primary responsibility for coordinating such processing. The results are discussed in terms of current theory concerning interhemispheric interaction in the normal brain.
Correspondence: *Michael W. O'Boyle, Department of Psychology, Iowa State University, Ames IA 50011, USA.*

D.C. THEBERGE, L.H. MOORE, T. MARKEE, D. BURNISON, & W.S. BROWN. Behavioral and Electrophysiological Evidence for a Multifunction–Multipathway Callosal System.
Recent anatomical evidence reveals that the corpus callosum is comprised of a multiplicity of neural pathways crossing the hemispheres. These neural channels reveal wide variety in topographical distribution and fiber composition, and appear to be related to specific neuropsychological functions of the brain. The present study utilized behavioral and electrophysiological measures of interhemispheric transfer and integration with 70 adults, including 21 persons with dyslexia, 28 with multiple sclerosis, and 21 normal controls. Results of factor analysis revealed seven distinct and meaningful factors that accounted for over 81% of the variance, and may represent specific neural pathways that transfer multimodal sensory information between the hemispheres. The measures employed in the study may serve as an index of global callosal functioning—both in integration and transfer of information between the hemispheres.
Correspondence: *W.S. Brown, Travis Institute of Biopsychosocial Research, Fuller Graduate School of Psychology, 180 N. Oakland Avenue, Pasadena, CA 91101, USA.*

E. LARSON, W. BROWN, & D. BURNISON. Bimanual Coordination and Interhemispheric Transmission in Multiple Sclerosis.
A callosal disconnection syndrome in patients with Multiple Sclerosis (MS) was examined using a test of motor abilities and visual evoked potentials. MS patients were slower than nonpatients on the Bimanual Coordination Test (BCT) on both unimanual trials (simple motor speed) and bimanual trials (intermanual coordination). Abnormal evoked potentials (low amplitude and prolonged cross-callosal responses) identified MS subjects with inefficient callosal transmission. The finding that for bimanual trials, MS patients with abnormal cross-callosal evoked potentials were slower than other MS patients and nonpatients (and that this difference remained after differences in unimanual motor speed were statistically controlled) suggests that their bimanual coordination deficits are related to callosal inefficiency.
Correspondence: *Eric Larson, Rehabilitation Institute of Chicago, 345 E. Superior St., Chicago, IL 60611, USA.*

W.F. McKEEVER & R.A. GANDY. The Measurement of Interhemispheric Transfer Time: Data on the Unimportance of Response Finger and Possible Importance of Familial Sinistrality.
Some findings by Trope et al. had suggested that the index fingers of the two hands are susceptible to a substantial degree of ipsilateral hemispheric control, while the little fingers are much more strictly contralaterally controlled. Since a basic assumption of the Poffenberger Paradigm for measuring interhemispheric transfer time (IHTT) is strict contralateral control of the response digits, a study was conducted to determine if employing the little fingers for responses would yield clearer IHTT than would the more conventionally used index fingers. Results showed that little finger responses were significantly slower and there was no difference in the magnitude of IHTT obtained for the little *versus* index fingers. A surprising finding was that these right-handed subjects showed significantly larger

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IHTT if they had no first degree left-handed relatives than if they had such relatives.
Correspondence: *W.F. McKeever, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

P. FORD-BOOKER, A. CAMPBELL, & O. LEWIS-JACK. Lesion Parameters and Performance on Visuoperceptual and Visuoconstructive Tasks Among Brain-Injured Patients.
The present investigation looked at the relationship between several lesion parameters (lesion laterality, lesion caudality, intrahemispheric locus of lesion) and performance on selected visuoperceptual and visuoconstructive tasks in 154 African American patients with unilateral (left = 38; right = 44) brain lesions and non-brain-injured controls ($n = 72$). A subsample ($n = 38$) of brain-injured patients with lesions confined to one of the brain quadrants was used to examine the effects of intrahemispheric locus of lesion on performances of these tasks. In contrast to the laterality groups in the larger sample, laterality groups comprised of patients with lesions restricted to a brain quadrant showed that right hemisphere lesions resulted in greater deficits on the Block Design test than left hemisphere lesions. Also, patients with anterior lesions earned lower Block Design scores than patients with posterior lesions. Results showed that the anterior quadrants of the brain were associated with impairments on visuoconstructive tasks. However, damage to the anterior quadrants and the right posterior region was associated with impairments on the visuoperceptual task. These findings are evaluated in terms of an interactive model of higher visual functions.
Correspondence: *Phyllis Ford-Booker, 717 Sligo Creek Pkwy. #303, Takoma Park, MD 20912, USA.*

Y. KANG. Intermanual Differences on Performance Tests of Handedness in Koreans.
A study was conducted to examine the distribution of intermanual differences on five performance tests commonly used in neuropsychological evaluation, and to investigate the validity of the "10%" criterion in Koreans. The subjects were 141 right-handed college students. They were evaluated on a 1-hr test battery that included the Edinburgh Inventory, the Dot-Filling Test, the Finger Tapping Test, the Purdue Pegboard Test, the Grooved Pegboard Test, and the Grip Strength Test. The results showed that the atypical patterns of performance indicating equal or better performance with the nonpreferred hand and large intermanual differences that exceed 10% are common in the normal Korean population. These data strongly challenge the validity of the 10% criterion. It was also found that there are larger intermanual differences in Koreans than in Americans. It suggests that a criterion applied to Koreans should be different from that applied to Americans.
Correspondence: *Yeonwook Kang, Department of Psychology, Chungbuk National University, Cheongju, Chungbuk 360-763, Korea.*

L. J. ELIAS & M.P. BRYDEN. Footedness is a Better Predictor of Language Lateralization Than Handedness.
Handedness is the most popular behavioral predictor of language lateralization, but some recent reports suggest that footedness may be a better predictor. The present study tested this claim by selectively recruiting 32 participants such that the factors of handedness, footedness, and sex were completely crossed. Language lateralization was assessed with the Fused Dichotic Words Test, and lateral preferences were assessed with questionnaires. Ear advantage varied significantly with preferred foot ($p < .001$) but not with preferred hand ($p = .196$). This result is problematic for evolutionary theories of cerebral lateralization that claim left-hemispheric language is related to fine manual motor skill and sequencing.
Correspondence: *Lorin Elias, Department of Psychology, University of Waterloo, Waterloo, ON N2L 3G1, Canada.*

G. AHERN, A. HERRING, D. LABINER, & M. WEINAND. Quantitative Analysis of Hemispatial Neglect in the Intracarotid Sodium Amobarbital (ISA) Test.
Sixty-nine subjects undergoing right hemisphere Wada testing were presented with a random letter cancellation test at various points during the procedure. Neglect was quantified as *significant*, *moderate*, *minimal*, or *none*, based on how many target letters the patients missed. The electroencephalogram from each of these testing points was spectrally analyzed, and topographic maps were generated. The degree of neglect was then compared to the comparable topographic map. As the amobarbital-induced dysfunction regressed, the degree of neglect lessened in a systematic fashion, as did the profound electroencephalographic changes induced by the drug. Thus, there is a clear relationship between the degree of hemispheric inactivation induced by the amobarbital and the degree of left hemispatial neglect. This relationship held regardless of side of hemispheric language dominance or epileptic focus.
Correspondence: *Geoffrey Ahern, Department of Neurology, University of Arizona Health Sciences Center, 1501 North Campbell Avenue, Tucson, AZ 85724, USA.*

R.A. GANDY, W.F. McKEEVER, A.T. LASITTER, C.O. DeFOSSE, & M. RAYPORT. Functional Evidence Against Intact Callosal Pathways as the Mechanism for the Puzzling Abilities of the Callosotomy Case "P.O.V."
The callosotomy patient P.O.V. shows a puzzling pattern of abilities. Initially she showed typical split brain deficits. Two years after her operations she began to name tactile and visual stimuli channeled to the right hemisphere. Gazzaniga reported that an MRI showed P.O.V. had fibers remaining in the splenium and rostrum, but this issue has not been resolved by MRI, with contradictory conclusions being drawn. We report that P.O.V. shows inability to do same/different judgments for objects palpated by the two hands simultaneously and shows interhemispheric transfer time (42 ms) characteristic of completely sectioned patients. These findings are consistent with an absence of functional callosal fibers and suggest that her naming abilities must be mediated by subcortical transfer, cross-cuing strategies, and/or right hemisphere speech.
Correspondence: *R.A. Gandy, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

M. HISCOCK, R. INCH, & M. KINSBOURNE. Shifting Attention in Dichotic Listening: Differential Effects on the Detection and Localization of Signals.
In each of four experiments, 48 normal right-handed adults (24 women, 24 men) performed a detection task in which they monitored the left ear, the right ear, or both ears for a specified target. Subjects indicated whether the target was heard and, if so, the ear of entry. The dichotic material consisted of digit lists, word lists, consonant–vowel syllables, and rhyming words in Experiments 1–4, respectively. Each of the experiments yielded a right-ear advantage for detection and localization. Focusing attention on one ear increased subjects' ability to localize signals at the attended ear and decreased their ability to localize signals at the unattended ear. With one exception (the experiment involving word lists), shifts of attention had no effect on the detection of signals at either ear. The results show a striking dissociation between detection and localization, and imply that attentional biases primarily affect the accuracy with which signals are localized.
Correspondence: *Merrill Hiscock, Department of Psychology, University of Houston, Houston TX 77204-5341, USA.*

J.M. CLARKE, M.N. HYDEN, J. KOLGUSHEV, & P. LAMBERT. Event-Related Potentials Evoked by Dichotic Presentations of Prosodically-Emoted Words.
Behavioral studies indicate that the left cerebral hemisphere is superior for word perception, while the right hemisphere is superior for detecting emotional prosody. We investigated the neurophysiological correlates of this effect by recording event-related potentials (ERPs) during a dichotic listening task with words spoken in different emotional tones. Participants detected a particular word or a particular emotion in separate sessions. Prior behavioral laterality findings were replicated. The ERP findings from 20 scalp sites indicated that word and emotion detection were associated with different ERP morphologies, scalp topographies, and latencies of processing. ERP correlates of emotion detection appeared earlier (N400) and more anterior than for word detection (P575). The findings suggest a fron-

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tocentral localization for emotional processing, while word detection involves posterior language areas. No lateralized ERP effects were found, possibly because of midline-oriented neuroelectrical dipoles.
Correspondence: *Jeffrey Clarke, Department of Psychology, University of North Texas, P.O. Box 13587, Denton, TX 76203, USA.*

T. HATTA, T. KOGURE, & A. KAWAKAMI. Hemisphere Specialization of Go-Experts in Visuospatial Material Processing.
Hemisphere specialization in two visuospatial recognition tasks was examined with Go experts and Go novices. In a higher demanding task, Go experts showed better performances as a whole, and no VF difference in the identification of spatial location of items, while novices showed a RVF advantage. In a less demanding task, Go experts showed a RVF, but novices showed a LVF advantage tendency in identification of spatial location of items. The performance levels of both groups were not different. Based upon these results, possibilities of hemisphere collaboration in experts and its relation to task demand are discussed.
Correspondence: *Takeshi Hatta, Department of Behavior & Information Processing, School of Informatics & Sciences, Nagoya University, Nagoya City 464-01, Japan.*

S. CHRISTMAN. Hemispheric Asymmetry in Categorical *Versus* Coordinate Processing of Dynamic Visual Input.
Kosslyn has proposed that the left *versus* right cerebral hemispheres (LH *vs.* RH) are specialized for the processing of categorical *versus* coordinate spatial relations, respectively. Given that part of the impetus behind this model involved the computational demands of spatial navigation and the attendant dynamic visual stimulation, the fact that all tests to date of Kosslyn's model have employed static displays represents a potential limitation. Therefore, this framework was tested using dynamic stimuli that changed over time. Categorical processing involved judgments about whether a dot grew or shrank, and yielded a nonsignificant LH advantage. Coordinate processing involved judgments about whether the dot changed size quickly or slowly, and yielded a significant RH advantage.
Correspondence: *Stephen Christman, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

PEDIATRIC NEUROPSYCHOLOGY—2

C.A. LEAVELL & J.A. LEAVELL. Which of Mirsky's Attentional Factors Affect Verbal Learning in Children With Attention/Learning Problems?
This study examined the relationship between Mirsky's four attention factors (*Focus-Execute*, *Encode*, *Shift*, *Sustain*) and a child's ability to engage in complex verbal learning on the California Verbal Learning Test–Children's Version. The attention factors *Encode* and *Sustain* tended to be related to those CVLT variables involving attentional control and proactive inhibition, *versus* relatively purer memory measures such as learning and savings indices. Cutting across factors, those tasks requiring simultaneous attention to multiple units of information, such as the Attention Capacity Test, Trails B, and Stroop Color–Word, had minimal associations with any CVLT variables. This data suggests that "concentration" is not a major attentional requirement for repetitive verbal list learning in children with attention/learning problems.
Correspondence: *Carol A. Leavell, Neuropsychology Department, Braintree Hospital Rehabilitation Network, 250 Pond St., Braintree, MA 02185, USA.*

P. CIRINO, L. CHAPIESKI, & P. MASSMAN. Impact of Obsessional and Attentional Symptomatology on Executive Functioning in Tourette Syndrome.
Executive functioning was examined in 57 (50 boys and 7 girls) children with Tourette Syndrome (TS) who were grouped according to their rates of OCD or ADHD symptomatology. TS children were administered the Wisconsin Card Sorting Test (WCST) and the California Card Sorting Test (CCST), as well as the child Leyton Obsessional Inventory and the ADHD Rating Scale. OCD symptomatology was low overall. Principal components analysis suggested that the WCST and CCST may measure different aspects of executive functioning. TS children in the present study did not have significant difficulty on the WCST or CCST that could be accounted for by associated OCD or ADHD symptomatology.
Correspondence: *Paul Cirino, c/o Lynn Chapieski, Blue Bird Circle Clinic, 6501 Fannin St., NB-100, Houston, TX 77030, USA.*

H. CLAUSEN & E. SHAPIRO. Differences in Visual Attention Among ADHD, Language-Based Learning Disability, and LLD/AHDH Children.
This study examined the visual attentional functioning of three groups of children, ages 7 to 12 years, who were diagnosed with attention deficit hyperactivity disorder, language-based learning disorder (including dyslexia), and a group of children with both ADHD and language-based LD, using the Test of Variables of Attention (TOVA). It was proposed that LLD children would perform significantly better on attentional measures than the other two groups. In addition, multiple and anticipatory response measures were examined for differences among groups. Signal detection measures including *d-prime* and *beta* were calculated for each subject to determine whether differences were found among groups in stimulus sensitivity and response criteria. Results indicated that omission, commission, response speed, and variability measures were not significantly different among groups. However, the d-prime (sensitivity) measure and the multiple and anticipatory response variables successfully discriminated among groups.
Correspondence: *Holly Hieb Clausen, 1401 Independence Avenue North, Golden Valley, MN 55427, USA.*

F. ZELKO, J. POCHYLY, & A. BURNS. The Elithorn Perceptual Maze Test as a Measure of Executive Skills in Children.
We studied the developmental sensitivity of a spatial problem-solving task, the Elithorn Perceptual Mazes, in a sample of 121 normal 7- to 14-year-old children. A significant age effect was found for problem-solving efficiency on the task, with 11- to 14-year-olds performing significantly better than 7- and 8-year-olds. Significant correlations were found between the task and indices from the Nelson Revision of the Wisconsin Card Sort, and with Vocabulary and Block Design performances as well. Results suggest that the Elithorn Mazes may be useful as a measure of executive skills in children.
Correspondence: *Frank Zelko, Department of Child and Adolescent Psychiatry, Children's Memorial Hospital, Box 10, 2300 Children's Plaza, Chicago, IL 60614, USA.*

N. J. FISHER & J.W. DeLUCA. Performance of NLD Children on the Wisconsin Card Sorting Test.
Children with the nonverbal learning disability syndrome (NLD) display well developed rote verbal skills within the context of poor psychomotor, tactile–perceptual, visual–spatial, organizational, and problem solving abilities. One neglected area has been the study of their performance on so-called 'executive' function measures. We examined the performances of NLD children on the Wisconsin Card Sorting Test (WCST), hypothesizing that they would produce a large number of perseverative responses/errors, with minimal difficulty maintaining set. Fifteen children ages 9 to 17 years were classified into impaired *versus* nonimpaired groups by level of performance. Binomial tests of the observed *versus* expected frequency of cases were significant for two variables: trials to first category, and failure to maintain set. Results are discussed in terms of the Goldberg-Costa hemispheric specialization model.
Correspondence: *Nancy J. Fisher, Department of Psychiatry, Wayne State University School of Medicine, University Psychiatric Center, 2751 E. Jefferson, Detroit, MI 48207, USA.*

S. CHRIST, D. WHITE, & A. HEFFELFINGER. Short-Term Recognition Memory in Young Children With Neurodevelopmental Disorders: Prenatal Cocaine Exposure, Phenylketonuria, and Cerebral Palsy.
There are few tasks suitable for measuring short-term recognition memory in young children, even though memory systems are developed early in

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childhood. We developed a new task designed to measure recognition memory. In order to determine whether the task measures recognition memory, preliminary data were collected from children ages 2 to 7 years with neurodevelopmental disturbances (cocaine-exposed = 7, PKU = 5, CP = 5) and a control group of 30 children. Mean performance was highly correlated with age ($r = .68$, $p < .001$) indicating that the task measures different developmental levels. In addition, group differences were apparent, suggesting that the task is sensitive to developmental disturbances affecting memory systems.
Correspondence: *Shawn Christ, Washington University, Campus Box 1125, One Brookings Dr., St. Louis, MO 63130-4899, USA.*

S. MOSTOFSKY, S. MOTT, L. SCHUERHOLZ, M. MAZZOCCO, & M. DENCKLA. The Association Between Visuospatial and Motor Abilities in Children With or Without Neurofibromatosis Type I.
To examine the hypothesis that children develop a representation of space by actively exploring their environment, the association between visuospatial ability and motor performance was examined among children with neurofibromatosis type 1 (NF1) and their siblings. The aspects of visuospatial ability examined were performance on the Benton Judgment of Line Orientation (JLO) test and map-walking performance. Motor performance was measured using the Physical and Neurologic Examination of Subtle Signs (PANESS) and a praxis battery. Results indicated that accuracy on a map-walking task was significantly correlated with performance on both motor assessments. Performance on the JLO was significantly correlated with the total PANESS score. These findings lend support to the notion that visuospatial perception is associated with active exploration of the environment.
Correspondence: *Stewart H. Mostofsky, Division of Developmental Cognitive Neurology, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205, USA.*

V. PETTI & S. VOELKER. *In Vivo* Peer Interaction Skills of Children With Nonverbal Learning Disabilities.
Nonverbal learning disabilities have been linked to characteristic problems in socioemotional development. The present study directly examines social skills in a structured free-play setting. Fifteen children (*M* age 12 years) participated; 5 with nonverbal learning disabilities, 5 with verbal learning disabilities, and 5 psychiatric controls. Peer interaction behavior was coded by trained raters blind to study methodology. As anticipated, children with nonverbal learning disabilities engaged in more isolative play than controls and showed a trend toward emitting fewer adaptive peer interaction behaviors than did comparison children. Implications for treatment planning are discussed.
Correspondence: *Sylvia Voelker, Department of Psychology, University of Windsor, Windsor, ON N9B 3P4, Canada.*

B. WADELTON, A. SELLERS, & W. BURNS. Neurological and Neuropsychological Measures of Outcome in Infants With Significant Pre-, Peri-, and Postnatal Complications.
The purpose of this study was to compare neurodevelopmental outcome on the Bayley Scales (BSID) with results of a neurological exam for infants at risk for neuropathology. Eighty-two infants who had been hospitalized in an intensive care nursery at birth were given the BSID and a neurological exam. Discriminant function showed that BSID scores correctly classified neurologically abnormal infants 75% of the time and normal infants 80% of the time. Therefore the BSID provides an adequate estimate of neurological status.
Correspondence: *William J. Burns, School of Psychology, Nova Southeastern University, 3301 College Ave., Ft. Lauderdale, FL 33314, USA.*

L. J. SPEEDIE, I. DAVIS, A. GROP, W.D. GAILLARD, & M.B. DENCKLA. Neuropsychological Deficits Following Left Caudate Lesion in Childhood.
Following a lesion of the left caudate nucleus, a 12-year-old prepubescent girl, previously gifted, was impaired in language initiation, confrontation naming, automatic speech, and reading speed. Writing was micrographic. She could no longer perform calculations involving fractions, decimals, or beginning algebra, for which she had won prizes the preceding year. Recall of lists was limited but recognition was preserved. These findings, compatible with those reported in adult patients with caudate lesions, confirm findings related to caudate influences on cognitive function and suggest that these functions may be in place at least by late childhood.
Correspondence: *Lynn Speedie, Department of Neuropsychology, Kennedy Krieger Institute, 707 N. Broadway, Baltimore, MD 21205, USA.*

B. J. KAPLAN, T. GAITENS, & B. FREIGANG. Absence of an Association Between Atopic Responsiveness and ADHD Symptomatology.
There are mixed research results regarding a possible association of ADHD (Attention Deficit Hyperactivity Disorder) and allergic reactions. If the association were supported, the implications for underlying pathophysiology would be significant. We have evaluated level of atopic responsiveness (based on IgE-mediated response to skin prick tests) in 312 consecutive referrals to a pediatric allergist. Parents of the children completed the Child Behavior Checklist (CBCL). Raters of atopic responsiveness were carefully trained, and interrater reliability was high. Based on the atopic responsiveness code, children were categorized as nonatopic, moderately atopic, or severely atopic. MANOVAs on the eight CBCL subscales revealed no group differences. We had an adequate sample size to detect a medium effect size. We conclude that the association between ADHD and atopic responsiveness is not a significant one.
Correspondence: *Bonnie J. Kaplan, Behavioural Research Unit, Alberta Childrens Hospital, 1820 Richmond Rd. S.W., Calgary, AB T2T 5C7, Canada.*

D. MOLFESE, A. TAN, & D. FOX. Developmental Changes During Orthographic, Phonological and Visual Processes in 9- and 10-Year-Olds: Electrophysiological Correlates.
Sixteen children (8 boys, 8 girls) were tested at 9 years of age, and again at age 10 years on three reading tasks: orthographic, phonological, and visual. Auditory evoked responses (AERs) were recorded from six electrode sites using auditory probe tones while the children were engaged in the respective tasks. The children were required to decide if a given letter string was comprised of legal letter combinations in the orthographic task, while the phonological task involved decisions regarding the sound of the word. The visual task required the children to make lexical decisions between real words and pseudowords. Differential patterns of brain activity attributable to age, condition, electrode site, and hemisphere differences were revealed in subsequent analyses using the PCA–ANOVA procedure. The findings of this study provide relevant evidence to reading theories.
Correspondence: *Dennis Molfese, Department of Psychology, Southern Illinois University at Carbondale, Carbondale, IL 62901, USA.*

M.W. LOVETT & K.A. STEINBACH. Subtype × Treatment Interactions: Using a Double-Deficit Model of Developmental Dyslexia to Assess Differences in Treatment Response.
Severely reading disabled children were classified according to two dimensions specified by the double-deficit model: They were defined as having phonological deficits, visual naming speed deficits, or both (double-deficit). Response to remediation was assessed in a controlled treatment outcome design comparing two forms of word identification training to a control treatment. All three deficit subgroups demonstrated improved word identification skill and letter-sound knowledge following 35 hr of well-defined remedial treatment. The greatest treatment gains were achieved by children with only phonological deficits. These data indicate that the phonological deficits of severely disabled readers are amenable to improvement with intense remediation. Whether visual naming speed deficits will prove as amenable to treatment remains to be addressed.
Correspondence: *Maureen W. Lovett, Research Institute, The Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada.*

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U. KIRK, C. McCARTHY, E. KAPLAN, & S.L. KEMP. Developmental Patterns on the Children's Clock Test: Drawing and Telling Time.
This study examined children's ability to position numbers on a predrawn and free-drawn clockface and to set and 'tell' specified times. Positioning numbers on predrawn clocks improved with age in both conditions. Qualitative error analyses indicated that the problem posed by these tasks is related to visuospatial planning. Patterns of error suggest that children adopt different strategies to solve the visuospatial problems of the clock tasks. Setting and 'telling' time errors reflected recoding difficulties rather than temporal understanding. These results underscore the need to evaluate children's performance within a neurodevelopmental framework.
Correspondence: *Ursula Kirk, Department of Developmental and Educational Psychology, Box 142, Teachers College, Columbia University, New York, NY 10027, USA.*

K. FERNANDO. The Role of Short-Term Memory and Executive Processing Among Children With Relative WISC–III Third Factor Index Deficits.
Ten children ages 8–10 years with deficits on the (WISC–III) Third Factor subtests relative to their Verbal Comprehension and/or Perceptual Organization Index scores were neuropsychologically assessed to test Kolligian and Sternberg's theory that children with relative Third Factor deficits have difficulty coordinating metacomponential processor tasks with a short-term memory component. Three WISC–III subtests were modified to increase or decrease the information processing components of the subtests and other relevant tests such as the Trail Making Test Parts A and B, and the Cancellation of Recurring Target Figures Test were administered to assess this theory. Results indicated that these children with relative Third Factor deficits experienced significant difficulties with tasks involving the coordination of problem solving strategies in short-term memory and showed relative strengths on tasks requiring simultaneous, holistic processing.
Correspondence: *Kris Fernando, Neuroservices Unit, Level 6, Auckland Hospital, Private Bag, Auckland, New Zealand.*

ATTENTION—2

R. OWNBY. A Neural Network Model of Sensory Suppression.
Sensory suppression is associated with parietal lobe lesions, especially those that are right-sided. Procedures for assessing the phenomenon are sometimes incorporated in neuropsychological evaluations. A computational, or neural network model for hemineglect was previously developed and used to simulate lesion-specific differences on letter cancellation and line bisection tasks. The purpose of this study was to determine whether a computational model would simulate sensory suppression. A counterpropagation network was trained to simulate attention to sensory hemifields and then experimentally lesioned. The network simulated both suppression to bilateral simultaneous stimuli and frank hemineglect at different degrees of lesioning. Implications of these findings for the anatomic network for directed attention proposed by Mesulam are presented.
Correspondence: *R. Ownby, 1790 SE 23rd Ave., Ft. Lauderdale, FL 33316, USA.*

L.B. KRUPP, N.K. SQUIRES, D.A. POLLINA, S. KHALIQUE, S. SCHEFFER, & P. CATALANO. Cognitive Processing Speed in Chronic Lyme Disease.
Lyme disease, a multisymptom disorder caused by the spirochete B. burgdorferi, is characterized by a variety of physical symptoms as well as severe fatigue. There have also been reports that neuropsychological impairments are associated with the disorder. However, these reports are difficult to interpret because some of the reported neuropsychological deficits could be caused by muscle fatigue. In the following study, 67 normal healthy controls were compared to 10 chronic Lyme disease patients on a computerized reaction time task. In this task, participants counted the number of "0"s presented on the CRT screen. The motoric aspect of the task, pressing the corresponding number on a computer keypad, remained constant. Reaction times were significantly greater in the Lyme disease patients, but only for presentations of fewer than five "0"s. These results indicate that a preattentive, perceptual process may be responsible for some of these patients' attentional deficits. Deficits on this task were significantly correlated with a self-report questionnaire measuring specific sleep disturbances.
Correspondence: *Dean Pollina, Department of Neurology, Health Sciences Center T12-020, State University of New York at Stony Brook, Stony Brook, NY 11794-8121, USA.*

J. CORWIN, M. HANEY, S.D. COMER, A.S. WARD, R.W. FOLTIN, & M.W. FISCHMAN. Dissociation of Dose-Related Effects of Marijuana on Sustained Attention Discrimination and Response Bias.
Twelve subjects underwent repeated testing on a 10-min rapid information processing task and rating battery before and at four times after smoking placebo, low dose, and high THC (tetrahydracannabinol) dose marijuana cigarettes. Results were as follows: (1) THC affected self-ratings of well-being, "highness" and perceived cognitive efficiency in dose-related and time dependent manners. (2) THC affected both accuracy and the decision rule under uncertainty (response bias) in dose-related and time dependent manners, lowering accuracy and moving bias conservative (nay-saying). The bias result is novel and somewhat counterintuitive. (3) There was a dissociation between discrimination and bias effects, with discrimination effects having more rapid offset than bias effects.
Correspondence: *June Corwin, Psychiatry Service (116A), New York VA Medical Center, 423 East 23rd Street, New York, NY 10010, USA.*

M. HISCOCK, J.S. CAROSELLI, & L.E. KIMBALL. Paced Serial Addition: A Measure of General Capacity or Arithmetic Skill?
Paced serial addition tasks are thought to measure general information-processing capacity, but performance also may reflect arithmetic-specific processing variables. Guided by Campbell's encoding-complex hypothesis, we administered to 48 normal adults a series of visual paced serial addition tasks in which addends were presented as Arabic numerals, number words, and Roman numerals. Performance varied as a function of addend format, and the effect was additive across different presentation rates. Scores from self-paced addition tests accounted for only a moderate proportion of the explained variance in paced serial addition. We conclude that paced serial addition performance reflects a general-capacity component in addition to arithmetic-specific components.
Correspondence: *Merrill Hiscock, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

A. ASBJØRNSEN, M.P. BRYDEN, & S. OFTE. Push and Pull Is All the Same? Different Attentional Manipulations in Dichotic Listening Do Not Give Specific Effects.
This study examines the effects of voluntary and automatic shifts of attention in dichotic listening in right-handed adolescents. Seventy-two right-handed 13-year-old children were presented a monaural tone cue and a binaural trial-by-trial instruction to direct attention to either left or right ear immediately before the presentation of CV-syllable pairs in a dichotic listening task. In addition, they were presented the cue task with the instruction to report from the opposite ear. Earlier data have suggested that monaural tone cues reduce the error rate in dichotic listening, while an instruction to attend selectively enhances the error rate. It has been speculated that these effects are based on an automatic pull action of a tonal cue, in contrast to a voluntary push action following the instruction. Both manipulations gave profound attentional shifts in the instructed direction, with no differences between the two in correct reports nor intrusive errors. In the third task, subjects failed to overrule the automatic attentional shift with a voluntary response. This implies that the response to the tonal cue is a more basic and automatic response than is the voluntary response to the instruction, even when the instruction is presented on a trial-by-trial basis.
Correspondence: *Arve Asbjørnsen, Department of Psychosocial Science, Christiegt. 12, N-5015 Bergen, Norway.*

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A. ASBJØRNSEN & M.P. BRYDEN. The Attention Shift Index: A Measure of Attentional Shift in Dichotic Listening.
The Attention Shift Index (ASI) is presented as a useful tool for the evaluation of attentional shift in dichotic listening. Attentional shift in dichotic listening with forced or directed attention is usually assessed from the interaction between task and ear score, and the attentional shift has been inferred from a significant interaction effect. However, this procedure cannot be used for the assessment of individual test performance, and the interaction does not give a measure of attentional shift useful for comparison with other measures of attention. The ASI is based on the log-odds ratio of hits to intrusion errors when the subject is performing the tasks of forced left and forced right. Due to the statistical properties of the log-odds ratio, an individual error term can be calculated, and thus attentional shift can be tested for significance within subjects. Data are presented as an example of how the index can quantify attentional problems among learning disabled children.
Correspondence: *Arve E. Asbjørnsen, Department of Psychosocial Science, University of Bergen, Christiesgt. 12, 5015 Bergen, Norway.*

E.H.F. DE HAAN. Feature and Conjunction Search in Patients With Posterior Lesions.
There is now abundant evidence for separate processing of visual cues, such as color, form and motion, in the prestriate cortex. Arguably, there should be a separate processing level at which these visual cues are subsequently integrated. This hypothesis is tested with Treisman's feature and conjunction detection paradigm in a group of patients with posterior brain lesions due to a CVA. Subjects have to search a stimulus display for a target stimulus that is either defined by one dimension (feature) or a combination of two dimensions (conjunction). In support of the hypothesis, the results indicate that the patients find it proportionally more difficult to detect the conjunctions than the features.
Correspondence: *Edward H.F. De Haan, Psychological Laboratory, Utrecht University, Heidelberglaan 2, 3584 CS Utrecht, The Netherlands.*

SEX DIFFERENCES

L. BAXTER & M. SEIDENBERG. Sex Differences in Verbal Memory: Findings From a Literature Review.
A literature search of currently published articles (only adult nonneurological samples) was conducted to determine if a reliable sex difference in verbal memory exists. Studies were examined according to the memory task employed: (1) list learning, (2) paired associates, (3) prose passage. Fourteen of 19 list-learning studies (74%) reported a significant sex effect favoring women (mean effect size = .50). Seven of nine paired associate studies (78%) also reported a significant sex difference favoring women (mean effect size = .30). No consistent sex effect was evident in nine studies with prose recall. We examined additional features (e.g., list format; type of stimuli) that need to be considered when evaluating possible explanations for the sex effect in verbal memory.
Correspondence: *Leslie Baxter, Department of Psychology, Chicago Medical School, 3333 Green Bay Road, North Chicago, IL 60064, USA.*

M. HISCOCK, N. PERACHIO, & R. INCH. Is There a Sex Difference in the Laterality of Dual-Task Interference?
The entire contents of six neuropsychology journals (161 volumes, 612 issues) were screened to identify dual-task laterality experiments. Of 112 experiments thus identified, 45% provided information about sex differences. Although 23 experiments yielded at least one significant main effect or interaction involving the sex factor, only 7 outcomes represented an unambiguous sex difference in laterality. Of those 7 sex differences, 5 support the hypothesis of greater hemispheric specialization in males. The confirmatory outcomes constitute less than 10% of the informative experiments, and less than 5% of the total population of experiments. These data alone do not rule out the possibility that sex differences are chance findings. However, when considered along with similar results from perceptual laterality data previously examined, the dual-task data fit the pattern of a small but reliable population-level sex difference in human laterality.
Correspondence: *Merrill Hiscock, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

D.A. YURGELUN-TODD, S.A. GRUBER, A.A. BAIRD, & P.F. RENSHAW. fMRI of Schizophrenics and Normal Controls During Verbal Recall: Sex Differences.
Abnormal language functions have been repeatedly demonstrated in schizophrenic patients. Differences in activation of the prefrontal cortex have been detected between normal controls and schizophrenic patients with functional MRI during word production tasks. Recent hypotheses of schizophrenia suggest schizophrenic males may be characterized by extreme forms of sexual dimorphism. We applied fMRI techniques to study 12 DSM–IV schizophrenic patients and 12 controls using a verbal challenge paradigm. The challenge paradigm included verbal recall of nine separate lists of five words. Cortical activation was measured using neuroanatomically defined regions of interest. In the dorsolateral prefrontal cortex, normal controls demonstrated higher activation than schizophrenic subjects. When groups split by sex, a highly significant increase in signal intensity was evident for normal control males compared to schizophrenic males. These findings suggest sexual differentiation in activation, which may provide us with important insights into the pathophysiology of schizophrenia.
Correspondence: *Deborah Yurgelun-Todd, Brain Imaging Center, McLean Hospital, Harvard Medical School, 115 Mill Street, Belmont, MA 02178, USA.*

J.H. KRAMER, L. SHARE, & J. LEONARD. Sex Differences in Spatial Cognition: A Matter of Perspective?
This study was undertaken to more clearly define sex differences in visuospatial ability. Subjects were 8 boys and 8 girls with a mean age of 9 years. All children were right-handed, with no history of developmental, neurological, or psychiatric disorders. They were administered a task requiring them to divide their attention between the global and local levels of a visual stimulus and search for one of two targets. Results yielded a significant Sex × Level interaction. While both boys and girls were faster with global targets, the increase in reaction time when the target was at the local level was significantly greater for the boys than the girls. Results suggest a female advantage for local processing, consistent with previous reports of female superiority in abilities associated with the left hemisphere.
Correspondence: *Joel Kramer, Department of Psychiatry, UCSF Medical Center-0984, 401 Parnassus Ave., San Francisco, CA 94143, USA.*

R. BOUCHER & M.P. BRYDEN. Laterality Effects in the Processing of Melody and Timbre.
Laterality for the processing of melody and timbre was investigated in 64 right-handed nonmusicians. In one block of dichotic listening trials, participants listened for a prespecified target melody, and in a second block they listened for a prespecified target instrument. Females were more accurate on the left ear in the melody task (whereas males tended to show no ear advantage), but there were no significant ear differences in the timbre task for either sex. This supports the idea of a complementary sex-based pattern of lateralization, with males more strongly lateralized for verbal stimuli and females more strongly lateralized for nonverbal stimuli. No relation was observed between lambda measures for the two tasks, suggesting that laterality for melody processing is independent of laterality for timbre processing.
Correspondence: *M.P. Bryden, Department of Psychology, University of Waterloo, Waterloo, ON N2L 3G1, Canada.*

W.F. McKEEVER, L. J. CERONE, P. J. SUTER, D.T. BARRY, & H.L. RAMSEY. Fingerprints and Handedness: Sex and Other Correlates.
Genetic, partial-genetic, and nongenetic theories of handedness have been proposed. If handedness could be shown to be related to traits known to be under genetic control it would provide support for a genetic factor in hand-

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edness. Fingerprints are under genetic control and formed by the fourth month of gestation and do not vary thereafter. Coren found greater frequencies of arches and ulnar loops in sinistrals. He also found the effects only on the left hand. We examined this question for the sexes separately, since Coren had not reported any analysis of possible sex differences. We found that arches and ulnar loops are indeed more frequent in sinistrals and only on the left hand, but also only in females. Among male sinistrals, frequency of arches and of ulnar loops were associated with an absence of familial sinistrality, poorer left hand performance on Finger Tapping, and better right hand performance on the Grooved Pegboard Test. Fingerprints may prove informative for delineating genetic as opposed to "pathological" sinistrality.
Correspondence: *Walter F. McKeever, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

LANGUAGE—2

D. BANDY, A.M. RAYMER, J.C. ADAIR, R.L. SCHWARTZ, D. J.G. WILLIAMSON, L. J.G. ROTHI, & K.M. HEILMAN. Effects of Bromocriptine in a Patient With Crossed Aphasia.
Investigations with the dopaminergic agent bromocriptine have shown mixed results in nonfluent aphasic patients. We examined the effects of bromocriptine in a right-handed patient, RF, with crossed nonfluent aphasia and emotional aprosodia following a right frontal lesion. In this ABAB withdrawal design, our patient received bromocriptine, and we measured verbal fluency (discourse words/min and Thurstone letter fluency), expression of emotional prosody, and gesture production. Results demonstrated substantial improvement in the verbal fluency tasks and slight improvement in emotional prosody. These results could not be attributed to practice or spontaneous recovery as we observed no improvement in the control gesture production task. However, continued verbal fluency improvements during withdrawal phases of the experiment suggested that either there was spontaneous recovery or that the effects of bromocriptine were long-lasting.
Correspondence: *A.M. Raymer, Department of Child Study/Special Ed., Old Dominion University, Norfolk, VA 23429-0136, USA.*

C. CIMINO, M. GOLD, N. ALI, & T. BORGATTI. Effects of Frequency and Familiarity in Lexical Fluency.
The purpose of this study was to determine the influence of word frequency and word familiarity on a lexical fluency task. Results demonstrated that familiarity was a highly significant predictor of total words produced during each time period, while frequency was not. In addition, while significant changes in familiarity ratings were observed over time, changes in frequency were nonsignificant. These results suggest that word familiarity, rather than frequency, may be a more potent variable in predicting performance in lexical fluency tasks. Further implications of these findings suggest that possible changes in qualitative variables guiding the search in lexical fluency may be early indicators used to identify abnormal aging associated with disorders such as Alzheimer's disease (AD).
Correspondence: *Cynthia R. Cimino, Department of Psychology, BEH-339, University of South Florida, 4202 Fowler Avenue, Tampa,FL 33620, USA.*

K.A. NOLAN, B.T. VOLPE, & L.A. BURTON. The Continuum of Deep/Surface Dyslexia.
Subsequent to traumatic brain injury involving the right parietotemporal region, a right-handed male patient demonstrated a pattern of reading errors consistent with deep dyslexia: production of semantic, visual, and derivational errors, with part-of-speech and concreteness effects. However, nonlexical derivation of phonology from print was impaired but not entirely abolished. Over time, his ability to associate letter patterns with sounds improved, as did overall oral reading. Although he continued to produce visually and phonologically related errors, he no longer produced semantic errors. Three months postinjury, oral reading had improved significantly and was consistent with very mild surface dyslexia. These observations add to the accumulating evidence supporting dual-deficit models of acquired dyslexia. The case is also discussed in relation to lateralization of function.
Correspondence: *Karen Nolan, The Nathan S. Kline Institute for Psychiatric Research, 140 Old Orangeburg Rd., Orangeburg, NY 10962, USA.*

M. TOCCO, P.M. FITZPATRICK, L.K. OBLER, L.T. CONNOR, & M.L. ALBERT. The Effects of Socioeconomic Status on Aphasia Severity and Recovery.
Low educational and occupational levels are linked to increased incidence of numerous diseases (e.g., cardiovascular; renal), but have not been adequately studied in aphasia. We examined initial aphasia severity and subsequent long-term recovery in relation to premorbid education and occupation. Thirty-nine aphasic subjects were evaluated at two test points: 4 months and 103 months postonset. Aphasia severity was greater for subjects in lower educational and occupational groups. However, recovery rate was equivalent for both higher and lower educational and occupational groups. Lesion size did not account for differences in initial severity. Although low socioeconomic status may be a marker for poor general health, it does not seem to influence cerebral plasticity or potential for recovery from brain injury.
Correspondence: *Michael Tocco, Boston VA Medical Center (12A), Building 9, Room 321, 150 South Huntington Avenue, Boston, MA 02130, USA.*

D. JACOBS, M. MORRIS, R. MORRIS, & R. BRENDEN. Correlates of Spelling Ability in College Students.
A large battery of linguistic and reading measures was administered to college students to determine which measures best predict spelling. Subjects were selected based on their performance on a measure of spelling achievement (WRAT–3) to represent a broad range of spelling ability. Phonological, orthographic, and lexical retrieval skills were assessed. Results of two different approaches to data reduction, theoretical and statistical, using hierarchical regression analyses, showed that phonological decoding skills accounted for the majority of the variance in spelling ability in this sample. Measures of orthographic and lexical retrieval skills contributed minimal additional variance. Results of factor analysis raise questions about the independence of phonological and orthographic decoding skills in a non-brain-injured population.
Correspondence: *Diana Jacobs, Department of Psychology, Georgia State University, Atlanta, GA 30303-3083, USA.*

J. E. CIBULA, J.M. ANDERSON, R. YANKE, G.P. CRUCIAN, L. J. GONZALEZ ROTHI, & K.M. HEILMAN. Phonological Neglect in a Patient With a Right-Hemisphere Stroke.
We studied a 58-year-old right-handed man with left-sided neglect and extinction to determine whether auditory perception would be affected to the same degree as visual and spatial perception, and to ascertain whether auditory allesthesia was present. Words were presented to each ear with and without a white noise mask. Initially, false localization of words presented to the left ear without a mask occurred 40% of the time. This auditory allesthesia improved over time. The patient also demonstrated a phonological misperception, with 73% of the errors involving words presented to the left ear. This phonological neglect did not resolve over 3 weeks of testing, and involved the first phoneme in 61% of the errors. The phonological neglect we observed is analogous in several aspects to neglect dyslexia.
Correspondence: *J.E. Cibula, Department of Neurology, UF HSC Box 236, Gainesville, FL 32610-0236, USA.*

M.F. MENDEZ, M.M. CHERRIER, & K.M. PERRYMAN. Progressive Alexia-Simultanagnosia in Posterior Cortical Atrophy.
This study reports 2 patients with the rare clinical dementia syndrome of Posterior Cortical Atrophy (PCA) which is characterized by early alexia with higher visual impairments. Initially, these patients demonstrated a dyslexia with letter-by-letter reading and preserved writing followed by "ventral simultanagnosia" with preserved detection of multiple stimuli that

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developed into Balint's syndrome. Positron emission tomography (PET) revealed posterior cortical dysfunction consistent with PCA. Neuropsychological testing also revealed their increased difficulty with letter-by-letter reading of nonwords *versus* high-frequency English words and a progressive impairment reading whole words when individual letters were attenuated. In PCA, these findings suggest early difficulty accessing visual word forms and the meaning of whole scenes from temporal–occipital dysfunction and later Balint's syndrome from parietal–occipital dysfunction.
Correspondence: *Mario Mendez, Neurobehavior Unit (691/116AF), West Los Angeles VA Medical Center, 11301 Wilshire Blvd., Los Angeles, CA 90073, USA.*

A. CHATTERJEE, M.H. SOUTHWOOD, D. BASILICO, & A.A. ARMSTRONG. Verbs, Events and Spatial Representations.
Although language is considered to be propositional, events encoded by verbs may have spatial components. We wished to learn if the *location* of thematic roles (agent: doer of action; patient: recipient of action) and/or the *direction* of action are represented metrically. The effects of location and direction were dissociated by contrasting different kinds of verbs: "push" *versus* "pull," in which actions move away from or towards the agent. From three experiments using drawing and sentence–picture matching reaction time tasks, we found that normal subjects located agents to the left of patients and represented actions with a left-to-right directionality. Left-to-right directionality effects determined by verb meaning cannot be explained by reading habits, and may be fundamental to event encoding.
Correspondence: *Anjan Chatterjee, UAB Neurology, 454 SC, 1720 7th Avenue South, Birmingham, AL 35294, USA.*

E. ZAIDEL & L. SEIBERT. Speech in the Disconnected Right Hemisphere?
Patient L.B. with complete cerebral commissurotomy from the California series has long been able to name some pictures or words presented in his left visual hemifield (LVF). This could be due to (1) cross-cuing of the verbalizing left hemisphere (LH) by the informed RH, (2) ipsilateral visual projection from the LVF to the LH via the superior colliculus, (3) subcortical cognitive transfer from the informed RH to the verbalizing LH, or (4) RH speech. We carried out an experiment to determine whether occasional LVF naming reflects LH or RH speech. The rationale was that if LVF naming reflects LH speech then it should show a progressive decline in the presence of progressively complex distractors in the RVF, whereas if it reflects RH speech it should improve with or be unaffected by RVF distractors. In the experiment, L.B. was required to name LVF words (1) without RVF distractors, (2) with figural RVF distractors, and (3) with verbal RVF distractors. Results showed a variety of strategies for naming LVF words, all consistent with LH control of speech.
Correspondence: *Eran Zaidel, Department of Psychology, University of California, Los Angeles, 405 Hilgard Avenue, 1282A Franz Hall, Los Angeles, CA 90095-1563, USA.*

E. FELDMAN, B.E. LEVIN, J.L. FLEISCHMANN, A. KUSHCH, & H.A. LUBS. Neuropsychological Profile in Adult Familial Dyslexia.
We studied the neuropsychological correlates of adult developmental dyslexia controlling for SES and IQ in individuals with a three-generation family history of dyslexia. Thirty adult familial dyslexics (FD) and 32 unaffected family control subjects (FC) were given a comprehensive battery of tests assessing reading, language, visuoconstructional skills, attention, memory, and executive functions. Findings indicate that FD continue to exhibit neuropsychological difficulties relative to FC. Most prominent deficits were evident on tasks assessing rapid naming and susceptibility to interference, in which dyslexic subjects demonstrated increased retroactive interference. Discriminant analyses revealed that 89% of FD and 86% of FC were correctly classified based on their performance scores on these measures.
Correspondence: *Esther Feldman, Division of Neuropsychology, Department of Neurology, University of Miami School of Medicine, 1150 NW 14th Street, Suite 715, Miami, FL 33136, USA.*

NEUROGENETICS

N. THOMPSON, C. GAY, J. CODY, E. McCLURE, J. HARDIES, C. KAYE, & R. LEACH. Genetic and Neuroradiologic Determinants of Intelligence in 18q- Syndrome.
The 18q- syndrome, a common chromosomal deletion syndrome, is associated with varying levels of intelligence. We related variations in IQ to MRI and molecular genetic data in 20 children to clarify causes of mental retardation and identify genes influencing brain development. All but 1 child exhibited incomplete myelination. One child with average intelligence had abnormal white matter; the only child with normal myelination was mildly mentally retarded. Profound mental retardation and simplified gyrification patterns were only evident in the two children lacking a region containing the Deleted in Colon Cancer (DCC) gene, linked to neural crest cell proliferation/differentiation. Thus, variations in myelination alone do not explain intellectual outcome in 18q-, but deletion of the region containing DCC appears to have a profound effect on intelligence.
Correspondence: *Nora M. Thompson, 23331 Cedar Way Apt. D105, Mountlake Terrace, WA 98043, USA.*

E.M. MOSS, P.P. WANG, D.M. McDONALD-McGINN, M. GERDES, T.B. KETING, L. REED, D.A. DRISCOLL, B.S. EMANUEL, M.L. BATSHAW, & E.H. ZACKAI. Characteristic Cognitive Profile of Patients With a Chromosome 22q11.2 Microdeletion: A Nonverbal Learning Disability.
Syndromes associated with the 22q11.2 microdeletion include DiGeorge anomalad and velocardiofacial syndrome (VCFS). Subjects were 24 children and young adults with confirmed 22q11.2 deletions (ages 4–27; 14 female, 10 male). Their mean FSIQ was 74.2, but VIQ was higher than PIQ ($p < .001$) for 78% of subjects. This did not differ by sex. WRAML Verbal Learning was superior to Design Memory ($p = .002$), and was even superior to VIQ ($p = .001$). Overall reading was higher than math ($p < .004$), reflecting strong rote verbal memory skills. These patients appear to be at increased risk for psychiatric disturbance, including schizophrenia or bipolar disorder. They display patterns similar to subjects with nonverbal learning disabilities (NLD). There appears to be a genetic etiology for a specific NLD that maps within the 22q11.2 deletion.
Correspondence: *Edward M. Moss, Department of Psychology, Children's Seashore House, 3405 Civic Center Boulevard, Philadelphia, PA 19104-4388, USA.*

W. JONES, S. NICHOLS, J. TOWNSEND, & U. BELLUGI. Attentional Processes in Adolescents and Adults With Williams Syndrome: Evidence for Cerebellar Abnormalities in a Rare Genetic Disorder.
Williams syndrome is a rare genetic disorder characterized by distinct abnormalities in brain morphology. Past studies suggest that individuals with Williams syndrome have reduced volumes of posterior brain regions including the parietal lobes, and abnormally large volumes of the cerebellum, particularly of the neocerebellum. The present study examined attentional processes in individuals with Williams syndrome, using a covert visual attention paradigm that other researchers have suggested taps into both parietal and cerebellar functioning. Our results suggest that subjects with Williams syndrome show patterns of responses that may be similar to those seen in people with acquired or developmental cerebellar abnormalities.
Correspondence: *Wendy Jones, Laboratory for Cognitive Neuroscience, The Salk Institute for Biological Studies, 10010 North Torrey Pines Rd., La Jolla, CA 92037, USA.*

L. BUCHANAN, J. PAVLOVIC, & J. ROVET. Memory for Visual/Spatial Information in Turner Syndrome.
Turner Syndrome (TS) is a genetic disorder that occurs in females when one of the two sex chromosomes is totally or partially missing. Associated cognitive deficits involve visuospatial processing and working memory. The exact nature of these deficits is not entirely clear, because tasks that have been used to study them do not distinguish between the two independent components of visual processing [*viz.*, locating an object in space (*where*?) and de-

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termining the identity of an object (*what?*)], nor do they examine deficiencies in specific—visual, spatial, and verbal–working memory. Eight girls with TS and 7 normal controls participated in a computerized experiment designed to examine these issues. The TS group was found to be disadvantaged mainly in conditions that tapped visual and spatial working memory.
Correspondence: *Lori Buchanan, Psychology Department, Hospital for Sick Children, Toronto, ON M5G 1X8, Canada.*

V. J. HINTON & N.E. NEREO. Cognitive Function in Duchenne Muscular Dystrophy.
Duchenne muscular dystrophy (DMD) is a neurogenetic developmental disorder that presents with a wide range of intellectual function. Twenty-nine boys with DMD (individual estimated IQs from less than 40 to 137), were segregated into two groups, based on whether they scored above or below 100. Between group performance on a battery of neuropsychological tests was examined with the effects of IQ covaried out. Profiles did not appear to be significantly different. Further comparison of 6 DMD subjects with normal IQ and matched sibling controls indicated the DMD group had selective deficits in attending to, comprehending, and phonemically decoding sequentially presented verbal material, but were no different on memory and nonverbal tests. These data suggest that boys with DMD may have selective neuropsychological deficits, regardless of intellectual level.
Correspondence: *Veronica J. Hinton, G.H. Sergievsky Center, Columbia University, 630 West 168th Street, New York, NY 10032, USA.*

M. GOLD, C. CIMINO, F. CRAWFORD, & M. MULLAN. Neuropsychological and Clinical Features of a Patient With Chromosome-14-Mediated Alzheimer's Disease.
The discovery of chromosomally mediated forms of Alzheimer's disease (AD) prompted investigations to determine if a given pathological process leads to a unique clinical profile. Certain features of chromosome-14-mediated AD such as myoclonus and seizures appeared to be specific. However, as more cases of this form of AD are reported, it appears that there is significant clinical heterogeneity within this group. We present a case of a patient with chromosome-14-mediated AD whose sequential mental status examinations and formal neuropsychological testing supports the hypothesis of clinical heterogeneity.
Correspondence: *Michael Gold, University of South Florida College of Medicine, Department of Neurology, Tampa, FL 33612, USA.*

L. FREUND, T. BAUMGARDNER, M.M.M. MAZZOCCO, A.L. REISS, & M.B. DENCKLA. Neuropsychological Profiles in X-Chromosome Disorders: Fragile X and Turner Syndrome.
Neuropsychological profiles of girls with either Fragile X (fra X; $N = 20$) or Turner (X0; $N = 20$) syndrome were compared to a control group ($N = 20$). Subjects were *individually* matched for Verbal IQ, age, gender and SES. Results were consistent with previous reports of visuospatial (VS) and math deficits and relative strengths on verbal-based (VB) tasks in X0 and fra X groups. Profile specificity was indicated by a deficit in VS memory for the X0 group only, and attention and executive function (EF) deficits in the fra X group only. Within the fra X group, attention and EF tasks correlated positively with math achievement and VS tasks. This pattern was not observed among the X0 or control groups. Conclusion: Fra X and X0 cognitive phenotypes can be distinguished.
Correspondence: *Lisa Freund, Kennedy Krieger Institute, 707 N. Broadway, Room 509, Baltimore, MD 21205, USA.*

Paper Session 12/11:00 a.m.–12:30 p.m.

IMAGING—3

A.C. ROSEN, K. WILLIAMS, T. HAMMEKE, J. WIESER, P. ANTUONO, & E.A. DeYOE. A fMRI Study of Achromatopsia.
We describe a case of incomplete achromatopsia in a 57-year-old art professor. Retinotopic mapping of visual cortex using fMRI as well as high resolution MRI with three-dimensional reconstruction identified lesioned areas both anatomically and functionally. Regions of right hemisphere infarction included the lingual and fusiform gyri, collateral sulcus, and ventral medial visual areas including the lower bank of the calcarine sulcus. On the left, ventral medial visual areas and posterior hippocampus were infarcted. Neuropsychological testing revealed superior intellect, borderline memory, impaired visuospatial abilities, and slowed object recognition. Psychophysical testing revealed generally impaired isoluminant hue discrimination with relatively impaired blue sensitivity and a left upper quadrantanopsia. Performance was intact on color naming and identification, visuospatial imagery, facial discrimination, and stereo depth perception.
Correspondence: *Edgar A. DeYoe, Department of Cellular Biology, 8701 Watertown Plank Road, Milwaukee, WI 53226, USA.*

J.M. CUNNINGHAM, S.M. RAO, E.A. DeYOE, J.A. BOBHOLZ, S. J. WOODLEY, A.C. ROSEN, W. O'REILLY, C. LANGER, & T.A. HAMMEKE. Functional Neuroanatomy Associated With Feature and Conjunction Searches of Facial and Nonfacial Stimuli.
Speed of visual processing is dependent upon the search type and target familiarity. This functional MRI (FMRI) study was designed to examine the differences in neural substrates underlying visual processing of familiar and unfamiliar stimulus configurations (schematic faces and nonfaces) during feature and conjunction searches. Reaction time results revealed significant main and interaction effects ($p < .001$) for search type and stimulus configuration. Unfamiliar conjunction search times were significantly slower than for familiar feature, familiar conjunction, and unfamiliar feature searches. FMR images demonstrated significantly greater bilateral activation in the superior parietal region (right $>$ left) and cerebellum (left $>$ right) during the unfamiliar conjunction search task relative to the other conditions. These results suggest that complex conjunction searches of unfamiliar stimuli require participation of the dorsal spatial processing stream and cerebellum.
Correspondence: *Joseph M. Cunningham, Department of Neurology, Section of Neuropsychology, Medical College of Wisconsin Clinic at Froedtert, 9200 West Wisconsin Avenue, Milwaukee, WI 53226, USA.*

S. J. WOODLEY, S.M. RAO, J.A. BOBHOLZ, A.C. ROSEN & T.A. HAMMEKE. Neural Correlates of Verbal and Visuospatial Working Memory Using Functional Magnetic Resonance Imaging.
In a previous fMRI study, we demonstrated relatively distinct neural subsystems involved in verbal and visuospatial working memory tasks. We replicated and extended our findings by comparing the two tasks to a control task and also to a combined task involving rehearsing both the verbal and visuospatial aspects of the stimulus. Preliminary results indicate brain activation relative to control in the following areas: Visuospatial—bilateral superior parietal and SMA, right occipital and inferotemporal, left lateral premotor; Verbal—left occipital, SMA, Broca's area, Brodmann area 9, and right cerebellum. The combined task showed a mixed pattern of activation. Greater activation was consistently seen in the control task in several areas suggesting the possibility of deactivation of specific brain regions when subjects are engaging in a working memory task.
Correspondence: *Scott J. Woodley, Department of Neuropsychology, Medical College of Wisconsin, 9200 W. Wisconsin Ave., Milwaukee, WI 53224, USA.*

J. GOLD, K. BERMAN, B. KIRKBY, J. VAN HORN, G. ESPOSITO, M. GOUROVITCH, T. GOLDBERG, & D. WEINBERGER. A PET Study Comparing Verbal Fluency and the Wisconsin Card Sorting Test.
Both verbal fluency and the WCST are considered clinical measures of frontal lobe function. However, the tasks appear to involve different cognitive operations, likely mediated by different frontal and extrafrontal regions. To examine this issue, we measured rCBF of 17 normal volunteers during both tasks and paired control tasks, using [^{15}O]-water PET. Common areas of activation across tasks occurred in left dorsolateral prefrontal cortex and cingulate. The WCST activation was greater in right prefrontal cortex and in temporal–parietal regions. The fluency activation was more left lateralized and included the thalamus. Activation across tasks oc-

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curred in the left prefrontal cortex in the context of different extrafrontal activations, suggesting that these tasks recruit partially overlapping, but largely distinct networks of brain regions.
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R.-A. MÜLLER, R.D. ROTHERMEL, M.E. BEHEN, O. MUZIK, & H.T. CHUGANI. Stronger Right-Hemisphere Language Involvement in Children With Early Than in Adults With Late Left Lesion: A PET Study.
PET studies with adult left lesion patients have shown strong right perisylvian language activations. We compared activations for language perception and production in 9 child and 9 adult left-lesion patients and in 4 normal adults. Regional blood flow changes were studied using [^{15}O]-water PET. The child patients showed more reduced left and stronger right hemisphere activations than the adult late-lesion patients in the inferior frontal, superior temporal, and inferior parietal regions. An inverse trend was found in the caudate nucleus. Even though the adult patients also exhibited abnormally strong right hemisphere involvement, their regional brain activations were rather similar to the normal controls. The results support previous clinical findings suggesting greater capacity of right-hemisphere language participation during immaturity than in adulthood.
Correspondence: *Ralph-Axel Müller, PET-Center, Children's Hospital of Michigan, Wayne State University, 3901 Beaubien Blvd., Detroit, MI 48201, USA.*

D. BENAVIDEZ, H. LEVIN, J. FLETCHER, D. BRUNDER, D. MENDELSOHN, J. YEAKLEY, D. BRUCE, N. PERACHIO, R. SCHEIBEL, J. SONG, & M. LILLY. Corpus Callosal Atrophy and Hemispheric Disconnection in Children Following Closed Head Injury: Detection With Magnetic Resonance Imaging and Functional Testing.
We conducted two studies to evaluate corpus callosal (CC) lesions and atrophy following closed head injury (CHI). In Study 1, CC areas of children with mild and severe CHI were computed. Children with mild CHI demonstrated larger areas of total CC ($p < .001$), genu ($p < .004$), isthmus ($p < .003$), and splenium ($p < .006$) than children with severe CHI. In Study 2, children with mild, moderate, and severe CHI were administered tests of interhemispheric integration. Children with moderate to severe CHI and CC lesions demonstrated a greater right ear advantage on a verbal dichotic listening task than children with mild CHI ($p < .02$). These findings suggest that children with moderate to severe CHI are at greater risk for CC atrophy, with corresponding hemispheric disconnection effects, than children with mild CHI.
Correspondence: *Debra Benavidez, Department of Physical Medicine and Rehabilitation, 6550 Fannin, Suite 1421, Baylor College of Medicine, Houston, TX 77030, USA.*

Paper Session 13/11:00 a.m.–12:30 p.m.

PEDIATRIC NEUROPSYCHOLOGY—3

D. FEIN, C. MODAHL, L. GREEN-SNYDER, L. WATERHOUSE, & C. FEINSTEIN. Blood Levels of Oxytocin in Autistic and Normal Children.
Oxytocin (OT) is a neuropeptide that has been related to a variety of social functions in animals and humans. Blood levels of OT were assayed in 30 autistic and 30 age-matched nonpubertal boys between the ages of 6 and 11. Results showed that the autistic group mean was significantly lower than the normal group mean, but distributions were largely overlapping. Correlations between OT level and age, time of day, and time since eating were more robust for the normal children. OT was positively related to socialization for the normal children. The autistic group showed inverse correlations between OT and a variety of developmental measures; these correlations were mostly contributed by the aloof subgroup. Results are discussed in terms of possible receptor abnormalities and the need for direct central measurement.
Correspondence: *D. Fein, Department of Psychology, University of Connecticut, U-20, 406 Cross Campus Rd., Storrs,CT 06269-1020, USA.*

D. ANDERSON, E. LEE, A. MATA, & J. REILLY. Emotional Expression in Children With Early Focal Brain Damage.
This study investigated the emotional expressivity of children with early unilateral focal brain injury (FL) and their normal controls (NC). Our previous naturalistic studies demonstrated that FL children with right hemisphere damage used positive expression less frequently and negative affect more frequently than children with left hemisphere damage or NC. In the current experimental study, we test the emotional expressivity of FL children (ages 6–24 months) using a standardized battery, Laboratory Temperament Assessment Battery (LABTAB). Overall, children with brain damage appear to be delayed in their expression of positive and negative affect during the first two years of life. However, they demonstrate emotional expressivity that is comparable to NC by 24 months. These results are consistent with findings from other studies that suggest the effects of early brain damage are not necessarily the same or as severe as those observed in adults with comparable injuries.
Correspondence: *Diane Anderson, 6363 Alvarado Ct. #221, San Diego, CA 92120.*

K. HOLLER, F.D. EYLER, M. BEHNKE, M. CONLON, E.B. FENNELL, L. MAAG, K. WOBIE, & N.S. WOODS. Behavioral Outcome at Age 3 for Children Prenatally Exposed to Crack Cocaine.
Prenatal exposure to crack cocaine may affect neurodevelopment and subsequent behavior via disturbed catecholamine functioning or hypoxic effects. However, long-term outcome for exposed children is unclear due to limited followup and methodological inconsistencies in the literature. We compared the behavior of 30 crack-exposed children to 30 nonexposed children at 3 years of age. Matching and covariate selection controlled for a number of maternal and environmental factors. Results showed (1) elevated conduct problems, learning problems, impulsivity, and hyperactivity in the total sample of 60 children compared to norms, and (2) no significant differences in the behavior of exposed *versus* nonexposed peers. Elevations in disordered behavior cannot be attributed to exposure status. Prenatal cocaine exposure does not appear to impact behavior significantly at 3 years of age. Implications are discussed.
Correspondence: *Karen Holler, Bradley Hospital, 1011 Veterans Memorial Parkway, East Providence, RI 02914, USA.*

A. HEFFELFINGER, S. CRAFT, & D. WHITE. Sustained Attention in Children Prenatally Exposed to Cocaine.
Heffelfinger et al. provide preliminary results suggesting that prenatal cocaine exposure disrupts the development of visual attention systems, and this disruption may be evidenced in lateralized attention difficulties. The present study investigates the hypothesis that cocaine-exposed children have more difficulty attending to stimuli in the right visual field over time than do control children. A visual attention task specifically designed to measure sustained attention in young children was administered to 14 cocaine-exposed children (mean age = 37 months) and 12 control children (mean age = 42 months). The cocaine-exposed group had fewer complete trials and correct responses, and longer reaction times to trials in the right visual field during the second half. Results support the hypothesis that cocaine-exposed children have difficulty sustaining attention to right visual field stimuli.
Correspondence: *Suzanne Craft, GRECC 182B, VAPSHCS, 1660 S. Columbian Way, Seattle, WA 98108, USA.*

P. ANDERSON, V. ANDERSON, K. GRIMWOOD, T. NOLAN, C. CATROPPA, & E. KEIR. Neuropsychological Consequences of Bacterial Meningitis: A Prospective Study.
Childhood bacterial meningitis is a life threatening disease, associated with infection of the membranes surrounding the brain and spinal cord. Mortality has reduced greatly with the introduction of new antibiotics and treatment regimes, although significant neurological and neuropsychological deficits have been reported in survivors. In 1983, children aged between 3 months and 14 years who experienced an episode of bacterial meningitis were recruited into a study designed to investigate the long-term sequelae of the illness. The post-meningitic cohort ($N = 130$) and a control cohort

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(N = 130) were evaluated between 1991 and 1993 (T1), and the postmeningitic cohort were found to have significant neuropsychological, neurological and audiological deficits, in comparison to the control children. This study reassesses the first 50 of the postmeningitic children on tests of general intelligence, executive functions, memory, learning and academic achievement 4 years following the initial assessment (T2). It was hypothesized that the postmeningitic children will exhibit continued deterioration in relation to developmental expectations. Within group analyses and descriptive statistics reveal that many postmeningitic children continue to experience cognitive and educational difficulties. The children at most risk for neuropsychological deficits are outlined.
Correspondence: *Peter Anderson, Department of Psychology, Royal Children's Hospital, Melbourne, Parkville, Victoria 3052, Australia.*

K.A. ESPY & M.L. GLISKY. Neuropsychological Outcome in Prenatally Drug-Exposed Toddlers.
Prenatally drug-exposed toddlers carry a risk for impaired neuropsychological performance that may vary according to drug type. Performance on A not B, inhibition, developmental, motor, language, and behavioral tasks was examined in 43 toddlers [17–21 months of age; 17 cocaine-exposed (CE), 8 other-drug-exposed (ODE), 17 nonexposed controls (CON)]. Both ODE and CE toddlers showed poorer developmental skills, reduced expressive communication, and less behavioral orientation than CON toddlers. CE toddlers exhibited greater perseveration, less inhibition, and deficits in auditory comprehension and emotional regulation relative to ODE and CON toddlers, after controlling for age and developmental skills. Only ODE toddlers evidenced motor impairment. These findings suggest that exposure to any drug may affect developmental outcome. Prenatal cocaine exposure may impart selective vulnerability to executive function, inhibition, and emotional regulation skills in toddlers related to the concurrent rapid maturation of frontal lobe structures and the neurobiology of cocaine.
Correspondence: *Kimberly Andrews Espy, Department of Behavioral and Social Sciences, Mail Stop 6517, Southern Illinois University, Carbondale, IL 62910-6517, USA.*

FRIDAY AFTERNOON, FEBRUARY 7, 1997

Symposium 3/1:30–3:20 p.m.

COGNITIVE FUNCTION IN TURNER SYNDROME: HORMONAL, GENETIC, AND LEARNING DISABILITY PERSPECTIVES

Organizer and Chair: Judith L. Ross

J.L. ROSS. Cognitive Function in Turner Syndrome: Hormonal, Genetic, and Learning Disability Perspectives.
Turner syndrome (TS) is the complex phenotype of females with complete or partial absence of the second sex chromosome. Girls with Turner syndrome manifest a particular neurocognitive profile including specific deficits in visual–spatial abilities, visual–perceptual abilities, recognition of facial affect, dichotic listening, and Performance IQ. The etiology of impaired cognitive development in Turner syndrome is unknown and could be due to environmental, endocrine, or genetic factors, either alone or in combination. The goal of this symposium is to (1) explore potential hormonal and genetic influences on cognition in Turner syndrome, (2) expand the description of the TS cognitive profile to include the domains of executive and motor function, and (3) examine TS as a model of how learning disabilities and attention deficit hyperactivity disorder are related.
Correspondence: *J.L. Ross, Department of Pediatrics, Jefferson Medical College, 1025 Walnut Street, Philadelphia, PA 19107-65818, USA.*

S.M. ROMANS & J.L. ROSS. Cognitive Function in Turner Syndrome: Impairment in Spatial, Attentive, and Executive Function.
Turner syndrome (TS) is a genetic disorder in females in which all or part of one X chromosome is missing, resulting in the absence of ovarian estrogen production. Researchers have identified a specific neurocognitive profile in TS characterized by decreased visual–spatial, arithmetic, and attentional abilities. The current study examines cognitive functioning in 105 TS females and 153 female controls matched for age, IQ, and SES. In addition to confirming the cognitive functions previously shown to be abnormal in TS (visual/perceptual skills and attention), the TS group (all ages) performed significantly less well than the controls on several measures of attention. TS girls performed at levels comparable to controls on the Wisconsin Card Sort Test and semantic clustering, but exhibited significant deficits on Controlled Word Association test, Rey–Osterrieth organizational component, and Tower of Hanoi. The contribution of decreased spatial and attentional skills to decreased performance on executive tasks in TS is discussed.
Correspondence: *J.L. Ross, Department of Pediatrics, Thomas Jefferson University Hospital, 1025 Walnut St., Philadelphia, PA 19107, USA.*

J.L. ROSS. Genetic Influence on the Neurocognitive Profile in Turner Syndrome.
Turner syndrome (TS) is the complex human phenotype of females with complete absence of the second sex chromosome, or monosomy X and is characterized by a particular neurocognitive profile. This presentation will address several potential genetic determinants of the Turner syndrome cognitive profile, including (1) imprinting, (2) expression of unmasked X-linked recessive mutations, or (3) haploinsufficiency of gene products from X-linked genes. In general, these results and previous data from other investigators suggest that there are X-chromosome effects on brain maturation and development of cognition. Ovarian hormones (estrogen) may also modulate brain development during fetal life and later in adolescence. The degree to which genetic effects of monosomy X are independent of ovarian failure in the neurocognitive development of girls with TS is a subject of future investigation.
Correspondence: *J.L. Ross, Department of Pediatrics, Thomas Jefferson University, 1025 Walnut St., Philadelphia, PA 19107, USA.*

D.P. ROELTGEN & J.L. ROSS. Effects of Estrogen Replacement on Cerebral Function in Turner Syndrome.
The study was designed to directly test the effects of estrogen (E) replacement on cerebral function in Turner syndrome (TS). A double blind, placebo controlled study of 65 TS girls tested the impact of E on performance on tests of general cognitive function plus verbal, spatial, motoric, attentive, and affective perceptive abilities. With only few exceptions, limited effects of E replacement are present, indicating that E replacement does not appear to reverse the cerebral dysfunctions present in TS. The possible reasons for this reflect the complexity of sex hormonal effects on the nervous system and will be discussed.
Correspondence: *J. Ross, Department of Pediatrics, Jefferson Medical College, 1025 Walnut Street, Philadelphia, PA 19107-65818, USA.*

M.B. DENCKLA. Turner Syndrome as a Model for How Nonverbal Learning Disability Syndrome and Attention Deficit Hyperactivity Disorder Are Related.
Although most individuals with Turner syndrome (TS) have Verbal IQs in the normal range, they have been reported to be vulnerable to specific

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learning disabilities and behavioral problems, particularly hyperactivity and attention problems. Turner syndrome represents a good model for what is heterogeneously seen as Attention Deficit Hyperactivity Disorder because their pattern of increased impulsivity and inattention resembles "idiopathic" ADHD. The TS pathway to learning disability is mediated by a group of anomalies in brain structure and more than one domain of neuropsychological impairment. Turner syndrome produces neither a singular abnormality in the brain nor a unimodular impairment of cognition. In addition, TS does not produce an esoteric or seldom seen type of developmental disorder. Possibly more generalizable to idiopathic nonretarded developmental syndromes is the hypothesis that learning disabilities are not each mapped one-to-one with an isolated cognitive deficit.

Correspondence: *J.L. Ross, Department of Pediatrics, Thomas Jefferson University, 1025 Walnut St., Philadelphia, PA 19107, USA.*

Paper Session 14/1:30–3:20 p.m.

HIV—2

J.T. BECKER, M.A. DEW, & O.L. LOPEZ. Factors Underlying the Cognitive Deficits in HIV-Infected Individuals: A Preliminary Model of the Information Processing Loss.

Most descriptions of the cognitive changes associated with infection with Human Immunodeficiency Virus emphasize the psychomotor slowing and bradyphrenia. The present report describes the results of a preliminary study of the relationship between psychomotor speed, memory, and verbal fluency among HIV-infected individuals. The data were taken from the baseline assessment of 200 infected men and women, 62% of whom had AIDS. The results of the analyses indicated that age ($r = -.27$), depression ($r = -.24$) and CD4+ count ($r = .21$) were significant and independent predictors of psychomotor speed. The speed variable was a significant predictor of memory ($r = .28$) and fluency ($r = .31$) factors. This preliminary analysis demonstrates that psychomotor speed, or an analogous factor, is central to the information processing deficit in HIV infection and may be causally related to the expression of other neuropsychological impairments.

Correspondence: *James T. Becker, 502 Iroquois Building, 3600 Forbes Avenue, Pittsburgh, PA 15213, USA.*

S.W. MILLER, R.K. HEATON, D. KIRSON, & I. GRANT. Neuropsychological (NP) Assessment of African Americans.

A comparison NP test results from matched samples ($N = 33$) of HIV antibody-positive, African American and Caucasian males revealed significantly lower scores by African Americans. An analysis of blind, clinical impairment ratings based, in part, on the NP scores showed that from a sample of 620 HIV+ subjects, 71% of African Americans were rated impaired, as compared to 38% of the Caucasian group. The application of NP norms developed for African Americans reduced the percent HIV+ African Americans rated impaired to 44%.

Correspondence: *S.W. Miller, HNRC, University of California, San Diego, 2760 5th Avenue, Suite 100, San Diego, CA 92103, USA.*

O.L. LOPEZ, J. WESS GICONI, & J.T. BECKER. Self Report Rating Scale for Motor and Mental Slowness: Correlations With Neuropsychiatric Factors in HIV-Infected Individuals.

We examined the psychiatric, neurological, medical, and neuropsychological correlates of subjective complaints of mental and motor slowness in human immunodeficiency virus (HIV) infection. Seventy-two HIV infected patients completed a self-rating questionnaire concerning mental and motor slowness in their activities of daily living. In addition, medical, neurological, psychiatric, and neuropsychological examinations were completed as well as symptom checklists of cognitive, psychosocial, and medical problems. Measures of motor and mental slowness correlated with severity of the disease (CDC stages), major depression, and with measures of memory, and speed of information processing. However, there was no statistically significative interaction between depression and slowness. These results suggest that complaints of slowness are independent predictors of depression, and of cognitive impairment, indicative of frontal–subcortical system dysfunction.

Correspondence: *Oscar L. Lopez, 502 Iroquois Building, 3600 Forbes Avenue, Pittsburgh, PA 15213, USA.*

E. MARTIN, R. FARINPOUR, D. PITRAK, T. FLETCHER, J. BARTOK, K. PURSELL, R. NOVAK, K. MULLANE, & M. HARROW. Self-Ordered Pointing and Verbal Working Memory in HIV–1 Infection.

We have shown previously that visuospatial working memory is impaired in HIV-seropositive subjects. In this study, we investigated the status of verbal working memory. Thirty HIV-seropositive and 30 seronegative drug users performed the Verbal Self-Ordered Pointing Task (SOPT) developed by Petrides and Milner. In a second experiment, subjects performed a modified SOPT that taxed working memory processes further by requiring subjects to monitor the test stimuli over a time delay. Significantly more HIV-seropositive subjects had diminished SOPT spans compared to controls, and this effect was most striking for the modified SOPT. Multiple working memory domains are affected in HIV–1 infection and mental operations responsible for maintaining memory representations over time may be a critical component of HIV-related cognitive deficit.

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C.H. HINKIN, S.A. CASTELLON, & S. WOOD. Cognitive Slowing in HIV-1 Infection: Results From a Dual Task With Probe Reaction Time Experiment.

To ascertain the specific stage of information processing at which cognitive slowing due to HIV infection is maximal, 26 HIV infected subjects and 18 uninfected controls engaged in a dual task delayed choice reaction time (RT) with probe RT experiment, as well as provided measures of simple and choice RT. The HIV+ subjects had slower choice RTs than did controls but the groups did not differ on simple RT. Estimates of the component cognitive processes subserving delayed choice RT performance—encoding, working memory, and response execution—were obtained using a probe RT technique in which increased response latency at differing probe positions provided a measure of the component cognitive operation that coincided with the probe. HIV+ patients were shown to be significantly slower at all stages, particularly so at the working memory and response execution stages. These data support the hypothesis that differential slowing seen at the working memory and response execution stages is associated with altered controlled attentional processing and/or impaired working memory.

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R. FARINPOUR, E. MARTIN, D. PITRAK, K. PURSELL, M. SEIDENBERG, R. NOVAK, & K. MULLANE. Verbal–Working Memory in HIV-Seropositive Drug Users.

Recent studies indicate HIV-seropositive subjects are impaired on measures of visuospatial working memory and raise the question of the extent of working memory deficit. We evaluated verbal working memory in 30 HIV-seropositive substance abusers and 30 seronegative controls using the listening span test, a verbal working memory measure that is performed abnormally by patients with basal ganglia disease. HIV-seropositive patients were impaired on the listening span test compared to matched controls. Group differences could not be accounted for by differences in age, education, estimated verbal IQ, or psychological distress. The findings demonstrate that seropositive substance abusers can be discriminated from controls on both verbal and visuospatial working memory measures, and support

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the utility of tests sensitive to basal ganglia disease in the study of HIV-related cognitive deficits.
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Paper Session 15/1:30–3:20 p.m.

HEMISPHERIC ASYMMETRY—2

J.E. OBRZUT, M.P. BRYDEN, P. LANGE, & B. BULMAN-FLEMING. Concurrent Left-Hemisphere-Verbal and Right-Hemisphere-Emotional Processing in Children: Dichotic Laterality Effects.
This study assessed both left and right hemisphere functions simultaneously when two-syllable words differing only in the initial stop consonant and spoken in different emotional tones were paired dichotically. Seventy-two right-handed children, 12 boys and 12 girls at each of Grades 1, 3, and 5 were instructed to detect either the presence of a specific word (72 trails) or of a specific emotion (72 trials). Results indicated that when the target was a word, a REA was obtained, when the target was an emotion, a LEA was obtained, and that emotional stimuli were easier to process than word stimuli. "Complementary specialization," i.e., verbal and emotional functions clearly lateralized to the opposite hemisphere, was found for third graders. In contrast to adult findings, a larger LEA was obtained for the emotion "happy" than for the emotion "sad." It was concluded that this type of study (target detection) may be the prototype for the distribution of hemisphere specializations in individuals with intact brains, as well as in clinical populations.
Correspondence: *John E. Obrzut, Department of Special Education and Rehabilitation, University of Arizona, Tucson, AZ 85721, USA.*

B. CICERO, J. BOROD, L. OBLER, J. WELKOWITZ, C. SANTSCHI-HAYWOOD, H. ERHAN, I. GRUNWALD, & R. AGOSTI. Facial, Prosodic, and Lexical Emotional Perception in Stroke Patients with Unilateral Brain Damage: Preliminary Findings.
This study examined emotional perception in stroke patients, focussing on three communication channels: facial, prosodic, and lexical/verbal. Neuropsychological hypotheses regarding hemispheric specialization for emotion (right-hemisphere and valence) were tested. Subjects were 11 right-brain-damaged (RBD), 10 left-brain-damaged (LBD), and 15 demographically-similar normal control (NC) adults. Experimental measures were identification and discrimination tasks, including positive/pleasant and negative/unpleasant emotions. Nonemotional control tasks evaluated perception of neutral faces, visuospatial stimuli, intonational contours, and neutral words and sentences. For identification tasks, RBDs were significantly impaired relative to NCs and LBDs across the three channels, regardless of valence. There were no significant subject–group differences for discrimination tasks. These results were maintained when statistical controls were conducted for nonemotional tasks. Overall, results support the right-hemisphere hypothesis for the identification of emotional stimuli.
Correspondence: *Barbara Cicero & Joan Borod, Psychology Department, Queens College, 65-30 Kissena Blvd., Flushing, NY 11367, USA.*

S.A. COPELAND & E. ZAIDEL. Callosal Channels and the Bilateral Distribution Advantage: Patterns in Agenesis and Partial Section of the Corpus Callosum.
When visual items are compared, presentation to opposite hemispheres may result in superior performance [bilateral distribution advantage (BDA)] by permitting each hemisphere to partially process stimuli, leaving more resources available for the decision. We have previously demonstrated that a blocked four-item version of this task controls for postperceptual scanning while presenting symmetric perceptual load to the hemispheres. This task yields a BDA for letter name but not letter shape matching in normal subjects. To elucidate the role of the corpus callosum in the BDA, the task was administered to (1) a callosal agenesis patient, yielding a BDA within normal range; (2) an anterior callosotomy patient, yielding a unilateral advantage (no BDA). The BDA appears to be supported by alternate extracallosal interhemispheric connections in agenesis. In the normal callosum, intact anterior connections appear critical. This implies that early transfer negates the benefits of dividing initial processing between the hemispheres, and that interhemispheric transfer at late stages of processing may be critical for producing a BDA.
Correspondence: *Sarah A. Copeland, Department of Molecular & Medical Pharmacology, 1231 JLNRC, University of California Los Angeles, Los Angeles, CA 90095-1770, USA.*

A.E. MORGAN & G.W. HYND. Atypical Planum Temporale Asymmetry: Is It Associated Specifically With Dyslexia or With Weak Linguistic Abilities?
This study compared dyslexic ($N = 19$), ADHD ($N = 23$), and normal ($N = 12$) children on planum length and asymmetry variables, and examined the relationship between these variables and linguistic abilities. Groups differed on right parietal bank, parietal bank interhemispheric asymmetry, and right intrahemispheric asymmetry variables. Diagnostic groups did not differ in proportion of rightward asymmetrical/symmetrical temporal banks. Children with weak linguistic skills had a high proportion of atypical asymmetry. Linguistic abilities positively correlated with left temporal bank and left total lengths among ADHD and normal children. Linguistic abilities negatively correlated with right temporal bank length among dyslexic children. Leftward temporal bank and total asymmetry positively correlated with linguistic abilities for all subjects. Right intrahemispheric asymmetry negatively correlated with linguistic abilities among dyslexic subjects.
Correspondence: *George W. Hynd, School of Professional Studies, University of Georgia, Athens, GA 30602, USA.*

J.M. CREBOLDER & M.P. BRYDEN. Complementary Specialization for Verbal and Visual Tasks.
According to the theory of hemispheric complementarity a division of functional asymmetry between the cerebral hemispheres for language and spatial processing should be consistently observed in the population. Clinical data however suggests otherwise. One way of investigating hemispheric complementarity in the normal population would be to look for differences in the pattern of asymmetry expected between right- and left-handers. In this study right- and left-handed subjects performed a language and a spatial task using the same stimulus material. We suggest that it is important to look at individual patterns of performance rather than group data when investigating the complementarity issue. When the data for each individual were analyzed using a log-odds ratio the findings suggested that handedness was a determining factor in hemispheric dominance for the language but not for the spatial task.
Correspondence: *J.M. Crebolder, Department of Psychology, University of Waterloo, Waterloo, ON N2L 3G1, Canada.*

J.M. KEILLOR, G.M. GRIMSHAW, & M.P. BRYDEN. Interhemispheric Interaction in Bilateral Lexical Decision.
The present study investigated the interhemispheric interactions that occur in bilateral lexical decision. Several researchers have suggested that bilateral presentation of words (but not nonwords) produces activation of homologous areas of opposite hemispheres. Further, this bilateral activation is proposed to inhibit interhemispheric interaction, forcing the hemispheres to process independently (direct access), and magnifying the right visual field advantage that is typically observed for lexical decision. We provide two pieces of evidence that contradict the homolog activation account. First, robust right visual field advantages were observed with nonword as well as word distractors. Second, imageability of the target words did not interact with visual field, suggesting that bilateral presentation did not produce direct access.
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J. NIKELSKI, G.M. GRIMSHAW, M.P. BRYDEN, & T. COCIVERA. Relations Between Lateralization of Semantic and Phonological Processes.
The present study examined relations between lateralization of phonological and semantic processes in right-handers, who have nearly uniform left-hemisphere language representation, and in left-handers, who have variable language representation. Specifically, we wished to determine whether the same hemisphere need subserve both semantic and phonological processes. A dichotic listening procedure was used in which participants detected targets on the basis of phonological features or semantic category. Right-handers demonstrated a robust right-ear advantage for both types of target, reflecting the validity of the task for the assessment of language lateralization. More importantly, left-handers, as a group, did not produce significant ear advantages for either target type, and did not demonstrate any systematic relationship between lateralization for semantic and phonological processes.
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Poster Session 5/1:30–4:30 p.m.

DEMENTIA—3

J. SUHR & R.D. JONES. Verbal and Semantic Fluency in Alzheimer's, Parkinson's, and Huntington's Dementias.
A pattern of semantic fluency worse than verbal fluency has been presented as evidence of impaired semantic networks in "cortical" dementias such as Alzheimer's disease, as distinguished from "subcortical" dementias such as Parkinson's or Huntington's. We compared subjects with AD, PD, and HD with mild dementia, and normal controls (NC) on verbal (VF) and semantic fluency (SF) tasks. Results revealed parallel SF–VF fluency patterns for all groups, suggesting that there is no unique pattern of SF/VF deficit for "cortical" or "subcortical" dementias. Results have implications for semantic network theories of cortical dementia. Analysis of qualitative errors revealed significant differences among the groups on repetition errors, particularly for HD and AD groups, which may have implications for differential diagnosis in the dementias.
Correspondence: *Julie Suhr, Department of Neurology, University of Iowa College of Medicine, Iowa City, IA 52242, USA.*

M.W. HAUT, V. J. ROBERTS, F.C. GOLDSTEIN, R.C. MARTIN, R.W. KEEFOVER, & E.D. RANKIN. Working Memory Demands and Semantic Sensitivity for Prose in Mild Alzheimer's Disease.
It is not clear whether deficits in semantic processing observed in Alzheimer's disease (AD) are a product of degradation of semantic knowledge or a deficit with information processing. This study examined the effects of varying demands on working memory on the ability of patients with AD to recall and recognize prose in a manner consistent with the inherent semantic structure of the passages. Patients with mild AD were compared to age and education matched normal elderly controls. The results indicated that patients with mild AD lost the ability to recall prose in a manner consistent with the semantic structure of the stories as demands on working memory increased. This study lends support to the hypothesis that information processing deficits result in impaired semantic processing in mild AD.
Correspondence: *Marc W. Haut, Department of Behavioral Medicine, Box 9137, WVU School of Medicine, Morgantown, WV 26506, USA.*

J.M. HAMILTON, J.S. PAULSEN, D.P. SALMON, L. GHARAHBAGHIAN, & D.C. DELIS. The Nature of Intrusion Errors in Alzheimer's and Huntington's Diseases.
Intrusion errors committed on the California Verbal Learning Test (CVLT) by 32 Alzheimer's disease (AD) patients and 32 Huntington's disease (HD) patients matched for dementia severity were compared. After age and education were statistically controlled, results showed that AD patients committed a greater total number of intrusion errors and a greater percentage of semantically unrelated errors than HD patients. HD patients generated a greater percentage of source memory errors than AD patients. Furthermore, across the distribution of dementia severity, frequency of intrusions remained relatively stable in the AD group, but an increase in intrusions occurred with advancing illness in HD and may reflect the eventual involvement of cortical structures. These findings support the idea that intrusion errors in AD may reflect semantic memory disruption, whereas in HD, they may reflect dysfunction of frontal–subcortical circuitry.
Correspondence: *J.M. Hamilton, Psychology Service (116B), DVAMC, San Diego, CA 92161-2410, USA.*

M. PATTERSON, M. JACOBS, & J. MACK. Effortful and Automatic Processing and Activities of Daily Living (ADL) in Individuals with Alzheimer's Disease (AD) With and Without Depression.
Performance on neuropsychological tests involving effortful and automatic processing was compared between 20 depressed individuals with AD and 33 with AD and no depression matched for age, education, and MMSE. Tasks were classified as effortful *versus* automatic using the method of paired comparisons. Eight measures were included in the final analysis, consisting of four effortful and four automatic tasks. Test scores were ranked and pooled to create two domain scores: effortful and automatic. Using nonparametric analysis of variance, AD groups did not differ significantly on the domains; however, in agreement with previous literature, the depressed group was significantly more impaired in ADL.
Correspondence: *Marian B. Patterson, University Alzheimer Center, University Hospitals of Cleveland, 12200 Fairhill Road, Cleveland, OH 44120, USA.*

R.D. VANDERPLOEG, R.L. YUSPEH, L.W. DUPREE, J.A. SCHINKA, & D. COHEN. Memory Retrieval in Differential Diagnosis of AD and Vascular Dementias.
The present study explored differential diagnostic factors using discriminant analyses with six clinical groups: AD, AD with vascular dementia, vascular cortical dementia, vascular subcortical dementia, depression, and normals. Subjects consisted of 153 individuals referred for neuropsychological evaluation because of memory complaints or concerns. There were two significant ($p < .05$) discriminant functions. The first discriminant function, defined by Animal Naming, differentiated AD and the other cortically-based dementias from normals and depressed. In the second discriminant function CERAD Recognition Memory trial (Correct Yes—Incorrect No; representing memory retrieval) was the most important measure in differentiating groups, and discriminated vascular subcortical dementia from other groups. Results suggest that patterns of performance on Animal Naming and the CERAD Recognition Trial are useful in discriminating among diagnostic groups commonly seen in a memory disorder clinic setting. Interestingly, CERAD Delayed Word List Learning performance was not useful in the discriminant analyses, suggesting that rate of forgetting may not be as helpful in differential diagnosis of AD as has been previously reported.
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C. DREBING, E. FEDERMAN, P. CIPOLLONI, T. SULLIVAN, & P. LYON. Behavioral Symptoms in Alzheimer's Disease: The Validity of Collateral Reports.
Data was collected from 22 pairs of family caregivers of patients with probable AD. Each caregiver filled out the following measures: The Center for Epidemiological Studies–Depression Scale; State–Trait Anxiety Inventory; Neuropsychology Behavior and Affect Profile. The Neurobehavior Rating Scale was also filled out on each patient. The results suggest an interaction between relationship and emotional distress that confounds the way symptoms are reported. In adult children, emotional distress is associated with a tendency toward underreporting of symptoms. For spouses, distress is positively correlated with symptom report.
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M.F. DORREGO, L. SABE, A. GARCÍA CUERVA, G. KUZIS, C. TIBERTI, & S. STARKSTEIN. Remote Memory in Alzheimer's Disease.
We examined the severity and type of deficits in remote memory in patients with probable Alzheimer's disease (AD). Forty AD patients and 40 age-comparable normal controls were assessed with the Remote Memory Scale (RMS), which consisted of two sections (free recall and recognition), each containing 10 questions (5 famous names, and 5 well-known events) for the 1950s, 1960s, 1970s, and 1980s decades. Patients were also assessed with the Buschke Selective Reminding Test, Benton Visual Retention Test, Block Design, Digits Span, Wisconsin Card Sorting Test, Boston Naming Test, Verbal Fluency, Token Test, and the Raven's Progressive Matrices. AD patients showed significantly more severe deficits on both the free-recall and the recognition sections of the RMS as compared to the normal control group, and the severity of deficits was similar across all four decades assessed. Deficits in remote memory were significantly related to age, severity of dementia, and deficits in both anterograde verbal memory and verbal naming.
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L. GECK, R. HARGRAVE, & D. MUNGAS. Affective Changes in Alzheimer's Disease and Ischemic Vascular Disease.
The present study investigated affective change in Alzheimer's disease (AD) and ischemic vascular disease (IVD), and examined the contribution of white matter disease (WMD) to affective change. Four principal components of affective characteristics in dementia were identified: (1) Decreased Affect/Withdrawal, (2) Agitation/Irritability, (3) Disinhibition, and (4) Psychomotor Speed. Results indicated greater Decreased Affect/Withdrawal and slower Psychomotor Speed in patients with an ischemic vascular component to their dementia ($N = 36$) compared to probable AD patients ($N = 195$). Results also showed that these two components were each related to greater WMD severity rated from neuroimaging studies. The relationships of WMD to decreased affect and psychomotor slowing are consistent with other studies and may suggest dysfunction of subcortical–frontal pathways associated with cerebrovascular disease.
Correspondence: *Laurie Conniff Geck, Alzheimer's Disease Center, 1771 Stockton Boulevard, Suite 2005, Sacramento, CA 95816, USA.*

S. CRAFT, L. TERI, W. KUKULL, S. EDLAND, G. SCHELLENBERG, & E. LARSON. Neuropsychological Heterogeneity of Apolipoprotein E Genotypes in Alzheimer's Disease.
Although a striking neurogenetic association has been observed between apolipoprotein E4 (apoE4) and Alzheimer's disease (AD), at least half of all patients diagnosed with AD do not possess an E4 allele. Non-E4 genotypes may therefore represent different forms of AD that are characterized by varying clinical presentations. The present study examined the neuropsychological performance at the time of diagnosis of a large cohort ($N = 247$) of patients with AD with five different apoE genotypes (E2/3, E3/3, E4/2, E4/3, E4/4). Neuropsychological measures were grouped into six cognitive domains: attention, initiation and perseveration, conceptualization, language, spatial construction, and memory. MANOVAs revealed significant effects for genotype for the attention [$F(6,76) = 4.06$, $p < .01$], initiation/perseveration [$F(2,43) = 4.17$, $p < .05$], and memory [$F(20,718) = 1.92$, $p < .01$] domains. For the attention domain, the E4/4 genotype was most impaired on Trials A and on the DRS Attention Index. For the initiation/perseveration index, the two genotypes without an E4 allele (E2/3, E3/3) were most impaired. For the memory domain, the two groups with an E2 allele (E2/3, E4/2) scored highest on the Visual Reproduction subtest. These results suggest that neuropsychological profiles differ at diagnosis for AD patients with different apoE genotypes. Neuroimaging reports of differing early atrophy patterns among genotypes may provide a basis for such neuropsychological differences.
Correspondence: *Suzanne Craft, GRECC 182B, VA Puget Sound HCS, 1660 South Columbian Way, Seattle, WA 98180, USA.*

G. PEAVY, D. SALMON, J. PAULSEN, I. BEAR, & N. BUTTERS. WAIS–R NI Performance Patterns in Alzheimer's, Huntington's, and Parkinson's Disease.
This study examined the ability of the WAIS–R as a neuropsychological instrument (WAIS–R NI) to differentiate among patients with various dementing disorders. The WAIS–R NI was administered to Alzheimer's (AD; $N = 18$), Huntington's (HD; $N = 13$), and Parkinson's (PD; $N = 18$) patients, and to normal control (NC; $N = 28$) subjects. Patients with HD, a prototypical subcortical dementia, were more impaired than patients with AD, a prototypical cortical dementia, and PD impaired relative to NC subjects, on measures of attention–initiation, visuomotor speed, and problem solving. These findings are consistent with a pattern of prominent frontal–subcortical dysfunction in HD and PD patients and suggest that the WAIS–R NI is effective for differentiating specific types of dementia.
Correspondence: *Guerry Peavy, University of California, San Diego, ADRC, 9500 Gilman Dr. (0948), La Jolla, CA 92093-0948, USA.*

C.A. SMITH & J.G. BUCKWALTER. Age at Menarche and Cognitive Performance in Elderly Women.
Research has noted that there is an increased risk for Alzheimer's disease with a later onset of menarche. This study examined the relationship between age at menarche and cognitive functioning in 86 neurologically-intact elderly women. Women with an earlier age at menarche demonstrated better cognitive performance on the BNT ($p = .004$), the MMSE ($p = .008$), the Short Blessed ($p = .03$), and on the CERAD combined Word List ($p = .009$). These results suggest that a longer period of estrogen exposure over one's lifetime has significant implications for later cognitive functioning.
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TRAUMATIC BRAIN INJURY—2

M. SCHMITTER-EDGECOMBE & W.A. ROGERS. Automatic Process Development Following Severe Closed Head Injury.
Automatic process development was investigated in a closed head injury (CHI) population. Ten severe CHI participants (> 1 year postinjury) and 10 matched controls completed consistent mapping (CM) and varied mapping (VM) category search tasks. In VM search, despite a similar pattern of serial memory search, the CHI participants responded slower than controls and exhibited slower memory search rates throughout practice (1800 trials). In CM search, after extensive practice (1800 trials) both groups showed the performance characteristics indicative of automatic process development, that is, near-zero slopes and large reductions in response times. However, the CHI participants were slower to automatize the task. These results indicate that for memory-based search tasks the effects of a CHI may slow down the speed with which automatic processes develop, but that CHI participants can acquire and use automatic processes in task performance.
Correspondence: *Maureen Schmitter-Edgecombe, Department of Psychology, Washington State University, Pullman, WA 99164-4820, USA.*

M. JACOBS, J. GERRING, K. BRADY, L. FREUND, X. JU, & M. DENCKLA. Neuropsychological Status of Children and Adolescents with Closed Head Injury With and Without Attention-Deficit Hyperactivity Disorder.
Closed head injury (CHI) and attention-deficit hyperactivity disorder (ADHD) have overlapping neuropsychological characteristics. We hypothesized that, among CHI children, those without ADHD would have higher neuropsychological functioning than those with ADHD, and that CHI children with both premorbid and post-injury ADHD could be distinguished from those who acquired "ADHD" postinjury. Using the Diagnostic Interview for Children and Adolescents-Revised, 59 patients with CHI, ages 5 to 18 years, were assessed for premorbid and postinjury ADHD and divided into comparison groups. They were administered neuropsychologi-

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cal measures sensitive to executive functioning. On the Test of Variables of Attention the non-ADHD group differed from the ADHD group on the variability measure. On the California Test of Verbal Learning the non-ADHD group had fewer false positives and more clustering. Children who were ADHD prior to injury could not be distinguished on these measures from those who acquired "ADHD."
Correspondence: *Marc P. Jacobs, Department of Psychiatry, Kennedy Krieger Institute, 707 N. Broadway, Room 509, Baltimore, MD 21205, USA.*

M. FRANZEN, M. LOVELL, G. IVERSON, S. SMITH, & L. SMITH-SEEMILLER. Percent Retention on WMS–R Delayed Recall Subtests in Patients With Acute Closed Head Injuries.
The amount of retained information over a delay period is an important aspect of assessing memory. This study investigated the percent retained scores of the Logical Memory and Visual Reproduction subtests of the WMS–R in a sample of 1220 consecutive admissions to an acute trauma hospital service. Subjects were classified as having *mild*, *moderate*, or *severe* closed head injuries. The percent retained scores were significantly different across groups. MANOVA revealed that significant differences existed among the groups. Inspection of the mean scores indicated that all scores decreased from *mild* to *severe* classifications. Discriminant function analyses indicated that the groups could be separated on the basis of initial recall and percent retained. Delayed recall did not have a significant relation to group membership when the variance associated with the other variables had been removed. The percent retained score may be a more clinically useful index than the delayed recall score.
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L. SMITH-SEEMILLER, M.R. LOVELL, S.S. SMITH, & N. MARKOSIAN. Impact of Skull Fracture on Neuropsychological Functioning Following Closed Head Injury.
The purpose of the current study was to investigate the role of skull fracture in predicting neuropsychological dysfunction following CHI. Subjects included patients admitted to the trauma service of a teaching hospital with CHI. All patients completed neuropsychological testing and had normal Computed Tomography (CT) scans. Patients who had skull fractures were compared to those who had not suffered skull fracture on selected neuropsychological measures. Groups did not differ in terms of CHI severity as assessed by the Glasgow Coma Scale (GCS), but they did differ in terms of neuropsychological functioning. Results suggest that the presence of a skull fracture is predictive of additional neuropsychological dysfunction, even in the absence of intracranial pathology or more severe disturbance of consciousness on the GCS.
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R.A. HANKS, L. J. RAPPORT, S.R. MILLIS, & S.D. DESHPANDE. The Ecological Validity of Measures of Executive Functioning in a Traumatically Brain Injured Population.
This study attempted to measure the ability of executive control measures to predict functional outcome in a traumatically brain injured population upon discharge and approximately 5 months postinjury. Ecological validity for executive control measures was demonstrated through concurrent validity with scores from the Functional Independence Measure upon discharge, and through predictive validity with the Disability Rating Scale and the Community Integration Questionnaire 5 months postinjury. Other neuropsychological tests purported to measure memory, visual–spatial functioning, premorbid intellectual ability, and complex auditory comprehension were also found to be predictive of functional outcome. One possible interpretation for these findings is that a general neuropsychological factor, or "g," may underscore the cognitive abilities that are important for functional recovery.
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M. McCREA, J.P. KELLY, J. KLUGE, B. ACKLEY, & C. RANDOLPH. A Standardized Method for the Sideline Assessment of Concussion in Football Players.
The recent formulation of guidelines for the management of concussion in sports proposes a format for the sideline evaluation of players suspected of having suffered a concussion. The present study involved the preliminary investigation of the feasibility and clinical validity of a standardized version of a brief sideline examination compiled in accordance with these guidelines. This examination, intended for use by athletic trainers and other similar personnel, was administered by three trainers to 141 nonconcussed high school football players at three separate schools at the beginning of the Fall 1995 season. Six of these players subsequently suffered concussions, and all were tested immediately following their injury. The examination was found by athletic trainers to be easily administered and sensitive to the effects of concussion, as concussive players as a group scored significantly below the nonconcussed controls and below their own baseline performance, despite the fact that all were considered by athletic trainers to be mild Grade I concussions. Although preliminary, these data suggest that a standardized sideline examination of this type is practical and can be clinically useful in detecting concussion and determining fitness to return to play.
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R.A. COHEN, A. ROSENBAUM, K. FLETCHER, R. KANE, W. WARNKEN, & S. BENJAMIN. Neuropsychological Impairments Associated With Domestic Violence: An Epidemiological Analysis.
The present study examined the relative contributions of neuropsychological functioning and prior head injury to domestic violence. Batterers (men) were compared to both nonviolent maritally discordant and satisfied men (Non-Batterers) on clinical, psychosocial, and neuropsychological measures. Batterers had greater impairments than Non-Batterers on many neuropsychological measures, greatest with respect to attention, learning and memory, and executive control. Discriminant functions analyses correctly classified Batterers and Non-Batterers with over 80% accuracy. While between group differences were found on other demographic and clinical indices (education, income, prior ETOH abuse, childhood behavioral problems, emotional distress, head injury history), three cognitive measures (Digit Symbol, WCST, Recognition Memory Test–Words) were most strongly associated with Batterer status. Among clinical variables, only head injury status and overall emotional distress also contributed to the Batterer/Non-Batterer discrimination. These findings suggest that brain dysfunction may play an important role in the epidemiology of marital violence.
Correspondence: *R.A. Cohen, Neuropsychology, The Miriam Hospital, Brown University, 164 Summit Ave., Providence, RI 02960, USA.*

E. CHOI, W. MITTENBERG, W. BURNS, & D. BUSH. Differentiating Between Verbal Memory Dysfunction Due to Neurologic *Versus* Psychiatric Sequelae of Traumatic Brain Injury.
The need to distinguish between memory difficulties due to the neurologic *versus* psychiatric consequences of head trauma is common in clinical practice. This study examined the utility of the Auditory Verbal Learning Test in differentiating memory dysfunction due to traumatic brain injury (TBI) *versus* affective disorders (AFD). The TBI and AFD groups consisted of 30 subjects each and did not differ significantly on age, education, or premorbid intelligence. The two groups did not differ on immediate recall, delayed recall, retention, confabulations, or false positive errors. TBI patients recalled significantly fewer words during a forced-choice recognition task and made more intrusion errors during recall than AFD patients. Results suggest that TBI patients experience relatively greater difficulty 'encoding' new information, while AFD patients show prominent retrieval deficits.
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J.E. HERRON, L.M. GRATTAN, D.R. GREENBERG, D. RIGAMONTI, F.A. ALDRICH, & P.J. ESLINGER. The Relationship Between Coping Strategy and Outcome After Frontal Lobe Damage.
Coping ability has been implicated as an important outcome mediator in normal and head injured populations. However, its relationship to adaptive outcome following frontal lobe damage remains minimally known. The association between coping strategies (measured by the COPE), lesion location (frontal *vs*. nonfrontal), and outcome (positive *vs*. negative) was investigated in 35 patients with acquired focal frontal and nonfrontal cerebral lesions. Results of MANOVA procedures indicate that (1) across both lesion groups, subjects with positive outcome used more acceptance and less restraint coping than patients with poor outcome ($F = 4.02$, $p = .02$); and (2) frontal lesion patients with negative outcome used religion ($F = 3.95$, $p = .05$), denial ($F = 5.31$, $p = .03$), and mental disengagement ($F = 4.15$, $p = .05$) as coping strategies significantly more than frontal lesion patients with positive outcome and nonfrontal patients.
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C.S. GASS. Cognitive Complaints in Closed-Head Injury: Relation to Memory Test Performance and Emotional Disturbance.
Subjective cognitive complaints in 63 nonlitigating closed-head injury patients were evaluated in relation to performance on the Wechsler Memory Scale–Revised, Digit Span, and MMPI–2 measures of anxiety and depression. The Cognitive Difficulties Scale (CDS) consists of 39 items that measure complaints related to attention and concentration, praxis, orientation and memory, domestic activities, name recall, and task efficiency. Self-rated attention and concentration, orientation and memory, and task efficiency were predictive of WMS–R Logical Memory performance (*r*s $-.43$, $-.51$, and $-.39$, respectively; *p*s $< .005$). Ratings failed to predict Digit Span and Visual Reproduction. Pt (Psychasthenia) predicted cognitive complaints (*r*s: 47 to .52). The scope of CDS validity is discussed, along with its usefulness in evaluating insight in head injury patients.
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F.C. GOLDSTEIN, H.S. LEVIN, V.J. ROBERTS, A.N. CLARK, W.P. GOLDMAN, & T. KENEHAN. Neurocognitive Recovery in Older Adults With Closed Head Injury.
This study examined neurocognitive recovery in older adults with closed head injuries. Mild and moderate patients ≥ 50 years of age or older were administered tests of verbal memory, expressive language, and visuospatial functioning approximately 1 month postinjury and then at 6 months and 1 year. Improvement was observed in memory and letter fluency. Memory and letter fluency reached normative levels by 6 months, whereas category fluency was still impaired at 1 year. Naming and visuospatial functioning were preserved even at the baseline assessment. These differential recovery patterns indicate the importance of evaluating a wide range of cognitive abilities and performing serial evaluations in older CHI patients. The findings also suggest that older persons exhibit cognitive gains, in contrast to the pessimistic portrayal of recovery in the literature.
Correspondence: *Felicia C. Goldstein, Department of Neurology, Emory University School of Medicine, 1841 Clifton Road, N.E., Atlanta, GA 30329, USA.*

G.J. LARRABEE. Recovery to Preinjury Baseline Within 1 to 4 Months Following Mild Closed Head Injury.
Two cases of mild closed head trauma (CHI) are presented, who had neuropsychological testing 2 and 4 years prior to being injured. Examinations, conducted 22 days and 115 days posttrauma, demonstrated normal neuropsychological function without evidence for deterioration compared to baseline. These case data are consistent with the results of Gentilini et al. and Levin et al., demonstrating recovery within 1 to 3 months following mild CHI.
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S.C. JOHNSON, C.V. ANDERSON, E.D. BIGLER, & D.D. BLATTER. Logical Memory *Versus* Verbal Paired Associate Learning and Hippocampal Volume in a Sample of Male Closed Head Injury Patients.
There is evidence to suggest that the relationship between verbal memory and the hippocampus is stronger for rote associations than for complex tasks. We tested this hypothesis using 27 male patients who suffered closed head injury. Hippocampal volume was quantified from thin slice magnetic resonance (MR) scans in the coronal plane. We correlated left hippocampus with the delayed subtests of Logical Memory (LM) and Verbal Paired Associates (VerPa) of the Wechsler Memory Scale–Revised. A significant correlation was found between VerPa and left hippocampus ($r = .60$) while the correlation between LM and hippocampus was nonsignificant. The higher correlation for VerPa is perhaps because this is a priming task involving rate associations, while the complexity of LM may involve systems of memory beyond the hippocampus.
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E.M.S. SHERMAN, E. STRAUSS, & F. SPELLACY. Detecting Depression-Related Cognitive Impairment on Neuropsychological Tests in Persons With Head Injury.
Depression is common in head-injured patients. The goals of the study were to: 1) determine clinically significant group differences between depressed and nondepressed head-injured patients on neuropsychological tests, and 2) quantify the magnitude of the effect in clinically relevant terms. Participants were 236 head-injured adults (Non-Depressed = 168, Depressed = 68, based on the MMPI–2). Participants were administered tests of attention, memory, language, achievement, visual–spatial skills, and motor skills. Results indicate that the Depressed group had lower scores on tests of attention, verbal ability, and verbal memory in comparison to the Non-Depressed group. Group differences were clinically significant for only a subset of measures. The clinical utility of attempting to determine the cognitive effects of depression when deficits are superimposed on cognitive compromise due to head injury are discussed.
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APRAXIA

B.J. KAPLAN, S.G. CRAWFORD, B.N. WILSON, & D.M. DEWEY. Comorbidity of Developmental Coordination Disorder With Different Types of Reading Disability.
Many children with reading disabilities also meet diagnostic criteria for Developmental Coordination Disorder (DCD), yet DCD characteristics are rarely used for subtyping of learning disabilities. We wondered whether different patterns of DCD might be associated with different levels of reading deficits, particularly the contrast between phonological skills and higher level (e.g., comprehension) skills. Children with learning problems were assigned to three overlapping groups: those with phonological deficits ($N = 129$), those with prereading deficits ($N = 112$), and those with comprehension difficulties ($N = 99$). The most significant finding was that the same children were captured by the three methods of defining the comorbid deficits. In other words, children with DCD and phonological impairments were also deficient in prereading and comprehension skills.
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R.E. HANLON, D. MATTSON, W.E. LUX, & A.W. DROMERICK. Preservation of Axial Movements to Command in Apraxic Aphasics.
Apraxia is commonly manifested during the acute stage following left hemisphere cerebrovascular accident and typically co-occurs with aphasia. Patients with severe aphasia combined with severe apraxia, involving both ideomotor and ideational/conceptual apraxia, are extremely limited in their capacity to engage in focused neurologic rehabilitation. We examined 24 acute stroke patients with aphasia and apraxia in order to de-

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termine if such patients show evidence of preservation of selective subclasses of movements. Although Geschwind noted the preservation of axial movements to command in aphasic apraxic patients, his views were subsequently refuted. However, we found that aphasic apraxic patients of varying degrees of severity, including patients with severe global aphasia, commonly showed preservation of axial movements to command. Theoretical interpretations and implications for acute neurologic rehabilitation are discussed.
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R.L. SCHWARTZ, A.M. BARRETT, G. CRUCIAN, & K.M. HEILMAN. Dissociation of Gesture and Object Recognition.
Studies of the visual system in monkeys have suggested the existence of two predominant visual pathways. The ventral stream or "what" system runs from the primary visual and secondary visual association areas to the temporal lobes and is associated with the perception of objects. The dorsal stream or "where" system runs from the primary and secondary visual association areas towards multimodal association areas in the parietal lobes and is critical for determining the spatial location of objects. We studied a patient with bilateral ventral temporal–occipital lesions who could recognize visually presented gestures but could not recognize seen objects. As such, our patient's spared dorsal visual subsystem may be closely linked to praxis systems important for gesture recognition.
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A.M. RAYMER, L.M. MAHER, B. MACAULEY, A.L. FOUNDAS, L. J. GONZALEZ ROTHI, & K.M. HEILMAN. Differences Between Transitive and Intransitive Gestures in Limb Apraxia.
Investigations of limb apraxia reporting better performance for intransitive (emblems) than transitive (tool use) gestures have led some researchers to propose that the representation of transitive gestures is more lateralized to the left hemisphere. Alternatively, this difference may relate to motoric complexity of the two gesture types. We analyzed the performance of left-hemisphere brain-damaged (LBD) and control subjects as they produced gestures to verbal command. For both groups, transitive gestures were more difficult than intransitive gestures, and the rank order difficulty of gestures was correlated in the groups. Gesture complexity as indexed by the number of joints involved in each gesture was significantly greater for transitive than for intransitive gestures. These findings suggest that gesture complexity may account for some of the differences observed between transitive and intransitive gestures.
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A.M. RAYMER, R.L. SCHWARTZ, J.C. ADAIR, D. J.G. WILLIAMSON, L. J.G. ROTHI, & K.M. HEILMAN. Crossed Apraxia and Handedness.
Liepmann posited that right hand preference is related to left hemisphere dominance for skilled movements. Right-handed patients with limb apraxia following right-hemisphere lesions (crossed apraxia) appear to refute this hypothesis. To propose that the right hemisphere plays a dominant role in crossed apraxia it is necessary to demonstrate that the apraxia parallels the left hemisphere (LH) presentation of apraxia. We studied the apraxia of a right-handed man following a right frontal lesion. Like LH apraxic patients with frontal lesions, he was better at gesture recognition than gesture production which was impaired across tasks. His pattern of movement/spatial aberrations and unrecognizable gestures also conforms to that seen in LH apraxic patients. Findings in our crossed apraxic patient provide evidence for the fractionation of systems underlying hand preference and skilled movement.
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K. BARBOUR, E. ROY, & S.E. BLACK. Apraxia in Alzheimer's Disease: Pantomime *Versus* Imitation.
Limb apraxia has been reported in Alzheimer's disease (AD), although it is not clear how apraxia relates to the severity of AD or whether both pantomime and imitation are affected to the same degree. Patients with mild or moderate AD and age- and education-matched healthy adults performed a series of transitive and intransitive gestures. Imitation and pantomime performance were compared. Performance deteriorated with the severity of AD, although the effect of AD was greater in the pantomime condition when gesture production placed demands on memory. AD also affected the analysis of visual gestural information as revealed on imitation. These processes were most affected in the patients with moderate AD, suggesting that as AD advances a more general impairment in praxis is observed.
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A.L. FOUNDAS, S.K. DANIELS, M.A. FIESELMAN, K. THOMPSON, & U. VASTERLING. Limb Apraxia Errors in Left *Versus* Right Hemisphere Damage.
Limb apraxia errors were studied in left hemisphere (LHD) and right hemisphere damaged (RHD) patients and controls performing gestures to command with the ipsilesional limb. Brain injured patients were significantly more impaired than controls, with LHD patients more impaired than RHD patients. Spatial errors were the most common errors produced, although RHD patients were more likely to make temporal errors than LHD patients. In LHD patients, transitive limb movements were more degraded than intransitive movements. Whereas spatial errors occurred more commonly with transitive movements, content errors occurred more often with intransitive limb movements. Our data suggest that learned skilled movements are mediated by a modular network in the left hemisphere, although some components, such as temporal aspects of gestures, may be preferentially processed in the right hemisphere.
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A.L. FOUNDAS, L. J.G. ROTHI, S.K. DANIELS, J. J. VASTERLING, A.M. RAYMER, L.M. MAHER, & K.M. HEILMAN. Localization of Lesions in Limb Apraxia.
Lesion localization in limb apraxia was investigated in unilateral left hemispheric stroke patients to determine whether the predicted neural substrates for limb apraxia would be prevalent. Posterior lesions were more common than anterior lesions, with the inferior parietal lobule and deep white matter connections the most common site. Unexpectedly, visual association areas were also commonly lesioned, suggesting that the inability to assess the visual representation of movements results in degraded performance. Anterior lesions involved the predicted regions of premotor and motor association cortex. Our data demonstrated that damage to discrete regions of the left hemisphere, including the inferior parietal lobule and premotor cortex, produce limb apraxia.
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TOXIC EXPOSURE

L. BARKER, E. BIGLER, B. BOINEAU, C. ANDERSON, & K. EYRE. Polysubstance Abuse in Adolescent Males: Magnetic Resonance Imaging and Neuropsychological Assessment Results.
Sixteen young substance abusers (SA group) and 20 controls underwent MRI of the brain. The SA group also was administered a comprehensive battery of neuropsychological tests. Quantitative MRI measures revealed no significant difference between the two groups. On neuropsychological testing, however, the SA group demonstrated impairment on tests of ver-

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bal memory, visual spatial ability, and academic achievement. When the SA group was separated according to probable learning disability (LD), results indicated that LDSA subjects' scores were significantly lower than the non-LD-SA subjects' on tests of memory, academic achievement, and IQ. Trends for greater ventricular size were noted in the LDSA group. Results suggest that LD history is an important variable to investigate in studies of substance abuse.
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M. CROSSLEY, K. ARBUTHNOTT, & K. SEMCHUK. The Development of a Neuropsychological Test Battery for a Prairie Ecosystem Study of Pesticide Exposure and Health.
As part of a larger investigation of the health effects of occupational and environmental exposure to pesticides, farm and town residents were invited to participate in low exposure (baseline) and high exposure (acute) assessments of their immune system, pulmonary functions, and neuropsychological status. The neuropsychological test battery was individually administered in the field and included standardized measures of somatosensory and motor functions, as well as a range of memory and other higher brain functions. It was designed to be comprehensive and sensitive, but was necessarily relatively brief, inexpensive, and practical. Baseline data indicated that the battery was well-tolerated and provided valid estimates of the neuropsychological health of this rural population.
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P.D. CONNOR & A.P. STREISSGUTH. Auditory and Visual Attention in Adults With Fetal Alcohol Syndrome.
Eleven adult FAS/FAE patients were compared with 9 normal control subjects on four measures of attentional functioning, including tasks of visually mediated and auditorially mediated attention. Results indicated that patients with FAS/FAE made significantly more errors of omission on tasks of auditorially mediated attention. Significant differences were not observed between the two groups on tasks of visual attention or on auditory false positive performances. When the effects of IQ were removed, two tasks of auditory attention still showed significant differences between patients with FAS/FAE and controls. The results are discussed in light of previous studies of attention functioning in children and adults.
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L. KWON, J. RIPPETH, & I. GRANT. Analysis of Alcoholics' Problem-Solving Abilities and Subsequent Memory Performance on the Rey–Osterrieth Complex Figure.
The Rey–Osterrieth Complex Figure (ROCF) requires integrity of the following skills especially impaired in alcoholics: abstraction, problem-solving, learning and recall, and visuoconstruction. This study investigated whether alcoholics differ qualitatively from controls in performance on the ROCF and examined effects of problem-solving ability on learning and retention. Data were collected on three groups of neuromedically healthy, middle-aged males matched on age, education, WAIS–R Vocabulary, and ANART IQ: 29 recently detoxified alcoholics (RDA; abstinent $\geq$ 2 weeks), 29 long-term abstinent alcoholics (LTA; abstinent $\geq$ 18 months), and 29 nonalcoholic controls (NAC). Three indices of problem-solving approach were used to score *how* subjects produce the ROCF during copy condition: perceptual clustering, organization, and constructional accuracy. Learning and retention were measured by immediate recall, 20-min delayed recall, and recognition performance. ANOVAs revealed significantly impaired immediate and delayed recall, and recognition scores for the RDAs compared to NACs. RDAs also had significantly lower perceptual clustering, organization, and constructional accuracy scores than LTAs and NACs. Multiple regression analyses revealed problem-solving ability at copy accounted for a significant proportion of variance in immediate recall, delayed recall, and recognition. Repeated-measures design revealed that across the three groups, forgetting rate from immediate to delayed recall was almost nonexistent, while performance improved significantly for recognition. In conclusion, it appears less efficient problem-solving strategies utilized by RDAs in approaching a novel, complex geometric design (ROCF) adversely affected memory performance.
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C. JORDAN, E. SHAPIRO, & S. HUGHES. The Utility of the Personality Inventory for Children: Behavioral and Emotional Problems in Lead-Poisoned Children.
Lead-poisoned children display hyperactivity, inattention, impulsivity, aggression, liability, and oppositionality. The utility of the Personality Inventory for Children in quantifying these features and the relationship of these features to severity, age at first burden and duration of burden were evaluated. Seven scales appeared to tap the above behavioral-emotional features (F, ADJ, D, DLQ, PSY, HPR, SSK). For 47 children referred by attorneys these scales served as dependent variables in MR analyses using the three lead variables as predictors. Equations for F and HPR were significant. Children burdened longer evidenced higher HPR scores. Children with lower lead levels demonstrated higher F scores. Duration may be more predictive than elevation. Parents' tendency to overreport may be related to the strength of their legal case.
Correspondence: *Catherine Jordan, Department of Pediatric Neurology, Box 486 UMHC, 420 Delaware St. SE, Minneapolis, MN 55455, USA.*

G. GIOIA, S. GUY, & P. ISQUITH. Neuropsychological Outcome of Childhood Lead Poisoning: Effects of Chronicity on Executive Regulatory Function.
The present investigation examines the effects of chronic lead exposure on neuropsychological functioning using several classification methods of lead exposure history. After controlling for the influence of SES, a significant association exists between chronic lead exposure (defined by the composite exposure index of length and mean level of exposure) and problems with rigid and inflexible problem-solving on the Wisconsin Card Sorting Test. Significant relationships were not found between the lead exposure indices and general intellectual ability, attention, or memory performance. Unlike the composite exposure index, the unidimensional measures of lead exposure (e.g., peak lead level) were not related to measures of neuropsychological performance. The results extend previous findings of Bellinger to a sample of chronically poisoned children.
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D. JOHNSON-GREENE, K.M. ADAMS, S. GILMAN, K. J. KLUIN, L. JUNCK, S. MARTORELLO, & M. HEUMANN. Impaired Upper Limb Coordination and Motor Function in Alcoholic Cerebellar Degeneration.
Alcoholic cerebellar degeneration (ACD) is a disorder resulting from severe chronic alcoholism and malnutrition characterized by cognitive disturbances, ataxia of gait, and truncal instability, with generally preserved coordination of the upper extremities. We examined cognitive function and upper limb coordination in 13 severe chronic alcoholic patients with ACD in comparison with severe chronic alcoholic patients without ACD, all of whom had comparable levels of total alcohol intake. The results revealed impaired performance in both groups on neuropsychological tests involving motor function, upper limb motor coordination and tactile learning, but the ACD patients had significantly greater disturbances in these areas than non-ACD patients. The findings suggest that ACD patients have impaired upper extremity motor function and coordination compared with non-ACD patients.
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EMOTION

A.M. BARRETT, G.P. CRUCIAN, A.M. RAYMER, & K.M. HEILMAN. Spared Comprehension of Emotional Prosody in a Patient With Global Aphasia.

Although there is support for the postulate that the right hemisphere mediates the comprehension of emotional prosody, this support occurs in part from the observation that aphasic patients with left hemisphere lesions (LHD), who have intact right hemispheres, are able to comprehend emotional prosody. However, in these reports, the aphasic patients with LHD had spared verbal comprehension. We report a patient, DM, with a severe global aphasia after a large left MCA infarct, with spared comprehension of emotional prosody in spoken material. She could not match prosody to the affective words "Happy," "Sad," and "Angry," but matched prosody to emotional faces under several conditions, including that in which the emotion expressed and sentence content were incongruent. These results further support the role of the right hemisphere in emotional processing. They also emphasize the need for sensitive communication with patients even when aphasia is severe.

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L. PICK, S. HALL, N. MADIGAN, J. BOROD, J. WELKOWITZ, L. OBLER, E. CANINO, & C. MORRISON. Relationships Among Channels of Emotional Perceptual Processing: Interrelated or Separate Systems?

This preliminary study investigated the relationship among emotional perception tasks (facial, prosodic, lexical) in a normal population. For each channel, identification and discrimination tasks were administered. The influence of subject characteristics (age, education, occupation, gender, language background) on these tasks was also examined. Correlational analyses were performed and revealed specific effects in relation to emotional tasks for all demographic variables except gender. When relevant characteristics were partialled out, significant relationships were found among all identification tasks and between the facial and prosodic discrimination tasks. These results support the notion of a single underlying processor for emotional perception. They further emphasize the importance of examining subject characteristics among channels of emotional processing. Finally, this set of perceptual tasks may be useful for work with neuropsychiatric populations.

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M. ROGISH, T. ZAWACKI, D. SCHAFFER, R. GILMORE, & D. BOWERS. Cross-Modal Association of Emotional Stimuli in Patients With Unilateral Anterior Temporal Lobe Dysfunction.

Although previous human studies suggest that the amygdala is not involved in cross-modal association tasks (visual, haptic, or auditory), it remains unclear whether *crossmodal emotional* tasks are affected by anterior temporal lobe (TL) dysfunction and whether hemispheric asymmetries might exist. To examine this, subjects with discrete epileptogenic foci of the left or right TL were evaluated presurgically on unimodal and crossmodal tasks of emotional prosody and faces (Florida Affect Battery). In contrast to predictions, the right TL group performed flawlessly on the crossmodal emotion tasks, whereas the left TL patients were impaired. Their defect appeared related to an elemental disturbance of prosody perception. Findings will be contrasted with data from the stroke literature regarding different contribution of posterior and anterior temporal regions to crossmodal tasks.

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K.M. BAUM, D. DIFORIO, E.W. WALKER, R.D. VANDERPLOEG, D. WEINSTEIN, J. SCHIFFMAN, & H. TOMLINSON. Neuropsychological Predictors of Emotion Perception in Personality Disordered Adolescents.

The present study explored neuropsychological predictors of emotion perception in adolescents with schizotypal personality disorder, other personality disorders, or no psychiatric disorder. Specifically, measures of verbal, visual spatial, intellectual, and executive functioning were used to predict performance on recognition of facial affect and emotional prosody. Results suggest that neuropsychological measures of visual spatial, executive, and intellectual functioning account for a significant proportion of the variance in facial affect recognition, while measures of visual spatial and executive functioning significantly predict emotional prosody recognition. However, the majority of the variance in the affect recognition measures remains unexplained, suggesting that each may make a unique contribution to a neuropsychological battery. Finally, group differences on the emotion perception measure suggest that it may have utility in understanding important neuropsychological differences among adolescent personality disordered groups, as well as other groups with social and interpersonal difficulties.

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S. BROWN-KUHL & G. BRUDER. Corrugator Facial Electromyography Evoked by Emotional Facial Expressions and Its Relation to Lateralization, Sex Differences, and Reliability.

Issues of laterality, gender, reliability, subjective experience, and time course of corrugator electromyography (EMG) in response to emotional faces were examined. Bilateral corrugator EMG was measured from 16 adults during slide presentation of happy, neutral, and sad faces. Slides were rated for affective intensity and subjective affective experience. Laterality effects were demonstrated only for baseline measures of muscle activity (left > right). EMGs to affective faces were greatest for sad and least for happy faces, reliable across sessions, showed greatest responsivity in females, and increased during slide exposure for sad and neutral faces. In general, findings replicate and extend previous research.

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R. HEATH, S. KRYST, M. ROSENBAUM, & L. BLONDER. Ethnographic Observations of Unilateral Stroke Patients.

Neuropsychological studies of nonverbal communication of emotion have suggested right hemisphere specialization. These studies have been based on neuropsychological testing, rating scales, or other quantitative measurement techniques. In this qualitative study, two cultural anthropologists, blind to hypotheses and diagnoses, observed individuals undergoing neurobehavioral testing. The subjects included 4 individuals with right hemisphere infarcts (RHD), 7 with left hemisphere infarct (LHD), and 7 normal controls (NC). Qualitative analyses suggest that (1) RHD and LHD patients were more likely to suffer from inexpressive faces than the NC subjects; (2) RHD patients were observed to have limited intonation; and (3) stroke patients, regardless of hemispheric side of lesion, were perceived as more commonly displaying a negative affective state than the normal controls.

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FRONTAL LOBES—1

S.Z. RAPCSAK, M.L. GLISKY, & K.I. FORSTER. Neuropsychological Mechanisms of False Recognition Following Frontal Lobe Damage: Evidence From Lexical Decisions.

In lexical decision experiments the effect of neighborhood density (N) is typically *inhibitory* for nonwords. That is, decision times for nonwords with many real word neighbors are longer than for nonwords with few neighbors. However, in J.S. a patient with ventromedial frontal lobe damage, a paradoxical *facilitatory* effect of N was observed for nonwords, combined with a strikingly high false alarm rate. We propose that false alarm responses in J.S. reflect the breakdown of postaccess strategic decision and monitoring functions. Due to his frontal lobe damage, J.S. has difficulty

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engaging in systematic lexical search to oppose the bias toward a "yes" decision created by nonwords that resemble real words. False recognition in frontal patients may result from a general failure to inhibit incorrect reflexive responses based primarily on stimulus familiarity.
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K. WOOD, M. LACY, T. FERMAN, & N. PLISKIN. Clinical Application of a Brief Verbal Fluency Paradigm.
Slowed mental processing speed and faulty retrieval have been hypothesized mechanisms for verbal fluency (VF) deficits in subcortical dementia. This study investigated the time course of VF performance in patients with documented subcortical pathology ($N = 15$). VF performance was examined at intervals less than 1 min, at 1 min, and at 2 min. Results showed that, compared to controls, the subcortical group showed significant impairment at 15 s ($p < .001$), 30 s ($p < .001$), 1 min ($p < .001$), and 2 min ($p < .001$). These findings demonstrate a pattern of consistently slowed VF performance at intervals shorter and longer than the standard 1 min.
Correspondence: *Katherine Wood, Department of Psychiatry, University of Rochester Medical Center, Rochester, NY 14642, USA.*

M. HARTMAN & G. POTTER. The Role of Organization and Planning in Age Differences on the Rey–Osterrieth Complex Figure: Evidence for Prefrontal Deficits.
The goal of this study was to examine the role of frontal lobe dysfunction in age differences on the Rey–Osterrieth Complex Figure Test. Protocols were scored using the Boston Qualitative Scoring System as well as the original 36-point system. In the copy condition, age differences were restricted to reduce organizational quality. Age differences in immediate recall resulted from reduced organization, as well as poor memory. Age differences in spatial abilities and organization, however, only accounted for a minor portion of the age-related decline in recall. Thus, older adults showed the predicted impairment in prefrontal functioning, as evidenced by reduced organization, and this was the only source of age-related difficulty in copying the figure. Deficits in episodic memory remain the most prominent explanation for deficits in recall.
Correspondence: *Marilyn Hartman, Department of Psychology, Davie Hall CB #3270, University of North Carolina, Chapel Hill, NC 27599-3270, USA.*

C. RANDOLPH, M. KULISH, & B. ACKLEY. The Effects of Normal Aging on "Frontal" and Nonfrontal Memory Systems.
Frontal lobe systems have been hypothesized to be involved in mediating certain aspects of memory, including working memory functions as well as in judgment of recency, frequency, and self-monitoring of responses. "Self-ordered" memory tasks, in which subjects must monitor their own response selection, are thought to depend in part on frontal lobe systems, and patients with focal frontal lobe lesions have been reported to exhibit deficits on these tasks. It has also been reported that normal aging may result in disproportionately poor performance on these tasks. We compared 20 normal young subjects to 20 normal older subjects on self-ordered response tasks that were carefully matched to recognition span tasks, counterbalancing stimuli across task type. The recognition span task was essentially a novelty detection task, presumed to be largely dependent on limbic memory systems. The older subjects performed more poorly than the younger subjects on both tasks, with a significant Group × Task interaction term. The interaction term was apparently due to the older group performing disproportionately worse on the recognition span test. The results suggest that "frontal" memory tasks are not differentially susceptible to the effects of normal aging, which appears to impact to a greater degree on "limbic" memory tasks.
Correspondence: *C. Randolph, Department of Psychiatry, 303 East Superior, Ste. 543, Chicago, IL 60611, USA.*

G. POTTER & M. HARTMAN. Contributions of Episodic Memory and Strategy Use to Age Differences in Self-Ordering.
This study designed a verbal version of the Self-Ordered Pointing Task (SOPT) to investigate contributions of episodic memory and strategy use as an explanation for age differences on this test. Results showed expected age differences in overall performance. In addition, performance for both young and old subjects was better when the stimuli were semantically related than when they were unrelated. Both young and old groups equally benefited from semantic clustering strategies in the semantically related condition. Older adults also recalled fewer words from the SOPT than younger adults, and age differences in recall, but not strategy use, contributed substantially to age-related deficits on the SOPT. These findings suggest that age differences on this test may result from a combination of hippocampal and frontal factors.
Correspondence: *Guy Potter, Department of Psychology, Davie Hall CB 3270, The University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3270, USA.*

N. JAUŠOVEC. Linear and Nonlinear Dynamical Analysis of Multichannel EEG: Differences Between Gifted and Average Individuals.
The study investigated differences in EEG between gifted and average individuals using Fourier analysis and Kolmogorov entropy. Gifted and average students solved tasks representing processing speed, working memory, arithmetic operations, proportional, deductive and inductive reasoning. Fourier analysis indicated that gifted individuals during task performance displayed higher alpha power (less mental activity) than did average individuals. The differences were most pronounced over the frontal brain areas for the tasks involving working memory and arithmetic operations. Similar findings were obtained using the nonlinear Kolmogorov entropy. Gifted individuals showed lower entropy measures indicating less complex brain activation when solving tasks involving deduction and arithmetic operations. The results suggest that gifted individuals in comparison with average ones more efficiently activated task-relevant brain areas.
Correspondence: *Norbert Jaušovec, Pedagoška fakulteta, Koroška 160, 2000 Maribor, Slovenia.*

C.S. BLUM & P.D. HARVEY. Spatial Working Memory in Geriatric Schizophrenic Patients: Correlates of Leukotomy.
The prefrontal leukotomy procedure provides a naturalistic experiment in frontal lobe lesion overlaid on both chronic schizophrenia and old age. Eleven chronic schizophrenic patients with leukotomy and 11 nonleukotomized patients matched for age and gender were administered tests of spatial delayed response, spatial delayed alternation, and object alternation. Both groups performed most poorly on object alternation. Despite the massive orbitofrontal lesions induced by bifrontal leukotomy, chronic elderly schizophrenic patients performed so poorly on these tests that there were no differences associated with leukotomy status. These data suggest that chronic schizophrenia is associated with profound deficits in performance on tests sensitive to the functions of the orbital–frontal cortex.
Correspondence: *Cynthia S. Blum, 230 E. 15th St., New York, NY 10003, USA.*

REHABILITATION

S. MacNEILL & P. LICHTENBERG. Living Alone: Predictors of Functional Outcome in Older Rehabilitation Patients.
This study evaluated factors contributing to discharge self-care skills in 372 older rehabilitation patients. Patients were living entirely alone prior to admission. Multiple regression analysis was used to evaluate contributions of admit self-care, demographic, medical, cognitive and depression variables to discharge Functional Independence Measure scores. Results indicate significant contributions of age, cognition, and depression, above and beyond admission FIM score status. These results emphasize the importance of cognition and depression in progress with self-care skills in geriatric rehabilitation.
Correspondence: *Susan MacNeill, Departments of Psychology and Physical Medicine and Rehabilitation, Wayne State University, 261 Mack Blvd., Detroit, MI 48201, USA.*

S. MacNEILL, T. GERSHKOVICH, J. CARON, & P. LICHTENBERG. Living Alone: Predictors of Recovery During Medical Rehabilitation.
This study evaluated performance-based activities of daily living and metacognition in return to living alone after medical illness, in a geriatric re-

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habilitation population. Logistic regression analysis was used to evaluate predictive values of cognition, the Structured Assessment of Independent Living Skills (SAILS), and an interview for awareness of deficits in return home alone. Cognition was seen as a significant and unique predictor of discharge status. Neither the SAILS nor the awareness interview contributed significantly to prediction. Results have important implications for the role of cognition in discharge planning with geriatric patients.
Correspondence: *Susan MacNeill, Rehabilitation Institute of Michigan, 261 Mack Blvd., Detroit, MI 48201, USA.*

L. BURTON. Relationship Between Caregiver and Patient Social/Emotional Functioning After Head Injury.
Mildly head injured outpatients and caregivers were evaluated 5 years posttrauma. Physical, social, and emotional status were assessed with the Sickness Impact Profile Physical Dimension Scale, Social Adjustment Scale, and Profile of Mood States, respectively. There were no significant relationships between the patient's physical or emotional functioning and the caregiver's emotional or social functioning. However, there was a strong relationship between the patient's and the caregiver's social functioning. Perhaps social functioning is more observable than mood of a significant other, and thus more influential.
Correspondence: *L. Burton, Psychology Department, Fordham University, Bronx, NY 10458, USA.*

H. KAHN, T. STANNARD, & J. SKINNER. A Cognitive Neuropsychological Approach to Apraxia Rehabilitation.
The strategies for the rehabilitation of apraxia of speech are recent and strikingly few in number, perhaps because there is little agreement as to the nature of apraxia of speech. We present a rehabilitation strategy based on models described by Caramazza and others, in which it is thought that speech can be produced by either a direct route (nonwords) or a lexical–semantic route (real words). Our patient was presented with both real words and nonwords in her treatment protocol. Better production of words than nonwords across treatment sessions demonstrated that the breakdown of speech in a patient with apraxia can best be mediated by drawing on both the motor and lexical–semantic systems.
Correspondence: *Helen J. Kahn, Department of Communication Sciences, Allen House, University of Vermont, Burlington, VT 05405, USA.*

B.K. CHRISTENSEN, M.L. KLASWICK, D.L. WOOD, M. ROSENTHAL, & R.R. HENRY. Predicting Behavioral Functioning Following Traumatic Brain Injury Using Neuropsychological Measures.
The ability of conventional neuropsychological measures to predict behavioral functioning of 37 persons with traumatic brain injury (TBI) at one year postinjury was investigated. The association between neuropsychological test scores and factor scores from the Neurobehavioral Rating Scale (NRS) were assessed while controlling for level of education, estimated premorbid IQ, and Glasgow Coma Scale scores. Rey Auditory Verbal Learning Test scores were significant predictors of NRS cognition/energy and somatic concerns/anxiety factor scores. In addition, the Wechsler Adult Intelligence Scale–Revised Similarities subtest score accounted for a significant proportion of variance in NRS metacognition factor scores. These findings suggest that performance on specific neuropsychological measures is predictive of behavioral functioning at one year postinjury. These data are likely useful for developing appropriate rehabilitation for persons with TBI.
Correspondence: *Bruce K. Christensen, Department of Psychology, Clarke Institute of Psychiatry, Toronto, ON M5T 1R8, Canada.*

W.M. HIGH, Jr., M. SHERER, C. BOAKE, K. GOLLAHER, P. BERGLOFF, C.N. NEWTON, & C. IVANHOE. Effect of Postacute Rehabilitation on Social Role Functioning 1 to 3 Years Following Traumatic Brain Injury.
Studies of the effectiveness of rehabilitation following traumatic brain injury (TBI) have often been impeded by lack of control over preinjury characteristics, spontaneous recovery, the severity of brain injury, and the lack of reliable and valid measures of outcome. In this study, 24 patients who received inpatient rehabilitation but did not participate in a comprehensive postacute rehabilitation (PAR) program were compared to 44 patients who received both comprehensive inpatient and PAR services. Groups were well-matched on age, education, percent competitively employed or in school prior to injury, initial GCS score, duration of impaired consciousness, PTA, Disability Rating Scale (DRS) at discharge from inpatient rehabilitation, acute hospitalization length of stay (LOS), inpatient rehabilitation LOS, and injury followup interval. The percentage of persons competitively employed in the PAR group (47%) was greater than in the no PAR group (36%) but the difference was not significant. However, the PAR group was significantly better on the DRS and measures of social role functioning including the Craig Handicap Assessment and reporting Technique (CHART), Community Integration Questionnaire (CIQ), and Supervision Rating Scale (SRS).
Correspondence: *Walter M. High, Brain Injury Research Center of TIRR, 4007 Bellaire Blvd., Ste EE, Houston, TX 77025, USA.*

K. GOLLAHER, W. HIGH, M. SHERER, P. BERGLOFF, C. BOAKE, M.E. YOUNG, & C. IVANHOE. Prediction of Employment Outcome 1 to 3 Years Following Traumatic Brain Injury.
The current study investigated the relationship between age, education (EDUC), preinjury employment (PIEMP), GCS score, days of impaired consciousness (DIC), Disability Rating Scale (DRS) at discharge from rehabilitation, and employment status at 1 to 3 years following traumatic brain injury. EDUC, DRS, and PIEMP all correlated significantly with followup employment status, −.24, .35, and .32 respectively. These predictors were then used in a discriminant function analysis. The discrimination function correctly classified 87% of the employed subjects, 48% of the unemployed, and 76% across both groups. The current results compare favorably with those obtained by Ponsford et al.
Correspondence: *Karen K. Gollaher, Brain Injury Research Center, 4007 Bellaire Blvd., Suite EE, Houston, TX 77025, USA.*

SATURDAY MORNING, FEBRUARY 8, 1997

Symposium 4/9:00–10:40 a.m.

LIMB APRAXIA: FROM THEORY TO PRACTICE

Organizer and Chair: Leslie J. Gonzalez-Rothi

L. J. GONZALEZ-ROTHI. Limb Apraxia: From Theory to Practice.
Historically, limb apraxia has been said to be a neuropsychological syndrome of theoretical but not practical importance. However, recent work has suggested otherwise, with multiple studies showing limb apraxia significantly impeding the successful completion of common activities of daily living. Therefore this symposium will focus on a review of the ecological effects of limb apraxia, how the praxis system is said to be represented in the human brain, how it can be assessed neuropsychologically, and what is known about its treatment.
Correspondence: *L.J.G. Rothi, Speech Pathology Service (126), VA Medical Center, Gainesville, FL 32608, USA.*

K.M. HEILMAN. Model of Limb Praxis Production.
Ideomotor apraxia is a disorder of learned skilled movements. Liepmann noted that a patient with a callosal lesion was unable to correctly perform gestures to command and imitation with his left hand. In a second study

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with patients who had unilateral hemisphere infarcts he demonstrated that apraxia is associated with left but not right hemispheric dysfunction. Based on these studies he posited that in right handers it was the left hemisphere that contained these movement formula. The representational model of apraxia suggests that in right-handers praxis is mediated by a left hemisphere distributed modular system. Deficits in this system induce apraxia. These deficits may be induced by: (1) destruction of spatial temporal movement representations (movement formula), (2) an inability of these representations to access premotor areas where they are transformed into innervatory patterns, (3) a destruction of these premotor areas or (4) a disconnection between premotor and motor areas.
Correspondence: *K.M. Heilman, Department of Neurology, University of Florida, Gainesville, FL 32610, USA.*

C. OCHIPA. Conceptual Apraxia: A Selective Impairment of Action Semantics.
Theoretical models of praxis have two major components; a praxis conceptual system that includes knowledge of tool use, and a praxis production system that includes the information needed to program skilled motor acts. Recent studies support the notion that conceptual apraxia, a disruption of the praxis conceptual system or action semantics, may occur independent of impairments in praxis production or verbal semantics. Action errors observed in conceptual apraxia and their ecological consequences will be described.
Correspondence: *Cynthia Ochipa, Speech Pathology (126), James A. Haley Veterans' Hospital, 13000 Bruce B. Downs Boulevard, Tampa, FL 33612, USA.*

A.M. RAYMER & R.L. SCHWARTZ. Praxis Assessment.
We will describe a cognitive neuropsychological approach to apraxia assessment that incorporates subtests from the Florida Apraxia Battery (FAB) and the Florida Action Recall Test (FLART) to contrast praxis input, praxis output, and praxis semantic processing demands. Examiners analyze patient performance across tasks for both accuracy and error pattern to develop hypotheses as to the cognitive basis for the observed praxis processing impairments. We will outline tasks sensitive to different levels of praxis processing and delineate means to interpret patterns of praxis task performance.
Correspondence: *A.M. Raymer, Department of Child Study & Special Education, Old Dominion University, Norfolk, VA 23529-0136, USA.*

L.M. MAHER. Management and Treatment of Limb Apraxia.
Despite the frequent occurrence of limb apraxia in patients with left hemisphere brain damage, the management and treatment of limb apraxia has not been well studied. Management of limb apraxia would involve altering the environment such that the negative impact of limb apraxia on activities of daily living is minimized and the risk of injury is eliminated. Alternatively, the clinician may choose to treat the apraxic deficits directly. Preliminary studies suggest that limb apraxia is amenable to treatment, but the gains made seem to be treatment-specific. The theoretical bases, designs, and results of these and other relevant studies will be reviewed.
Correspondence: *Lynn M. Maher, Department of Educational Psychology and Special Education, Georgia State University, University Plaza, Atlanta, GA 30303, USA.*

Paper Session 16/9:00–10:40 a.m.

PARKINSON'S DISEASE—1

H. KATZEN, B. LEVIN, N. NIEBLER, H. GINART, M. LLABRE, & P. McCABE. Age of Disease Onset Influences Cognition in Parkinson's Disease.
It is controversial whether the age at which a person develops Parkinson's Disease (PD) influences intellectual decline. We administered seven cognitive measures assessing visuospatial skills, memory, and executive functions to 222 patients with idiopathic PD and 108 normal control subjects. Regression analyses demonstrated that older age of onset consistently predicted cognitive decline above and beyond normal aging and duration of illness. These findings indicate that older age of disease onset is a critical determinant of cognitive deterioration in PD.
Correspondence: *H. Katzen, Division of Neuropsychology, Ste. 715, 1150 N.W. 14th St., Miami, FL 33136, USA.*

T. FISHER, J. AHARON-PERETZ, N. GILADI, & R. TOMER. Spontaneous and Reactive Cognitive Flexibility in Early Parkinson's Disease.
The performance of tasks requiring either spontaneous or reactive cognitive flexibility was examined in newly diagnosed, unmedicated patients with Parkinson's disease (PD), as compared to age- and education-matched controls. Patients were significantly worse than controls in performing the Alternate Uses Test, which requires spontaneous cognitive flexibility. The patients' performance was not correlated with the presence or severity of the motor signs and symptoms. However, only patients showing signs of bradykinesia were impaired on a measure of reactive cognitive flexibility (number of perseverative errors on the Wisconsin Card Sort Test), and the degree of impairment was significantly correlated with the severity of bradykinesia. These findings suggest that cognitive flexibility requires the integrity of mesocortical and striatonigral dopaminergic circuits.
Correspondence: *Rachel Tomer, Cognitive Neurology Unit, Rambam Medical Center, POB 9602, Haifa 31096, Israel.*

R.P. HART, J.B. WADE, & V.P. CALABRESE. Vigilance Performance in Parkinson's Disease and Depression.
Patients with Parkinson's disease (PD), patients with Major Depression (MD) and normal control (NC) subjects were administered a continuous performance test (CPT) under neutral and incentive conditions. Patients made more errors than NC subjects with the MD group making a larger proportion of omission errors than the PD and NC groups. Incentive reduced errors across groups. Reaction times were slowest in the MD group. The pattern of findings is consistent with a failure of effort-demanding cognitive processes in MD. In contrast, PD patients appeared to have more subtle deficiencies in effortful and flexible cognitive operations. A previously reported paradoxical effect of incentive on recognition memory performance in depressed patients did not generalize to a vigilance task, as our MD and PD patients improved their performance in response to reward.
Correspondence: *R.P. Hart, C/L Psychiatry, Medical College of Virginia, P.O. Box 980268, Richmond, VA 23298-0268, USA.*

D.A. CAHN, G. HEIT, E.V. SULLIVAN, P.K. SHEAR, P. WASSERSTEIN, K.O. LIM, & G.D. SILVERBERG. Three-Month Followup of Posterior Ventral Pallidotomy.
A lesion placed in the posterior third of the internal globus pallidus has been shown to reduce some motor symptoms in Parkinson's disease (PD). Although the targeted symptoms of pallidotomy are motor, disruption of the basal ganglia–thalamocortical circuitry may also result in cognitive changes. This study compared baseline and 3-month followup neuropsychological assessment in 16 PD patients who underwent pallidotomy. Improvements were seen in psychomotor speed, fine motor coordination, and accuracy, while grip strength decreased on the side contralateral to the pallidotomy. No change was detected in overall level of cognitive functioning, nor were changes demonstrated in memory, language, or working memory. These initial findings provide support for improved motor functioning following pallidotomy and suggest that cognitive functions are not significantly affected.
Correspondence: *Deborah Cahn, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, Stanford, CA 94305-5543, USA.*

H.J. RIORDAN, L. FLASHMAN, K. CARROLL, & D. ROBERTS. Neuropsychological Functioning Before and After Stereotactic Ventroposterolateral Pallidotomy in Parkinson's Patients: Preliminary Findings.
There are no known empirical investigations that have attempted to quantify changes in higher cognitive functioning associated with stereotactic ventroposteriolateral pallidotomy in Parkinson's patients. Sixteen patients

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underwent neuropsychological testing before and after left (n = 10) or right (n = 6) pallidotomy. Preliminary results suggest a specific pattern of frontal–subcortical neuropsychological dysfunction after stereotactic ventroposteriolateral pallidotomy with side of surgery being an important predictor of degree of neuropsychological decline following surgical intervention. Patients undergoing left pallidotomy experienced a significant decline on measures of verbal memory, fluency, and cognitive flexibility. Patients undergoing right pallidotomy exhibited a similar but nonsignificant decline on these measures, but enhanced performance on nonverbal memory measures. Lesioning the globus pallidus may disrupt larger frontal–subcortical circuits necessary for processing information in the dominant hemisphere.
Correspondence: *Henry J. Riordan, Department of Psychiatry–HB7750, DHMC/Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001, USA.*

C.M. CULLUM, L.H. LACRITZ, A.B. FROL, K.K. BREWER, C. GILLER, & R. DEWEY. Effects of Pallidotomy on Cognitive Function in Parkinson's Disease.
Stereotactic pallidotomy has recently emerged as an effective adjunct to medications in the treatment of advanced Parkinson's disease (PD), although few studies have examined the effects of pallidotomy on cognitive functioning. This study included 19 patients with a history of PD who underwent unilateral pallidotomy (14 right-sided, 5 left-sided) and had completed pre- and postoperative neuropsychological evaluations. Paired t tests were performed with subjects serving as their own controls. Significant neurocognitive improvements in verbal learning, nonverbal memory, and figural fluency were seen in a majority of patients, irrespective of side of surgery. Likewise, self-reported symptoms of depression showed improvement. Results suggest no major adverse effects of unilateral pallidotomy on cognitive functions in the majority of our cases to date.
Correspondence: *C. Munro Cullum, Department of Psychiatry, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75235-8898, USA.*

Paper Session 17/9:00–10:40 a.m.

PEDIATRIC NEUROPSYCHOLOGY—4 (Reading and Language)

J.M. HALPERIN, K.E. McKAY, J.H. NEWCORN, J. HIMELSTEIN, A. DONOVAN, & M. BONAFINA. Central Noradrenergic Function in ADHD Boys With and Without Reading Disabilities.
ADHD boys with and without reading disabilities (RD) were compared on a new measure of central noradrenergic function; the growth hormone (GH) response to a challenge dose of the alpha-2 adrenergic agonist, guanfacine. Plasma GH was assessed prior to oral administration of either guanfacine (.02 mg/kg) or placebo. Post-medication plasma GH samples were obtained every 20 min for 3 hr. GH increased significantly following guanfacine, but not placebo. The increase in GH following guanfacine was significantly greater in ADHD boys without RD, as compared to those with RD. These preliminary data suggest that ADHD boys with and without RD differ in central NA function.
Correspondence: *Jeffrey Halperin, Psychology Department, Queens College, Flushing, NY 11367, USA.*

B.L. BROOKSHIRE, J.M. FLETCHER, T.P. BOHAN, S.H. LANDRY, & K.C. DAVIDSON. Specific Language Deficiencies in Children With Early Onset Hydrocephalus: A 5-Year Longitudinal Followup.
Specific language abilities of 75 children representing three etiologies of early onset hydrocephalus were assessed over a 5-year period. Children were divided into three groups; those with shunted hydrocephalus, arrested, and no hydrocephalus. Measures of specific language skills—phonological awareness, semantics, fluency and automaticity, word retrieval, and syntactic comprehension—were administered on four occasions. At 5 to 7 years of age, the shunted hydrocephalus group performed more poorly than the other two groups on all measures. By Occasion 4 the differences between the hydrocephalus and other two groups persisted on measures of semantics, word retrieval, and fluency. Differences in phonological awareness and syntactic comprehension were minimal. These results document variable rates of development of specific language skills and persisting deficits in language content in children with early onset hydrocephalus.
Correspondence: *Bonnie L. Brookshire, Department of Pediatrics, University of Texas–Houston Health Science Center, 6431 Fannin, Suite 7.142, Houston, TX 77030, USA.*

G.A. STEFANATOS, H. RABINOVICH, P. KOLLROS, B. DOHERTY, & P. SHEVES. Pathophysiological Disturbances in Pervasive Developmental Disorder With Language Regression.
One third of children with Pervasive Developmental Disorder (PDD) demonstrate regression of language and behavior after a period of seemingly normal development. Many also exhibit problems with auditory language comprehension associated with hypoacusis and apparent verbal auditory agnosia. We examined steady-state electrocortical response evoked by frequency modulations in sound in PPD children with and without regression. Children with regression produced a significantly greater frequency of grossly abnormal responses. They also evidenced a higher frequency of electroencephalographic abnormalities, particularly involving centrotemporal areas. The results suggest that neurobiological disturbances exist in children with PDD who regress that may be associated with epileptiform abnormalities in children and give rise to prephonemic problems in processing specific acoustic features that may be associated with their language comprehension difficulties.
Correspondence: *Gerry A. Stefanatos, Department of Psychiatry, Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA 19107, USA.*

M. WOLF & K.R. BIDDLE. The Double-Deficit Hypothesis for the Developmental Dyslexias.
The Double-Deficit Hypothesis represents an alternative, integrative account of severe reading disabilities in which phonological deficits and naming-speed deficits are depicted as separable sources (and subtypes) of reading failure whose combined presence leads to the most profound forms of reading impairment. First, we describe the theoretical and applied implications of this new conceptualization for diagnosis, intervention, and our understanding of the developmental dyslexias. Second, we present a summary of related findings from our lab. These findings include longitudinal, cross-linguistic, and growth curve analyses of each subtype's development in Kindergarten through Grade 4. These cumulative findings provide new information and pivotal questions for research, particularly concerning the possibility of a domain-general timing deficit in dyslexia that extends beyond language.
Correspondence: *Maryanne Wolf, Department of Child Study, Tufts University, 105 College Avenue, Medford, MA 02155, USA.*

D.L. MOLFESE & V.J. MOLFESE. Predicting Language Performance at 8 Years of Age from Evoked Potentials Recorded at Birth.
Event related potential (ERP) recorded at birth from over left and right frontal, temporal, and parietal hemisphere regions of 104 infants to a set of consonant-vowel syllables discriminate with exceptionally high accuracy the verbal IQ of these same children at 8 years of age. Data extend findings previously reported from 3- and 5-year-olds and suggest strong innate bases for later language.
Correspondence: *Dennis L. Molfese, Behavioral and Social Sciences, School of Medicine, Southern Illinois University, Carbondale, IL 62901-6517, USA.*

K.M. THOMPSON, S.A. AMANO, A. KHATCHIKIAN, & W.S. BROWN. Development of the Corpus Callosum: Interhemispheric Transmission Time and Bilateral Field Advantage.
Assessing the maturation level of the corpus callosum and knowing the implication of callosal maturation for cognitive performance is important for pediatric clinical neuropsychology. This study used evoked potential interhemispheric transmission time (EP–IHTT) and bilateral field advan-

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tage (BFA) to measure the maturation of the corpus callosum in older children and adolescents. EP-IHTT and BFA were measured during a letter matching task in 31 normal children (ages 7–17). Significant age-related effects were found for both EP–IHTT and BFA. Thus, maturation of the corpus callosum can be observed in decreasing evoked potential callosal transfer time. Callosal maturation was also shown to be manifest in increasing bilateral field advantage in visual letter matching.
Correspondence: *Warren S. Brown, Travis Institute and Fuller Graduate School of Psychology, 180 N. Oakland Ave., Pasadena, CA 91101, USA.*

Poster Session 6/9:00 a.m.–12:00 p.m.

PEDIATRIC NEUROPSYCHOLOGY—5

J. RADCLIFFE, M. LAZAR, & S. RIED. Late-Onset Acute Change in Neuropsychological and Functional Status Secondary to Radiation Necrosis in Survivors of Pediatric Brain Tumor Treated With Cranial Irradiation.
Four case studies are reviewed of radiation necrosis that resulted in acute change in neuropsychological and functional status 5 to 12 years following cranial irradiation for primary brain tumor. Tumor type, location and treatment at initial diagnosis are summarized, and cognitive ability and functional status prior to late onset of symptoms are reviewed. Presenting symptoms associated with late onset changes, concomitant conditions, diagnostic evaluation, and hospital course, as well as neuropsychological and functional outcomes, are presented. All patients required comprehensive inpatient rehabilitation. Discharge planning and school and community reintegration, major challenges for this group, are also described. The need for long-term monitoring of these patients is underscored.
Correspondence: *Jerilynn Radcliffe, Pediatric Psychology, Children's Seashore House, 3405 Civic Center Boulevard, Philadelphia, PA 19104, USA.*

B. J. SPIEGLER & M. BARNES. Two Different Forms of Brain Injury (ALL and CHI) Before the Age of 6 Disrupt the Acquisition of Phonological Analysis Skills in Reading.
Acquired brain injuries may disrupt the development of skills yet to be acquired or those emerging at the time of injury. To test this hypothesis, 17 children treated with CNS-directed therapy for acute lymphoblastic leukemia were matched with 17 children with moderate–severe closed head injury and given tests of general intelligence, phonological analysis, and reading comprehension. For both groups, a younger age at injury was associated with poorer phonological analysis and poorer reading comprehension. The deficits in reading comprehension were shown to be related to primary difficulties in phonological analysis and not to a general language impairment. Results are compatible with the view that there may be a time window during which the brain must be intact in order to allow phonological analysis skills to develop normally.
Correspondence: *Brenda Spiegler, Department of Psychology, Hospital for Sick Children, 555 University Avenue, Toronto, ON M5G 1X8, Canada.*

M. KORKMAN, H. KOIVULEHTO, & I. AUTTI-RÄMÖ. Neuropsychological Effects at Early School-Age of Fetal Alcohol Exposure of Varying Duration.
Six- to 9-year-old children of mothers who had been abusing alcohol during pregnancy were subdivided into three subgroups according to duration of abuse: during trimester I ($n = 16$); during trimesters I and II ($n = 16$); and throughout pregnancy ($n = 14$). A control group ($n = 26$) consisted of unexposed children. The Token test, the VMI, and 14 NEPSY subtests were administered. Fetal alcohol exposure throughout pregnancy had significant, diffuse effects on the development of the children, whereas exposure during early pregnancy only did not. Observed deficits included naming, receptive language, attention, and visuomotor problems. Verbal and visual memory and manual motor performance did not significantly differentiate between the groups.
Correspondence: *Marit Korkman, 2 ave. de l'Aigle, B-1150 Brussels, Belgium.*

T. SULLIVAN, M.D. RIS, T. MAINES, D. POOL, S. DANIELS, & J. LOGGIE. Neuropsychological Functioning of Hypertensive Children.
Current recommendations regarding the use of antihypertensive medication in children are conservative. However, no studies regarding the neuropsychological impact of pediatric hypertension have been published. In the present study, neuropsychological evaluations were conducted on 22 children with essential hypertension and 7 sibling controls. Results indicate no significant differences between the hypertensive and nonhypertensive children on tests of intelligence, academic achievement, memory skills, and fine motor and graphomotor functions. Our findings contrast with reports of a pattern of visual memory, attention, and abstract reasoning deficits reported among adult hypertensives. Implications of these findings for the treatment of hypertension in children are discussed.
Correspondence: *T. Sullivan, 3401 Brookline #19, Cincinnati, OH 45220, USA.*

L. BUONO-BOYD, M. MORRIS, R. MORRIS, N. KRAWIECKI, & F. NORRIS. Evidence for Nonverbal Learning Disability (NVLD) in Children With Brain Tumors.
This study examined the utility of the NVLD Model for characterizing the neurocognitive and adaptive outcomes of a large sample of children with brain tumors. Forty-one percent of the sample was found to have an arithmetic deficit, while 16% of the sample was found to have a reading deficit when classified on the basis of WRAT–R discrepancy. Limited evidence was found for the full syndrome of NVLD; however, a dissociation of verbal–nonverbal abilities was found such that children with arithmetic deficit evidenced a higher rate of impairment on nonverbal skills with relative sparing of verbal skills, while children with reading deficit evidenced the opposite pattern. Arithmetic deficit was significantly related to older age at evaluation but not to medical variables.
Correspondence: *Lauren Buono-Boyd, Scottish Rite Children's Medical Center, Hematology/Oncology Center, Suite 260, 5455 Meridian Mark Road, Atlanta, GA 30342-1640, USA.*

R.M. LAZAR, C. CONNAIRE, J. PILE-SPELLMAN, L. HACEINBEY, R.A. SOLOMON, M.B. SISTI, & J.P. MOHR. Developmental Learning Disorders in Patients With Cerebral AVMs.
Cerebral arteriovenous malformations (AVMs) are congenital masses of blood vessels in the brain that do not come to clinical attention until the middle decades of life. The purpose of this study was to determine whether a remote history of developmental disabilities was more likely to be reported in these patients than in brain tumor or cerebral aneurysm comparison groups. Using structured interviews based on the format from the Federal Centers for Disease Control, we found that AVM patients were almost twice as likely to report a developmental learning problem than the aneurysm patients and more than three times as likely as tumor patients. These data suggest that a single vascular malformation may belie more widespread, longstanding disease of neurogenic origin.
Correspondence: *Ronald M. Lazar, Department of Neurology, Neurological Institute, Columbia-Presbyterian Medical Center, 710 West 168th Street, New York, NY 10032, USA.*

M. DUNN & H.G. VAUGHAN, Jr. Electrophysiologic Correlates of Semantic Classification in Autistic and Normal Children.
This study tested the hypothesis that language processing by high functioning, verbal autistic children is less influenced by global semantic context than that of their normal peers. Behavioral measures of reaction time and error rate were employed to evaluate speed and accuracy in classifying auditorally presented words according to a superordinate category label. Also, an electrophysiologic index of semantic expectancy, the N4 component of auditory ERPs, was used to assess the relative levels of activation of 'in-category' *versus* 'out-of-category' words. Age and nonverbal IQ matched groups of 8 normal and 8 nonretarded autistic children were studied. Subjects responded with a finger lift to any word belonging to the category "animals." The instruction set and stimulus list composition (i.e., 50% animal words; 50% unrelated nonanimal words) set up an expectancy for animal words. Reaction time data indicated that the autistic

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children were slower in classifying targets as animal words but just as accurate as the normal children. As expected, N4 was larger for the nontargets than for the targets in the normal control group. By contrast, the autistic children showed no difference in N4 amplitude for target *versus* nontargets providing support for the hypothesized failure of the categorical context to set up a selective expectancy for the target words.
Correspondence: *Michelle Dunn, Department of Neurology, Albert Einstein College of Medicine, Bronx, NY 10461, USA.*

W. HOUSTON, M.D. RIS, N. LESLIE, & M. HUNT. The Effects of Methylphenidate Administration in Children With Phenylketonuria (PKU).
This study represents a first attempt at pharmacological treatment for the cognitive deficits commonly observed in children with PKU. Ten children with PKU were administered methylphenidate (MPH) in a repeated measures, double-blind, placebo-controlled crossover design to examine the effects of the medication on their performances on several neuropsychological tests and behavior rating scales. No differences were observed between the MPH and placebo groups for the neurocognitive measures or the behavior rating scales. Implications of this finding, and considerations for future studies are discussed.
Correspondence: *M. Douglas Ris, Children's Hospital Medical Center, Division of Psychology, 3333 Burnet Avenue, Cincinnati, OH 45229-3039, USA.*

D. WHITE, C. SALORIO, J. SCHATZ, S. CRAFT, & M. DeBAUN. Deficits in Working Memory Related to Anterior Lessons in Children With Sickle Cell Anemia.
One of the more profound medical complications associated with sickle cell anemia (SCA) during childhood is stroke. Few studies have related neuropsychological function to region of brain lesion in SCA-related stroke. In the current investigation, working memory for words varying in length (1-, 2-, and 3-syllable words) and phonological similarity (similar and dissimilar words) was examined in relation to region of brain lesion in children with SCA. Results obtained across the range of measures indicated significant deficits in working memory for verbal information in children with SCA and accompanying lesions in anterior brain regions. Interestingly, extension of the area of lesion posteriorly did not result in exaggeration of memory span deficits beyond the level observed for children with anterior lesions only. This supports findings from previous research suggesting a significant role for frontal cortices in working memory function. In addition, it appears that posterior cortical areas may play a rather insignificant role in verbal working memory function, at least in groups of individuals experiencing brain injury relatively early in the course of development.
Correspondence: *Desirée A. White, Department of Psychology, Box 1125, Washington University, St. Louis, MO 63130, USA.*

J.S. HAUT, S. ROBYN, M.W. HAUT, & K.S. KIRK. Memory and Executive Functioning in Adolescents With Schizophrenia, ADHD, and Normal Controls.
This study compared memory and executive functioning of 16 adolescents with schizophrenia with that of 16 patients with ADHD and 16 normal controls. The groups did not differ in age, gender, or education. Patients with schizophrenia performed more poorly on three of four WRAML Indexes, and on the Picture Memory subtest. Patients with schizophrenia had poorer delayed recall on the Story Memory subtest, and tended to retain less information over the Story Memory delay. There was a trend toward decreasing conceptual level on the WCST. Results suggest the presence of significant memory deficits in adolescents with schizophrenia, supporting the notion of cognitive deficit being present at or very near symptom onset. Further research with larger groups is suggested.
Correspondence: *Jennifer S. Haut, Department of Behavioral Medicine & Psychiatry, P.O. Box 9137, WVU School of Medicine, Morgantown, WV 26506, USA.*

M.A. SCOTT & S. LANDRY. The Neuropsychological Profiles of Children With Asperger's and Tourette: A Comparison.
This study compared 8 children with Asperger's syndrome (AS), 11 children with Tourette (TD), and 10 children with generalized anxiety (ANX) on neuropsychological and behavioral measures. The groups did not differ with respect to gender or socioeconomic variables. Multivariate analysis of variance revealed significant differences only between the AS and TD groups on Verbal IQ and visual recognition memory, with the TD group performing more poorly. The AS group were more impaired than the TD group on some measures of fine motor speed but did not differ from TD or ANX on a visual motor integration task. Teacher ratings did not describe the three groups as significantly different with the exception of significantly more attention problems reported for the AS group. Parent ratings on the Child Behavior Checklist revealed significantly more social and thought problems in the AS group. This lends support to suggestions that the AS and TD group have similar deficits, but also supports the hypothesis that the TD group would be more impaired on measures of verbal ability, and that AS and TD subjects perform similarly on nonverbal tasks with the exception of visual memory and fine motor speed.
Correspondence: *Mary Ann Scott, University of Texas Medical School–Houston, Department of Pediatrics, 6436 Fannin, Houston, TX 77030, USA.*

D.M. MAHALICK, M. McDONOUGH, & J.P. GREENOUGH. Psychopharmacological Treatment of Pediatric Traumatic Brain Injury.
This investigation examined the efficacy of psychostimulant therapy in alleviating neurobehavioral dysfunction attendant to pediatric brain injury. The primary neurobehavioral sequelae associated with head injury in the pediatric population involve deficits of attention and concentration. There are several investigations in the adult literature that have employed the use of psychostimulants in treating both psychiatric and neuropsychological residua associated with head injury. Overall, the results of these studies are equivocal, but suggest a beneficial impact on general functioning. The present prospective investigation utilized a double-blind, placebo-controlled, crossover experimental design to examine the efficacy of methylphenidate in treating children with acquired attentional disorders secondary to brain injury. A cohort of 14 children with varying degrees of head injury were recruited for participation. As expected, there were no differences in performance between baseline and placebo conditions on neurobehavioral tasks of attention and concentration, except for 1 case. In contrast, differences between drug and placebo conditions uniformly achieved statistical significance. Current findings provide support for the hypothesis that methylphenidate is an effective psychostimulant agent in treating attentional disorders secondary to brain injury in children.
Correspondence: *David M. Mahalick, UMDNJ-NJ Medical School, DOL, Suite 5300, 90 Bergen St., Newark, NJ 07103-2499.*

J.G. JAVORNISKY. Use of Regression Equations to Estimate Preinjury IQ Scores Based on Characteristics of the Head Injury.
Forty-six children and adolescents with Wechsler IQ scores obtained prior to head trauma received Neuropsychological Evaluation including Wechsler IQ an average of 25 months following head injury. Comparison of these IQ scores to actual preinjury IQ levels were made. What characteristics of the head traumas are associated with changes in the IQ scores postinjury? Multiple regression analysis was used. Eight characteristics of the head injury and three aspects of treatment were chosen as independent variables. The dependent variable was the difference between preinjury IQ score and the postinjury IQ score. Regression equations accounted for up to 53% of the variance with the Verbal IQ difference score as the most highly predicted. The equations provide a good estimate of preinjury IQ levels in a head injury population.
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C.B. BARRY, H.G. TAYLOR, & K.O. YEATES. Behavioral Sequelae of Traumatic Brain Injury in Children.
Behavior changes following traumatic brain injury (TBI) were investigated by following groups of 35 children with severe TBI, 52 with moderate TBI, and 50 with orthopedic injuries not involving CNS insult. Children were 6–12 years of age at injury and were followed over a 6-month interval. Behavior change was assessed relative to ratings of preinjury behavior. Analysis revealed a higher rate of new behavior problems in the severe TBI group compared to the other two groups. Factors associated with emerging behavior problems included social disadvantage, family stress and dysfunction, substandard adaptive behavior prior to injury, and postinjury neuropsychological deficits. Results indicate which children are at risk for behavioral sequelae of TBI and argue for environmental influences on outcome.
Correspondence: *Christine Barry, Department of Pediatrics, Rainbow Babies & Childrens Hospital, 11100 Euclid Ave.–Pediatrics Psychology COR 6038, Cleveland, OH 44122-6038, USA.*

M. ROMAN, D. DELIS, T. DEMADURA, C. LOFTIS, & R. AYLOR. An Examination of Executive Functioning After Pediatric Traumatic Brain Injury Using the CCT.
This study utilized the Children's Category Test (CCT) to examine executive functioning after pediatric traumatic brain injury (TBI) as a function of injury severity and age at injury. TBI subjects from ages 6;0 to 16;11 were administered the CCT 1 month after resolution of posttraumatic amnesia and again 3 months later; their performance was compared to that of traumatically injured, non-head-injured controls. Results indicated that older S-TBI subjects were more impaired in their executive functioning ability than either older MM-TBI subjects or older controls; however, no group differences were obtained when the performance of younger TBI subjects was examined. Overall, findings suggest that the CCT is a measure that is sensitive to the effects of pediatric TBI.
Correspondence: *Mary Roman, UCSD Child and Adolescent Psychiatric Service, 6535 Alvarado Road, San Diego, CA 92120, USA.*

M.L. GREEN, M.K. MORRIS, M.A. FOSTER, R.D. MORRIS, & J. J. MUIR. Parent Assessment of Psychological Functioning in Children With Acquired Brain Injury.
The prevalence of psychopathology in 18 children with acquired brain injuries was measured by four parent-report instruments. Two questionnaires, the Child Behavior Checklist (CBCL) and the Personality Inventory for Children (PIC–R), and two interview measures, the Diagnostic Interview for Children and Adolescents (DICA–R) and the Vineland Adaptive Behavior Scales (VABS), were completed within 4 months of injury or diagnosis. The DICA identified the highest prevalence of anxiety, depression, and acting-out behavior, whereas the CBCL identified the lowest prevalence in these domains. The opposite results were found in the attention problems domain. Interview measures were more concordant for overall psychopathology than questionnaires. Discordant findings may relate to factors such as assessment model, measure format, type of disorder, and item characteristics/scaling.
Correspondence: *Michelle L. Green, Department of Psychology, Georgia State University, Atlanta, GA 30303-3083, USA.*

G. TREMONT, W. MITTENBERG, & S. NETHERTON. Acute Intellectual Effects of Pediatric Head Injury.
Declines in intellectual ability have consistently been found to be the most pronounced and long-lasting deficits following head trauma in children. This study examined the WISC–III performance of 30 children who sustained acute closed head injury (HI) compared with a matched group of children who experienced orthopedic injury (OI). Although the majority of HI subjects had injuries that were not detectable on neurodiagnostic procedures, they obtained significantly lower IQ, factor, and subtest scores than OI children, with performance-based scores showing the greatest differences. IQ scores were significantly correlated with trauma severity variables, including posttraumatic amnesia, Glasgow Coma Scale on admission, and length of unconsciousness.
Correspondence: *Geoffrey Tremont, University of Oklahoma Health Sciences Center, Department of Psychiatry and Behavioral Sciences, P.O. Box 26901, Oklahoma City, OK 73190, USA.*

D.R. BLOOM, A. BOUDOUSQUIE, J.M. FLETCHER, & H.S. LEVIN. Relationship of the Selective Reminding Test and California Verbal Learning Test–Children's Version in the Year Following Pediatric TBI.
Verbal learning and memory performance were compared in four severity groups of pediatric TBI three times in the first year postinjury using the Selective Reminding Test (SRT) and California Verbal Learning and Memory Test–Children's Version (CVLT–C). Both tests differentiated TBI groups on the basis of level of injury severity at baseline, with severely injured children consistently performing below children with milder injuries. By 12 months postinjury, few group differences were identified on either test. However, SRT summary scores adjusted for age resulted in much more frequent identification of significant memory impairment than the CVLT–C summary score. Potential reasons for the discrepancy are discussed.
Correspondence: *Douglas Bloom, University of Texas Medical School–Houston, 6431 Fannin, Suite 3.600, Houston, TX 77030, USA.*

D.R. BLOOM, G.A. STALLINGS, E. PATRICK, J.M. FLETCHER, & H.S. LEVIN. Assessment of Verbal Learning and Memory During the First Year Following Pediatric Traumatic Brain Injury.
Verbal learning and memory constructs were investigated through twelve months after pediatric traumatic brain injury using the California Verbal Learning Test–Children's Version (CVLT–C). Relative to children with milder injuries, severely injured children demonstrated poorer initial learning, delayed recall, recognition memory, and less frequent use of semantic clustering strategies as an aid to learning and recall. These performance differences generally remained through 6 months following injury with the exception of short delay free recall, long delay cued recall, and the discriminability index of recognition memory, where group differences were apparent through 12 months postinjury. The performance of moderately injured children paralleled that of the severe injury group at baseline, but generally improved to levels obtained by mild injury groups by 6 months postinjury.
Correspondence: *Douglas Bloom, University of Texas Medical School–Houston, 6431 Fannin, Suite 3.600, Houston, TX 77030, USA.*

S. CAUDLE, G. STALLINGS, L. EWING-COBBS, B.L. BROOKSHIRE, J.M. FLETCHER, & B. J. JUDD. Linguistic Deficits Following Traumatic Brain Injury in Children: Comprehension and Production of Syntax.
Aspects of syntactic comprehension and production were examined in children with language impairment during the early stage of recovery from TBI in TBI and sibling comparison groups. On a sentence repetition task, the language impaired TBI group recalled fewer sentences verbatim, fewer sentences containing required grammatical features, and made more syntactic errors that often involved functors. Neither of the TBI groups was impaired on indices of the comprehension of syntactic forms or metalinguistic awareness. These findings support previous studies of linguistic functions after TBI that emphasize greater vulnerability of expressive than receptive functions. The TBI comparison group did not show deficits on expressive or receptive tasks, suggesting that long term language deficits are not universal features following pediatric TBI. Early linguistic disturbance was predictive of persistent expressive deficits.
Correspondence: *Susan Caudle, 24014 Spring Towne Drive, Spring, TX 77373, USA.*

T. SULLIVAN, C.A. CHASE, & R. AYYANGAR. Neuropsychological Function After Delayed Postanoxic Encephalopathy (DPE).
DPE is commonly associated with diffuse cerebral demyelination, and is usually fatal. A few cases of DPE associated with circumscribed basal ganglia lesions have been reported, but are insufficient to guide expectations about prognosis. We present the first report of serial neuropsychological assessment in a child diagnosed with DPE associated with circumscribed basal ganglia lesions. The patient's symptoms, including mutism, ataxia, ballismus, abulia, delusions, and hallucinations, cleared in approximately 50 days. Evaluation 2 months postinjury showed several areas of severely impaired abilities. When reassessed after 11 months of recovery, mild to moderate impairment in visuospatial–visuocontructional and fine motor

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skills were the only symptoms noted. This case indicates that DPE associated with circumscribed basal ganglia lesions can result in a more hopeful course.
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S.W. HENDERSON, G.P. PRIGATANO, & J.D. SUMMERS. Wechsler Intelligence Scale Scores Pre- and Post-Brain-Injury in 5 Adolescents with Learning Disabilities.
Multiple patterns of Wechsler Intelligence Scale (WIS) scores are associated with different forms of learning disabilities (LD). Despite preinjury patterns, neuropsychologists have held that the Block Design and Coding WIS subtests are particularly sensitive to traumatic brain injury (TBI). We investigate pre- and post-TBI intellectual functioning in 5 adolescent males who had preinjury WIS assessments of intelligence for LD. Irrespective of their preinjury WIS pattern, 5 of 5 showed declines in Block Design, and 4 of 5 subjects showed declines in Coding and Arithmetic. Other subtests did not show consistent declines. While these results are tentative, given the small sample size, they suggest that these three measures may be particularly sensitive to the effects of TBI irrespective of preinjury WIS patterns.
Correspondence: *Steven Henderson, Barrow Neurological Institute, Section of Neuropsychology, Phoenix, AZ 85013, USA.*

M. PRASAD, D.N. CANALES, L. EWING-COBBS, P. LOUIS, L. BELL, J. FLETCHER, & S. LANDRY. Outcome From Inflicted and Noninflicted Traumatic Brain Injury in Infants and Preschoolers.
The performance of children ages 0–6 years with inflicted TBI, noninflicted TBI, and controls on measures of intelligence, expressive language, receptive language, and motor skills was examined at baseline and at 3 months postinjury. Children with inflicted TBI scored significantly lower than controls in all areas. The TBI groups performed comparably on all measures. The decrement in cognitive and motor scores is striking given the generally favorable scores in both TBI groups on measures of duration and depth of impaired consciousness. In contrast to studies of recovery in older children, and adolescents, there was not significant improvement in cognitive or motor skills over a 3-month interval for either of the TBI groups. These findings do not support the hypothesis of preferential recovery after early brain injury.
Correspondence: *Mary Prasad, UT-HHSC, 6431 Fannin, Suite 3.252, Houston, TX 77030, USA.*

J.L. FLEISCHMANN, E. FELDMAN, & A.C. NAGUIAT. Neuropsychological Functioning Following a Perinatal Right Hemisphere Lesion: A Case Report.
MRI, neurological, and longitudinal neuropsychological findings are reported on a right-handed girl, born prematurely with a right hemisphere lesion. MI scan revealed encephalomalacia of the right frontal lobe. Neuropsychological data at age 10 years, 5 months revealed low average IQ scores, deficits in fund of information and arithmetic, and significant difficulties performing visuospatial and constructive tasks. Obsessive–compulsive behaviors were reported. At age 11 years, 5 months, she obtained an average IQ score and improved performance on most neuropsychological measures. In contrast, obsessive-compulsive behaviors worsened. Implications of these findings are discussed.
Correspondence: *Joan Fleischmann, Division of Neuropsychology, Department of Neurology, University of Miami School of Medicine, 1150 N.W. 14th Street, Suite #715, Miami, FL 33136, USA.*

B. SEALOVE, S. WARSCHAUSKY, A. ARGENTO, & E. HURVITZ. Attention and Memory in Children With Acquired *Versus* Congenital Brain Insult.
Studies have not yet examined the specific neuropsychological deficits associated with types of congenital *versus* acquired conditions. To that end, this initial study examines specific neuropsychological functions in children with cerebral palsy (CP) and traumatic brain injury (TBI). We hypothesized that in samples matched on Verbal IQ, children with TBI sustained after age five would exhibit greater impairment in attentional and memory functions in comparison to children with spastic forms of cerebral palsy (CP) with IQ $>$ 70. Subjects were 24 children, ages 7–13, including 13 children with TBI and 11 with CP. The hypothesis of greater deficits in attention and memory in children with TBI was not supported. Importantly, children with CP and generally average range IQs exhibited significant attentional deficits including impaired executive functions, as well as memory impairment.
Correspondence: *Brett Sealove, Department PM&R, Box 0050, University Hospital, Ann Arbor, MI 48109-0050, USA.*

DEMENTIA—4

C.A. SMITH, G. MURDOCK, C. McCLEARY, & J.G. BUCKWALTER. Anosognosia and Alzheimer's Disease: The Role of Depression in Masking Impaired Insight.
Research on the relationship between anosognosia and dementia severity in Alzheimer's disease (AD) has been inconclusive. A self-report measure rating the difference between the subject's perceived level of awareness and their primary caretaker's perception indicated no correlation between levels of dementia and the presence of anosognosia in 23 subjects diagnosed with AD. However, controlling for the level of depression, dementia severity positively correlated with levels of anosognosia. These results suggest that the presence of depression may be a confounding factor in past research.
Correspondence: *Clifford A. Smith, Andrus Gerontology Center, University of Southern California, University Park, MC 0191, Los Angeles, CA 90089-0191, USA.*

D. J. CONNOR, T. J. SANDY, C. KIM, D.P. SALMON, & L. J. THAL. Qualitative Aspects of Word Production in Alzheimer's Disease: Normal Initial Generation Strategies?
Forty-one Alzheimer's disease patients and their pair-matched controls were administered the supermarket fluency subtest of the Mattis Dementia Rating Scale. Differences in total word production were adjusted for by dividing by the number of words generated or by scoring only the first 10 responses of all patients. Significant differences were found between the two groups on measures of categories sampled ratios and clustering ratios with the former but not the latter adjustment method. This may reflect statistical differences in the two methods based on limited category item pools, or may indicate similar initial production strategies for the AD and control subjects with later divergence between the groups.
Correspondence: *Donald J. Connor, UCSD/ADRC-0948, 9500 Gilman Dr., San Diego, CA 92093-0948, USA.*

M. PRASAD, P. MASSMAN, & N. COOKE. Autobiographical Memory in Patients With Probable Alzheimer's Disease.
Autobiographical memory in Alzheimer's disease has been sparsely studied, and differences in measures have led to conflicting patterns of loss. This study sought to clarify the status of autobiographical memory in AD patients by comparing patients' performance on two different types of tasks: Crovitz word cues, and a structured autobiographical questionnaire. The latter has been suggested to place fewer demands on the retrieval process. AD patients were found to display a flat retrograde loss on the word cues tasks, whereas normal elderly controls displayed a recency effect. On the structured questionnaire, AD patients displayed a pattern of recall similar to normals, but at a significantly lower level. These findings suggest that impaired remote memory in Alzheimer's disease is due to the concomitant effects of loss of information and a retrieval deficit. Additionally, the word cue task was not found to consistently correlate with measures of remote semantic memory (personal semantic questionnaire and a remote public events test), disputing previous suggestions that this task may place demands on semantic memory in AD.
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V. J. ROBERTS, D. OLSON, A.N. CLARK, F.C. GOLDSTEIN, & J.L. WOODARD. Asymmetric Cognitive Impairment and Sinistrality in Patients With Mild Alzheimer's Disease.
The present study investigated the relationship between handedness and atypical cognitive decline in AD patients. Left- and right-handed AD patients were matched for age, gender, and education. Their neuropsychological profiles, including performance on lateralizing measures, were examined. Although there was no significant difference in general intellectual functioning between the two groups, the frequency of asymmetric impairment in the left-handed patients was significantly greater. In fact, the majority of left-handed patients exhibited lateralized rather than diffuse cognitive decline. This clinical profile is important to recognize, since it may facilitate diagnosis and early detection of AD in left-handed patients in the absence of other identifiable causes of dementia. These results may explain the reported low incidence of sinistrality in AD patients.
Correspondence: *Vicki J. Roberts, Department of Neurology, Emory University School of Medicine, 1841 Clifton Road NE, Atlanta, GA 30329, USA.*

L. SINGLETON, G. PERUYERA, & S. SEVUSH. Premorbid Personality and Psychopathology in Alzheimer's Disease (AD).
The role of premorbid personality in inducing psychopathology in AD patients was examined. Personality traits for 68 NINCDS probable AD patients were assessed retrospectively and presently by caregiver questionnaire. Multiple regression analysis controlled for age, gender, education, and disease severity yielded correlations between AD depression, and both a neuroticism factor ($F = 11.63$, $p = .001$) and a conscientiousness factor ($F = 5.42$, $p = .02$). Comparison of retrospective with current assessments revealed significant changes in both factors ($T = 3.85$, $p = .0004$; $T = -2.45$, $p = .01$). The correlation between depression and neuroticism may have resulted from an exacerbation of emotional instability induced by the AD disease process, while the relationship between conscientiousness and depression may suggest an additional reactive component resulting from a high performance individual being unable to cope with declining abilities.
Correspondence: *Lauren Singleton, Department of Psychiatry, University of Miami, 1400 NW 10 Ave., Suite 702, Miami, FL 33136, USA.*

D.L. NYENHUIS, P.B. GORELICK. S. FREELS, & D.C. GARRON. Relatively Poor Memory at Baseline is Associated With Progressive Cognitive Decline in Patients With Cerebrovascular Disease.
We have followed a cohort of African Americans with Alzheimer's disease (AD) or cerebrovascular disease (CVD) with and without dementia for 5 years. In the present study, we combined neuropsychological test data to form standardized, weighted memory, language and visuospatial scores and compared the pattern of baseline test scores of AD patients ($N = 21$) to that of CVD patients who declined over the next 3 years ($N = 5$) and nondeclining CVD patients ($N = 58$). In a 3 (AD, decliners, nondecliners) $\times$ 3 (memory, language, visuospatial) repeated measures ANOVA, we found the pattern of the AD patients and the CVD decliners to similarly be one of relatively poor memory, with less impaired language and spatial skills, while the CVD nondecliners showed relatively higher baseline memory scores than scores on language or visuospatial tests. These results support the hypothesis that progressive cognitive decline in CVD patients with or without dementia may be due to the coexistence of both AD and vascular dementia.
Correspondence: *David L. Nyenhuis, Rush-Presbyterian-St. Luke's Medical Center, 1653 West Congress Parkway, Chicago, IL 60612, USA.*

M. CHERRIER & M. MENDEZ. Performance of Alzheimer's Disease Patients and Healthy Controls on an Ecologically Valid Route Learning Test.
Environmental disorientation (i.e., episodes of getting lost) is a common problem with Alzheimer's disease (AD) patients. AD patients with (AD–Lost) and without (AD–Not Lost) environmental disorientation and a normal control group were tested on a unique, ecologically valid route learning test. The test measures subjects' ability to learn a short route to a destination with the aid of prominent and unique landmarks. Our results indicate that AD patients who suffer from environmental disorientation (AD–Lost) perform particularly poorly on an objective measure of route learning. In fact, the AD–Lost group performed significantly worse than the AD–Not-Lost group. Both AD groups performed significantly worse than a group of age- and education-matched older adults (NC). Our findings indicated that while AD patients are able to recognize landmarks nearly as well as the NC group, they are unable to use this information in a meaningful manner to guide themselves on the route.
Correspondence: *Monique Cherrier, Department of Psychiatry & Biobehavioral Sciences, UCLA School of Medicine, Rm. 37-425 NPI&H, 760 Westwood Plaza, Los Angeles, CA 90049, USA.*

T. J. SCHWARTZ, D. SALMON, & M. KUTAS. In What Context? Lexical and Sentential Priming Effects in Alzheimer's Dementia.
Event-related potential (ERP) studies of language processing in young subjects have demonstrated both word- and message-level context that can affect the amplitude of the N400, a component modulated by semantic analysis. Studies have shown that, under some conditions, AD subjects, too, are able to demonstrate both lexical and sentential processing effects. This is the first study to directly compare these two context effects in AD subjects. ERPs elicited by lexically associated and unassociated word pairs embedded in congruous and semantically anomalous sentences were recorded from AD subjects, normal elderly controls, and young control subjects. Results revealed that, with aging and dementia, individuals rely more heavily upon surrounding context for processing lexical associates.
Correspondence: *Tanya J. Schwartz, Psychology Service (116B), DVAMC, San Diego, CA 92161-2410, USA.*

L. NORTON, A. OSTERGAARD, & L. RYAN. The Impact of Baseline Solution Rate on Word-Stem Completion Performance in Alzheimer's Disease.
Studies of word-stem completion (WSC) priming in patients with Alzheimer's disease (AD) have yielded inconsistent findings. The present study examined the influence of target word choice on performance on this task. Normative data was first collected in order to determine the baseline solution rates for 100 three-letter word stems. Based upon this data, a WSC task was constructed and administered to 31 healthy older adults and 29 AD patients. Findings revealed that AD patients were impaired relative to normals when target solutions were high in normative baseline solution frequency, but intact when solutions were medium or low. Item analyses showed that word frequency and the number of dictionary solutions for stems had little impact on the size of priming effects.
Correspondence: *Lauren Norton, UCSD Department of Psychiatry, 9500 Gilman Drive, mail code 0949, La Jolla, CA 92093-0949, USA.*

W. BEATTY, S. ENGLISH, J. SCOTT, & P. WINN. Driving in Dementia: Testing for Way-Finding Ability.
Patients in the early stages of dementia often become lost while driving, even in familiar territory. Currently, there is no way to identify patients who may otherwise be competent to drive, but are at risk for becoming lost while driving. We describe a mildly demented AD patient (MMSE = 25) who performed within normal limits on measures of visuospatial–perceptual function (Block Design, Fragmented Figures), but was severely impaired in locating places on an outline map. She had no recent accidents or moving violations, but had become lost twice on short drives close to her home. A more severely demented patient with corticobasal degeneration (MMSE = 17) performed normally on map tests and drove alone without getting lost. Assessing geographical knowledge may help to determine fitness to drive.
Correspondence: *William Beatty, Department of Psychiatry & Behavioral Sciences, OUHSC, P.O. Box 26901 Oklahoma City, OK 73190, USA.*

M. LEIKIN & J. AHARON-PERETZ. Sentence Comprehension in Dementia of the Alzheimer Type (DAT).
The present study investigated spoken language, in particular auditory sentence comprehension, in patients with dementia of the Alzheimer type (DAT), and in patients with mild, newly diagnosed DAT. The Western Aphasia Battery and a battery dedicated to sentence evaluation (RLE) was administered

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to the patients and to an age matched control group. DAT patients were impaired on spontaneous speech, naming, word fluency, and long sentence repetition. Single word comprehension was preserved in DAT patients. Sentence comprehension was impaired even in mild (MMSE 20–24) DAT patients. The impairment increased as sentences length and the number of thematic roles in the sentence increased. These findings suggest that language deterioration at early stages of DAT include impairment of sentence comprehension.
Correspondence: *Judith Aharon-Peretz, Cognitive Neurology Unit, Rambam Medical Center, P.O. Box 9602, Haifa, Israel.*

M.T. WAGNER, K.B. SPANGENBERG, D.L. BACHMAN, & T.M. SMITH. Degenerative Dementias of the Non-Alzheimer's Type.
Two cases are presented with Pick's-like neuropathology. Case 1 was a 69-year-old woman prospectively followed with an atypical progressive dementia characterized with a remarkable progressive fluent anomic dysphasia, profound hypoperfusion on neuroSPECT, and brain biopsy findings characterized by swollen distended perikaryon with no Pick bodies, neurofibrillary tangles or neuritic plaques. Case 2 was a 45-year-old man prospectively followed with psychiatric symptoms, progressive disinhibition, hypoperfusion in the frontal region on neuroSPECT, and pathologic findings similar to Case 1. These cases illustrate the need for both neuropathologic and clinical correlates to better categorize atypical neurodegenerative disorders.
Correspondence: *Mark T. Wagner, Annex 1 IOP, 171 Ashley Ave., Charleston, SC 29425, USA.*

PARKINSON'S DISEASE—2

G.P. CRUCIAN, H. CREWS, J.M. ANDERSON, A.M. BARRETT, R.L. SCHWARTZ, J.E. CIBULA, & K.M. HEILMAN. Spatial Ability in Parkinson's Disease.
Visual-spatial deficits are often associated with Parkinson's Disease (PD). Recent theories suggest frontal–basal ganglionic dysfunction affects cognition in PD. Whereas this hypothesis does not entirely explain spatial deficits seen in PD, field dependence may result from dysfunction in this system. Alternatively, the vestibular system is also involved in spatial cognition, and vestibular dysfunction may affect visual–spatial ability in PD. To test these hypotheses, we administered the Water Jar Test, while perturbing vestibular input. PD patients were significantly less accurate than controls in judging horizontal, and were field dependent. No effect was found for head tilt. These findings suggest the visual–spatial difficulties seen in PD are associated with a disruption of the frontal–basal ganglionic systems.
Correspondence: *Greg Crucian, Department of Neurology, University of Florida, Box 100236, Gainesville, FL 32610, USA.*

H. GINART, H. KATZEN, N. NIEBLER, A. FRIEDMAN, R. TOMER, & B. LEVIN. The Relationship Between Apathy and Depression in Parkinson's Disease.
The purpose of this study was to examine the relationship between apathy and depression in Parkinson's disease (PD). We administered the Apathy Evaluation Scale (AES) and the Geriatric Depression Scale (GDS) to 57 PD subjects and 16 controls. The PD group was found to exhibit greater depression and apathy relative to controls. However, no differences were found between depressed (GDS $\geq$ 11) and nondepressed (GDS $<$ 11) PD subjects. These findings indicate that depression and apathy may independently coexist in PD, and that apathy may be a distinct clinical entity rather than a symptom of depression.
Correspondence: *B. Levin, Division of Neuropsychology, Ste. 715, 1150 N.W. 14th St., Miami, FL 33136, USA.*

J.A. FIELDS, A.I. TRÖSTER, S.B. WILKINSON, & W.C. KOLLER. Preliminary Observations of Effects on Cognitive Function Following Unilateral Stimulating Electrode Implantation in Globus Pallidus Interna (GPI) for Treatment of Refractory Parkinson's Disease.
Chronic electrical stimulation of the pallidum was approved as an experimental treatment of Parkinson's disease for 5 patients at this center. These patients underwent neuropsychological evaluation 1 month before and 3 months following unilateral pallidal stimulator implantation to investigate how cognition might be affected subsequent to surgery, data not previously reported for pallidal stimulation. In the current study, cognitive change for individual patients was calculated and determined to be significant if preoperative/postoperative test scores differed by at least 1 standard deviation. It was observed that, although most measures showed little change following surgery, certain language and visuoperceptual functions were most likely to show decrements, while recall and recognition tended towards improvement. Attention changes were heterogeneous across patients and visuomotor coordination and speed showed no change. Pallidal stimulation appears relatively safe, but future studies might identify risk factors for decrements in category fluency and facial matching.
Correspondence: *Julie A. Fields, Department of Neurology, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160-7314, USA.*

A.I. TRÖSTER, J.A. FIELDS, S.B. WILKINSON, & W.C. KOLLER. Changes in Cognitive Functions Following Unilateral Thalamic VIM Nucleus Stimulator Implantation for Pharmacotherapy-Resistant Parkinson's Disease: Some Preliminary Observations.
Recently introduced as an experimental treatment for medically-refractory Parkinson's Disease (PD), chronic electrical stimulation of the VIM nucleus is thought to hold less risk than thalamotomy for cognitive dysfunction. A French report on 9 PD patients suggests that cognitive outcome might be heterogeneous, raising the possibility that the reported lack of change in mean test scores obscured subgroups of patients who experienced improvements or declines in cognitive functions. This study of 9 PD patients before and 3 months after thalamic stimulator implantation (5 left, 4 right), sought to gather preliminary observations concerning cognitive change in individual cases. Significant change in a test score was defined as one of at least 1 standard deviation. Patients were tested during the "on" phase of medication before surgery, and with the stimulator "on" after surgery. With very few exceptions, language and visuoperceptual functions did not change significantly. Attention, recall, and recognition were more likely to improve/not change than decline after surgery. Data offer preliminary support for the relative safety of thalamic stimulation in PD.
Correspondence: *Alexander I. Tröster, Department of Neurology, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160-7314, USA.*

J. GREEN, J.L. VITEK, R.A.E. BAKAY, A. FREEMAN, M.L. EVATT, W.M. McDONALD, & M.R. DeLONG. Pallidotomy for Treatment of Parkinson's Disease: Preliminary Neuropsychological Findings.
This study performed preliminary analysis of the neuropsychological sequalae of pallidotomy for treatment of intractable Parkinson's disease. Ten patients treated surgically and 8 control patients treated with conventional pharmacotherapy were compared on neuropsychological measures administered at baseline (presurgery) and after 3 months. The surgically treated patients received microelectrode guided lesioning aimed at the caudolateral "sensorimotor" region of the internal globus pallidus (GPi). The neuropsychological status of the patients receiving pallidotomy did not change following surgery in comparison to the control group. The results support the hypothesis that lesioning of sensorimotor GPi does not impact neuropsychological function, and are consistent with the concept of functionally segregated parallel basal ganglia–thalamocortical circuits.
Correspondence: *Joanne Green, Emory University Department of Neurology and Wesley Woods Geriatric Center, 1841 Clifton Road, Atlanta, GA 30329, USA.*

G. KUZIS, L. SABE, C. TIBERTI, R. LEIGUARDA, & S. STARKSTEIN. Cognitive Functions in Major Depression and Parkinson's Disease.
To investigate the importance of major depression in the production of cognitive deficits in PD, we carried out a comprehensive neuropsychological and psychiatric assessment in 19 patients with PD and major depression, 31 nondepressed patients with PD, 27 patients with major depression

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but no PD (i.e., primary depression), and 12 age-comparable normal controls. Major depressed patients (with or without PD) had significantly more severe cognitive deficits than both normal controls and nondepressed PD patients on tests of verbal fluency and auditory attention, while PD patients with major depression had significantly more severe deficits on tasks of abstract reasoning and set alternation than the other three groups. In conclusion, major depression in PD is associated with significant deficits on specific cognitive tasks. While some of these deficits may be explained by the presence of major depression, other cognitive impairments may result from specific brain dysfunction in PD with major depression.
Correspondence: *Liliana Sabe, Raúl Carrea Institute of Neurological Research, Department of Neuropsychiatry, Montañeses 2325, 1428 Buenos Aires, Argentina.*

A.L. FRIEDMAN & H. KATZEN. Is There a Relationship Between Perceptions of Cognitive Deficits and Depressed Mood in Parkinson's Disease?
Depression is cited as the most common psychiatric disturbance in Parkinson's disease (PD) and researchers argue that it is not a psychogenic reaction to physical disability. To date, it is unknown if depression is related to perceptions of *cognitive* disability. We evaluated 56 PD patients ranging in level of cognitive function from normal to mildly demented, based on MMSE scores. Clinical characteristics such as PD severity, dementia severity, and duration of illness were unrelated to depression or perceptions of cognitive deficits. Perceptions of cognitive deficits were, however, significantly positively related to depression. That is, the more perceived cognitive deficits PD subjects reported, the more depressed mood they reported. This is the first evidence to suggest that depressed mood in PD may reflect a psychogenic reaction to *cognitive* disability.
Correspondence: *Andrea L. Friedman, Division of Behavioral Medicine and Oncology, University of Pittsburgh Cancer Institute, Pittsburgh, PA 15213, USA.*

K.E. CARROLL, H. J. RIORDAN, L.A. FLASHMAN, A. J. SAYKIN, C.A. SMITH, & D. ROBERTS. Affective Distress and Duration of Illness Account for Neuropsychological Dysfunction in Elderly With Parkinson's Disease.
Cognitive functioning in elderly patients with Parkinson's Disease (PD) was evaluated in a consecutive series of outpatients being evaluated for pallidotomy surgery. Sixty-eight subjects completed a neuropsychological test battery. Comparisons of *young* (ages 50–65) to *old* (65–80) patients were made. Overall, the old group exhibited significant impairment relative to the young group on measures of visual attention (Digit Symbol), verbal learning (CVLT), cognitive flexibility (Trail Making B), and expressive language abilities (BNT, ANT, CFL). When affective distress and duration of illness were covaried out, only the ANT, BNT, WCST trials, and CVLT clustering remained different. This suggests that affective distress and illness duration account for some cognitive difficulties associated with aging in PD; however, there appears to be residual frontal–subcortical dysfunction.
Correspondence: *Kevin Carroll, Department of Psychiatry HB-7750 DHMC/Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001, USA.*

AGING

D. TRAHAN & G. LARRABEE. Visual Recognition Memory and Normal Aging: An Examination of Rate of Acquisition.
This study examined normal age differences in rate of acquisition using the Continuous Visual Memory Test (CVMT), a measure of visual recognition memory employing complex, ambiguous designs. Subjects were 275 adults (125 men, 150 women) ranging in age from 18 to 91 years. Results revealed no age differences in rate of Hits. However, older subjects obtained a significantly higher number of False Alarms (FA). An additional contribution of this study was the analysis of age differences in rate of acquisition across CVMT trials. Analysis of interaction effects revealed no age differences in rate of learning for CVMT Hits. However, for the FA variable, older subjects fell further behind younger ones on each successive trial. Learning curves for older and younger subjects diverged as the number of trials increased.
Correspondence: *Donald E. Trahan, 3560 Delaware, Suite 105, Beaumont, TX 77706, USA.*

P. LICHTENBERG, L. YOUNGBLADE, T. ROSS, & S. VANGEL. The NSRP Test Battery: Detection of Dementia in African American and White Elderly.
There exists a paucity of data on the ability of neuropsychological instruments to detect dementia in urban African American and White older adult medical patients. The Normative Studies Research Project (NSRP) test battery was created to help rectify this. In this study 74 cognitively intact medical patients are compared with 89 cognitively impaired medical patients. Average age of the sample was 77 years, with 60% of the sample comprised of African Americans and 40% of White subjects. The relationship of individual tests with demographic data, factor structure of the test battery, and clinical utility of the battery are all presented.
Correspondence: *Peter Lichtenberg, Rehabilitation Institute of Michigan, 261 Mack Blvd., Detroit, MI 48201, USA.*

M. RAMAREDDY, M.W. HAUT, R.W. KEEFOVER, & E.D. RANKIN. Verbal Learning Patterns in Rural Elderly Population.
The ability to detect patterns of cognitive performance in a large rural population on the basis of neuropsychological tests was examined. Cluster analysis of learning trials of 2188 rural elderly individuals on CERAD word list identified four distinct patterns of memory performance. The clusters differed in the rate and amount of acquisition, level of retention, and recognition of the list. There was a significant positive relationship between performance on the CERAD word list and performance on concurrent measures of verbal fluency, processing speed, functional status, and performance on general cognitive status.
Correspondence: *M.W. Haut, Department of Behavioral Medicine & Psychiatry, Box 9137, West Virginia School of Medicine, Morgantown, WV 26506, USA.*

T.E. MARKEE, G. SMALL, A. LaRUE, L.H. MOORE, & S. KOMO. Practice Effects on Neuropsychological Testing in Age-Associated Memory Impairment.
Tracking cognitive change in people at risk for dementia often entails the use of repeated neuropsychological evaluations. Repeated exposure to the same neuropsychological measures, however, may contaminate accurate assessment of longitudinal cognitive changes. The present study addresses the issue of how practice effects may differ on traditional neuropsychological memory measures for those at increased risk for dementia by examining individuals with age-associated memory impairment with and without a family history of Alzheimer's disease (AD). Results showed that subjects with no family history of AD showed an expected practice effect between two neuropsychological testings, while those with positive family history tended to remain stable in their performance. These results suggest that family history of dementia may increase one's risk for differential cognitive changes over time.
Correspondence: *Taryn Markee, Room 37-425, Department of Psychiatry and Biobehavioral Sciences, UCLA-NPI, 760 Westwood Plaza, Los Angeles, CA 90024, USA.*

B.L. PLASSMAN, K.A. WELSH, E.D. BIGLER, S.C. JOHNSON, C.V. ANDERSON, M.E. SIMONS, M. J. HELMS, & J.C.S. BREITNER. Similarity in Brain Volumes of Aging Monozygotic Twins.
We investigated the role of genes on brain morphology in 9 monozygotic and 1 dizygotic twin pairs with a mean age of 62.5 years. We compared MRI regional brain volumes within- and between-twin pairs and exam-

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ined the relation of regional brain volumes with memory function. For measures of total intracranial volume, total brain volume, and total cerebrospinal fluid (CSF) volume, overall variance was attributable almost entirely to variability between twin pairs and to measurement error. The within-pair component of variance was minuscule. This finding suggests that genes influence brain size even in later life. Structures such as the hippocampus and the ventricles appear to show less genetic influence in older subjects. After stratifying by twin pair, performance on some verbal memory measures showed a strong inverse correlation with CSF volume.
Correspondence: *Brenda L. Plassman, Duke University Medical Center, Box 41, 905 W. Main St., Durham, NC 27701, USA.*

J. RITCHIE, L. TERRYBERRY-SPOHR, M. LAM, E. J. RANKIN, S. GRANGER, D. DOWNS, & R. BENDORF. Concordance of Neuropsychological and Psychiatric Diagnosis With SPECT in a Geropsychiatric Population.
Sixty-six geropsychiatric inpatients were evaluated with SPECT and an abbreviated neuropsychological evaluation. Neuropsychological diagnosis and discharge diagnosis were correlated ($r^2 = .30, p = .001$). Chi squares revealed significant associations between SPECT and neuropsychological diagnosis [$\chi^2(3,N = 47) = 14.1, p = .003$], and SPECT discharge diagnosis [$\chi^2(3,N = 50) = 11.2, p = .01$]. SPECT abnormalities occurred in 100% of the neuropsychology diagnoses of VAS, 73% with DAT, 54% with Dementia NOS, and 27% with psychiatric diagnoses. Similar results were obtained for psychiatrists' discharge diagnoses. Although neuropsychological evaluation and SPECT results were significantly related, both neuropsychological evaluation and SPECT provide clinically relevant information that concurrently contribute to the diagnostic and treatment process.
Correspondence: *Eugene J. Rankin, Clinical Neuropsychologist, Alegent Health–Immanuel Rehabilitation Center, 6901 North 72nd Street, Omaha, NE 68122-1799, USA.*

ASSESSMENT–2 (Normative Studies)

S. REDIESS, R.Q. POLLARD, & B. VEYBERMAN. Assessment of Verbal (ASL-Based) Memory in Deaf Individuals: Clinical Utility of the Signed Paired Associates Test.
Although deaf people comprise a significant disability and language minority in the U.S., ignorance and misconceptions regarding American Sign Language (ASL) undermine effective clinical neuropsychological evaluation of deaf patients. Psycholinguistic and neuropsychological research with deaf signers provides a scientific foundation for the development of verbal (sign-based) assessment of learning and memory. The Signed Paired Associates Test is one of a series of ASL-based measures of memory and other verbal–cognitive domains currently being developed for use with deaf adults. This paper summarizes the current problems in neuropsychological assessment with deaf adults and presents normative data and demonstrates the clinical utility of this memory test.
Correspondence: *Sharilyn Rediess, Department of Psychiatry, University of Rochester Medical Center, 300 Crittenden Blvd., Rochester, NY 14642, USA.*

T. HARRIS, M. MERCURY, L. DUNAWAY, T. FERMAN, G. SHEELER, J. TAYLOR, M. DALY, K. WOOD, A. MALINA, N. DAWSON, & N. PLISKIN. Recognition Memory Paradigm for the Wechsler Memory Scale: Normative Data.
The Wechsler Memory Scale (WMS) with the Russell revision of delayed recall for stories and figures continues to be a widely used instrument due to the practical advantage of shorter administration time. Normal controls ($N = 75$), and patients ($N = 340$) were given the WMS, the 30-min delayed recall for Logical Memory (LM) and Visual Reproduction (VR), and a Recognition Paradigm devised by Milberg et al. Descriptive data are provided for normal controls and patients by lesion site (no lesion, cortical, subcortical, cerebellar, and mixed). This study extends previous research utilizing a recognition paradigm as a means for understanding patterns of memory dysfunction.
Correspondence: *Neil H. Pliskin, Department of Psychiatry, University of Chicago Hospitals, Chicago IL 60637, USA.*

F.W. UNVERZAGT, N. MERCADO, K.S. HALL, S. HUI, & H.C. HENDRIE. Long-Term Test-Retest Stability: Base Rate Data for CERAD Neuropsychological Battery in Normal Elderly African Americans.
The ability to accurately identify meaningful decline is crucial in the differential diagnosis of memory and cognitive disorders in the elderly. Clinically useful information on the frequency of test–retest change in normal samples on cognitive screening tests is limited. We report data for each of the tests in the CERAD neuropsychological battery at baseline and followup (1.5-year interval) in a community-based sample of 36 normal elderly African Americans. Test–retest correlations were significant (ranging from .33 to .80). There were no significant practice or deterioration effects during the interval (all paired *t*-test *p*s $> .05$). Frequency distributions of the change scores were examined to identify infrequently occurring declines. Cutoff scores to assist the clinician in identifying abnormal decline are reported.
Correspondence: *Frederick W. Unverzagt, Department of Psychiatry, Indiana University School of Medicine, 550 N. University Blvd., Suite 3124, Indianapolis, IN 46202-5266, USA.*

C. BOAKE & G. STALLINGS. Combined Norms for the Rey Auditory Verbal Learning Test.
Data from published normative studies of the English-language Rey Auditory Verbal Learning Test (RAVLT) were combined statistically into a single, large normative sample. Significant and unexplained differences were found between the RAVLT scores of published normative samples, even within the same age and sex subgroups. Meta-analysis of subject variables revealed that age exerted the largest effect on RAVLT performance, while a sex difference in favor of females was much smaller. The combined RAVLT norms should have the advantages of being more statistically stable and probably more representative of the general normal adult population.
Correspondence: *Corwin Boake, TIRR, 1333 Moursund, Houston, TX 77030-3405, USA.*

M.A. NORMAN, J.D. EVANS, S.W. MILLER, D.C. DELIS, & R.K. HEATON. Normative Data for an African American Population on the California Verbal Learning Test.
The present study examines performance of 289 African American subjects using the California Verbal Learning Test (CVLT). Initial analyses support separate norms for men and women in different age groups, which are consistent with published CVLT normative data. Separate normative data are offered for men and women stratified by age. Significant gender differences were noted, with females generally performing better. In addition, significant age differences were noted on all recall measures ($p < .001$). Means and standards deviations allow practitioners to use these data for clinical evaluations of African American individuals. The current study may further assist in better characterizing, and interpreting neuropsychological performance in the African American population.
Correspondence: *Marc A. Norman, Psychology Service (116B), Veteran's Administration Medical Center, San Diego, 3350 La Jolla Village Drive, San Diego, CA 92161, USA.*

P.S. FASTENAU & N.L. DENBURG. Geriatric Norms for the Rey Figure and Extended Complex Figure Test.
In this study, we administered the Rey Complex Figure Test and Extended Complex Figure Test (ECFT) to a sample of 100 community-dwelling older adults ranging in age from 55–85 years ($M = 72.9, SD = 7.0$) and ranging in education from 8 to 20 years (*Mn* and $Md = 12.0$). For Copy, there were no effects for age or education ($p > .05$). For Immediate and Delayed

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Recall, only age was significant (Multiple $R = .30–.31$, $p < .005$). For ECFT Recognition and for ECFT Matching, both age and education were significant (Multiple $R = .42–.45$, $p < .0005$). There was no Age × Education interaction for any variable ($p > .05$). Age- and education-appropriate norms for a healthy reference group are provided.
Correspondence: *P.S. Fastenau, Department of Psychology, LD 124, 402 N. Blackford St., Indiana University Purdue University Indianapolis (IUPUI), Indianapolis, IN 46202-3275, USA.*

T.P. ROSS & P.A. LICHTENBERG. Expanded Normative Data for the Boston Naming Test in an Urban Medical Sample of Elderly Adults.
Boston Naming Test (BNT) normative data for 241 elderly adults ages 65–95 are provided for use in urban, medical settings. The association between demographic variables and BNT performance was also examined. Age, education, ethnicity and gender were all associated with BNT performance, accounting for 22% of cumulative score variance. The BNT scores obtained from this sample were much lower than those reported in previous samples, with much greater variance yet highly consistent with other investigations of less educated, ethnically diverse, medical samples. The present normative data are interpreted as more appropriate for use in urban medical settings than normative data obtained from samples of highly educated, optimally healthy adults.
Correspondence: *Thomas P. Ross, Department of Psychology, Rehabilitation Institute of Michigan, 261 Mack Blvd., Detroit, MI 48201, USA.*

H. WISHART & B. KEYES. Development of Interhemispheric Transfer Tests: Normative and Psychometric Data.
Despite growing empirical interest in interhemispheric transfer (IHT) in certain neurological disorders, there is no readily available, standardized set of IHT tests for clinical use. Four new tests of IHT were developed and administered, along with a commercial dichotic listening test, to 76 healthy volunteers (49 women) ranging in age from 18 to 65 years; 120 subjects will be tested in total. Normative and psychometric data were compiled. All IHT tests showed adequate construct validity; performance was mildly diminished on test conditions thought to require IHT relative to conditions not requiring IHT, though findings failed to reach the .05 level of significance in two cases. Small but significant correlations were observed among the tachistoscopic reading, dichotic listening, and bimanual coordination tests, and between the tactile localization and posture replication tests ($p < .05$). Results were not related to motor function, intellect, attention, speed of information processing, or executive ability ($p > .05$).
Correspondence: *H. Wishart, Neuropsychiatry, University of Rochester MC, 300 Crittenden Blvd., Rochester, NY 14620, USA.*

F.W. BYLSMA, M.C. CARLSON, D. SCHRETLEN, A. ZONDERMAN, & S. RESNICK. Rey-Osterrieth Complex Figure Test (CFT) Q-Score Performance in 328 Healthy Adults Ages 20 to 94.
Bylsma and colleagues described the Q-Score method to assess planning and organization of Rey-Osterrieth copy productions, emphasizing the main structural elements of the figure and the order in which they are copied. Unit, Order, Total, and 5 Factor scores are generated. The CFT copy productions of 328 healthy adults, ages 20 to 94 years, were scored for copy accuracy and for qualitative aspects using the Q-Score method. Age-specific performance data are presented. Accuracy scores correlate with education ($r = .24$, $p < .01$; $n = 328$). Total Q-Score correlates with completion time ($r = -.28$, $p < .01$; $n = 328$). Total Q-Score and Factor scores correlate with measures of executive function [Total with Digit Span Backward ($r_{Time} = .13$, $p < .02$, $n = 293$); Factor 1 with Trail Making Test part B ($r_{Time} = -.14$, $p < .02$, $n = 209$); Factor 2 with phonemic fluency ($r_{Time} = .23$, $p < .03$, $n = 72$); and recency discrimination ($r_{Time} = .22$, $p < .03$, $n = 72$)], even after controlling for completion time. These findings suggest that Q-Score measures assess aspects of executive function independent of processing speed decrements accompanying advancing age.
Correspondence: *Frederick W. Bylsma, Department of Psychiatry & Behavioral Science, Johns Hopkins University, Meyer 218, 600 N. Wolfe St., Baltimore, MD 21287-7218, USA.*

Symposium 5/11:00 a.m.–12:30 p.m.

PEDIATRIC HEAD INJURY: DEVELOPMENTAL IMPLICATIONS

Organizer and Chair: H. Gerry Taylor

H.G. TAYLOR. Pediatric Head Injury: Developmental Implications.
Although neuropsychological sequelae of traumatic brain injury (TBI) in children are well documented, there are few published reports of longitudinal research in this area. Methodological limitations of past research include the use of cross-sectional designs, lack of meaningful comparison groups, insensitive measures of outcome, and failure to consider preinjury status and environmental factors as contributors to outcome. Topics to be covered in this symposium include the long-term effects of TBI on academic achievement, the special vulnerability of infants and preschoolers, the importance of preinjury child and family status in predicting recovery, and measurement of problem-solving deficits, in relation to locus of lesion. The studies demonstrate recent advances in methodology, and findings shed light on age-related variability in outcomes.
Correspondence: *H. Gerry Taylor, Department of Pediatrics, Rainbow Babies & Childrens Hospital, 11100 Euclid Ave.–Pediatrics Psychology COR 6038, Cleveland, OH 44122-6038, USA.*

G. J. KINSELLA, M. PRIOR, M. SAWYER, B. ONG, D. MURTAGH, & R. EISENMAJER. Predictors and Indicators of Academic Outcome in Children 2 Years Following Traumatic Brain Injury.
The aim of this study is to report on the relationship between neuropsychological studies and academic achievement in children following traumatic brain injury (TBI). Academic outcome was assessed by post-TBI changes in performance on formal standardized achievement measures of reading, spelling and arithmetic; changes in teacher ratings of school performance across the followup period, and provision of special education assistance received after injury. The utility of early neuropsychological measures in predicting children at risk and of concurrent neuropsychological measures in formulating rehabilitation and management strategies will be discussed.
Correspondence: *G.J. Kinsella, School of Psychology, La Trobe University, Bundoora, Melbourne, Victoria 3083, Australia.*

L. EWING-COBBS, J.M. FLETCHER, H.S. LEVIN, D. J. FRANCIS, & K. DAVIDSON. Cognitive and Motor Sequelae Following TBI in Young Children: A Longitudinal Analysis.
Neuropsychological outcome was evaluated longitudinally in children ages 0–41 and 42–83 months who sustained traumatic brain injury (TBI). In comparison to mild–moderate TBI, severe TBI was associated with a significant reduction in intelligence, motor, receptive language, and expressive language functions that persisted over a 2-year followup. Although the VIQ and PIQ scores were comparable over time, the PIQ showed greater initial deficit and greater improvement over time. VIQ scores did not change over time in children ages 0–41 months with mild–moderate or severe TBI. Motor scores remained significantly lower than IQ scores after severe injury. Expressive language was significantly reduced in the youngest children suggesting particular vulnerability of verbal functions to disruption by TBI.
Correspondence: *Linda Ewing-Cobbs, Department of Pediatrics, University of Texas–Houston Health Science Center, 6431 Fannin, Suite 3.222, Houston, TX 77030, USA.*

H.S. LEVIN, J.M. FLETCHER, S. CHAPMAN, J. SONG, R. SCHEIBEL, H. HARWARD, L. KUSNERIK, & F. GOLDSTEIN. Question-Asking Strategy Following Head Injury in Children.
To investigate sequential information gathering strategies (including utilization of superordinate categories) in relation to severity of closed head injury (CHI) and age at study, we administered the 20 Questions Test to 88 severe CHI, 63 mild CHI, and 89 controls who were also given the Tower

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of London (TOL), and the Wisconsin Card Sorting Test. CHI severity was significant on 20 questions and TOL. Age at study had a significant effect on performance for all three tests. Interactions of CHI severity with age and task complexity were present on TOL. Scores on all three tests had moderate intercorrelations. These findings support the usefulness of a subject-ordered procedure that evaluates the strategy of information gathering from a developmental perspective.
Correspondence: *Harvey Levin, Department of PM&R, A-205, 1333 Moursund, Baylor College of Medicine, Houston, TX 77030, USA.*

V.A. ANDERSON, S.M. MORSE, C. CATROPPA, F. HARITOU, G. KLUG, & J. ROSENFELD. Predicting Recovery From Head Injury in Preschool Children: A Prospective Analysis.
The consequences of brain injury on the developing brain are poorly documented, possibly due to the complexities associated with studying outcome in young children. Ongoing cognitive and neural development and psychosocial factors may interact with injury factors, making outcome prediction difficult. This study aimed to address these factors using a sample of head-injury children ($N = 60$), ages 1–6 years, divided into three groups according to injury severity, and a healthy control sample ($N = 20$), matched for premorbid ability and age. Children were evaluated acutely and at 6, 12 and 24 months postinjury, using measures of language, memory and intellectual ability. Results show that premorbid ability, psychosocial factors, and injury severity together predict acute test performance, with injury severity less predictive of later scores.
Correspondence: *V.A. Anderson, Department of Psychology, University of Melbourne, Parkville, Victoria, 3052, Australia.*

K.O. YEATES, H.G. TAYLOR, D. DROTAR, S. WADE, T. STANCIN, & S. KLEIN. Preinjury Family Environment as a Determinant of Recovery From Traumatic Brain Injury in School-Age Children.
Previous studies of childhood traumatic brain injury (TBI) have emphasized injury-related variables rather than environmental factors as predictors of recovery. We addressed this concern using data collected during an ongoing prospective study of children with either TBI or orthopedic injuries (OI) and their families. Participants included 52 children with severe TBI; 56 with moderate TBI; and 80 with OI, all from 6 to 12 years of age at the time of injury. Child cognitive and behavioral outcomes were assessed shortly after the injury (baseline) and at 6- and 12-month followups. Measures of the preinjury family environment were collected at baseline. The latter measures consistently predicted individual differences in both cognitive and behavioral outcomes, even after taking into account group membership and ethnicity. They also predicted intraindividual change over time. Thus, preinjury environmental factors predict neurobehavioral outcomes following TBI in children, even after accounting for injury-related variables.
Correspondence: *Keith O. Yeates, Department of Psychology, Children's Hospital, Timken Hall, 700 Children's Dr., Columbus, OH 43205, USA.*

Paper Session 18/11:00 a.m.–3:20 p.m.

AGING—2

J. GRIGSBY, K. KAYE, J. BAXTER, S.M. SHETTERLEY, & R.F. HAMMAN. Executive Cognitive Abilities and Independent Functioning Among Older Persons.
This study evaluated the hypotheses that (1) the executive cognitive functions are important determinants of older persons' ability to engage in Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs), and (2) that the association is stronger for measures of observed performance than self-report measures. A sample of 1,358 adults between the ages of 60 and 99 was administered measures of general mental status (the Mini Mental State Exam), executive functioning (Behavioral Dyscontrol Scale), and depression (CES–D). They also were interviewed regarding their ability to engage in ADLs and IADLs, and were administered a measure of observed performance in ADL/IADL functioning (the Structured Assessment of Independent Living Skills). Multiple regression analyses, controlling for age, education, and ethnicity, provided strong support for both hypotheses. The measure of executive functioning explained a significant percentage of the variance on all eight dependent variables. These results suggest that the executive cognitive functions are important determinants of functional capacity, especially for the more complex items on the observed performance measure, such as managing medications and handling money. The Behavioral Dyscontrol Scale demonstrated reasonable ecological validity as a predictor of everyday functioning among older adults.
Correspondence: *Jim Grigsby, University of Colorado Health Sciences Center, Center for Health Services Research, 1355 South Colorado Blvd. #306, Denver, CO 80222, USA.*

G.E. SWAN, D. CARMELLI, T.E. REED, & G.P. JARVIK. The Relationship Between Apolipoprotein E ϵ4 and Neuropsychological Test Performance in Nondemented Older Adults.
Relatively few studies have reported a relationship between the allelic variant ϵ4 of the gene for ApoE and lower levels of cognitive performance in *nondemented* elderly adults. To examine the relationship between ϵ4 status and neuropsychological performance, we used data from 574 subjects free of dementia and stroke from the NHLBI Twin Study who were genotyped for ApoE and assessed on cognitive function during the third examination of this panel. Mean age of subjects during the third examination cycle was 63 (range 59–70); a total of 149 subjects (26%) were carrying at least one ϵ4 allele. After adjustment for age and education *t*-test comparisons revealed carriers of the ApoE ϵ4 allele to have significantly lower performance on the Iowa global impairment score, [$t(567) = 2.24$, $p < .03$], and on its visual memory subtest, the BVRT, [$t(568)_{\text{total correct}} = 2.58$, $p < .01$, $t(567)_{\text{total errors}} = -1.98$, $p < .05$]. No significant differences between carriers and noncarriers on the digit symbol test or on the MMSE were observed. These results suggest that the presence of the ApoE ϵ4 allele in nondemented older adults is associated with subtle, but detectable decrements on a measure of global impairment that is based primarily on visual memory performance.
Correspondence: *Gary E. Swan, Center for Health Sciences, Stanford Research Institute, Menlo Park, CA 94025, USA.*

A. LaRUE, G.E. SWAN, & D. CARMELLI. Glucose and Neuropsychological Performance in Older Adults: A Prospective Association.
Associations between diabetic status, fasting blood glucose levels, and cognitive performance were examined in aging men participating in a long-term epidemiologic cardiovascular study, the Western Collaborative Group Study. Mean scores for diabetic and nondiabetic subgroups were compared, and within each group, age- and education-adjusted correlations were computed between blood glucose levels and cognitive test scores. There were relatively few associations cross-sectionally between diabetic status or glucose levels based on data collected on 1,023 participants (887 nondiabetic, 78 diabetic) in 1986–88. However, blood glucose levels in 1986–88 in nondiabetics retested in 1992 were significantly correlated with cognitive performance 5 years later on tests of psychomotor speed and cognitive flexibility and on delayed free recall of a word list. Mild problems in glucose metabolism may affect neurotransmitter function.
Correspondence: *Asenath La Rue, Department of Psychiatry, University of New Mexico, Albuquerque, NM, 87131, USA.*

M. SANO, D. DEVANAND, D.M. JACOBS, & Y. STERN. Effects of Age and Depressed Mood on Cognition in Community Dwelling Elders.
We have previously demonstrated reduced performance on memory and timed attention tasks in nondemented elders with depressed mood. Since both memory and speeded tasks are thought to be affected by age we examine the possible interaction between depressed mood and age in this cohort. Two components of memory and two aspects of attention were examined. Depressed mood was associated with lower performance on immediate recall, and rate of performance on attention tasks. Increased age was associated with lower performance on all aspects of memory as well

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as all aspects of attention. There was an interaction between age and depression on rate of performance, but not on accuracy or on any aspect of memory. These results suggest that the effects of age and mood on cognition are different with evidence of a synergistic effect on attention but not on memory.
Correspondence: *Mary Sano, Sergievsky Center, 630 West 168th Street, New York, NY 10032, USA.*

D.M. JACOBS, N.R. ZUBIN, & Y. STERN. Aging, Encoding Strategies, Verbal Recall and Working Memory.
We examined whether age-associated declines in the use of encoding strategies and recall memory reflect decreased working memory capacity. Healthy young and elderly subjects were administered two semantically-related word lists, one list with words blocked into their categories, the other with categories intermixed. Tests of working memory, language, and abstract reasoning were interspersed with the memory tasks. Contrary to our predictions, the relative benefits of blocked presentation on recall measures were comparable for young and elderly subjects. Recall was more strongly associated with category fluency than with measures of working memory or abstract reasoning. Results suggest that age-associated declines in verbal memory are not a function of decreased working memory capacity, but may be associated with a breakdown in the structure of semantic knowledge.
Correspondence: *Diane M. Jacobs, GH Sergievsky Center, 630 West 168 Street, New York, NY 10032, USA.*

E.D. RICHARDSON & R.A. MAROTTOLI. Cognitive Aspects of Driving Behaviors Among Community Residing Older Persons: The Role of Visual Attention.
Older drivers have a higher incidence of crashes per mile driven than younger drivers, and these crashes are associated with greater morbidity and mortality. Studies have suggested that cognition is an important determinant of driving risk. The current study was undertaken to identify the cognitive factors associated with driving performance among older adults, and to determine which common maneuvers in driving were related to cognition. Thirty-five active drivers over the age of 75 underwent a battery of cognitive tests and a standardized on-road driving evaluation. Results indicated that driving performance is associated with visual attention and executive function. Specific driving behaviors that place high demands on these areas of cognition among older persons include left-hand turns, speed regulation, and distance estimation.
Correspondence: *Emily D. Richardson, Department of Medicine, Yale University School of Medicine, YNHH: TMP-15, 20 York Street, New Haven, CT 06504, USA.*

Paper Session 19/11:00 a.m.–12:30 p.m.

NEGLECT

K. J. MEADOR, D.W. LORING, G.P. LEE, & M.E. NICHOLS. Anosognosia and Asomatopagnosia During Intracarotid Amobarbital Inactivation.
Anosognosia (i.e., denial of hemiparesis) and asomatopagnosia (i.e., inability to recognize the affected limbs as one's own) are reported to occur more frequently following right cerebral lesions. Prior studies of the recall of deficits following recovery from intracarotid amobarbital generally support this left/right dichotomy. However, the incidence and relative recovery of anosognosia and asomatopagnosia during right cerebral amobarbital inactivation have not been studied. We examined these phenomena in 30 patients undergoing preoperative evaluation for epilepsy surgery. During inactivation of the non-language-dominant hemisphere (29 right, 1 left), 100% of the patients exhibited anosognosia and 83% displayed asomatopagnosia. Recovery from asomatopagnosia occurred earlier than anosognosia, suggesting that it requires greater cerebral dysfunction. Anosognosia and asomatopagnosia are extremely common during dysfunction of the non-language hemisphere.
Correspondence: *K.J. Meador, Department of Neurology, Medical College of Georgia, Augusta, GA 30912, USA.*

R.L. SCHWARTZ, A.M. BARRETT, M. KIM, & K.M. HEILMAN. Ipsilesional Intentional Neglect and the Effect of Cueing.
Although spatial neglect commonly refers to contralesional defects following right hemisphere injury, we studied a right frontal stroke patient (R.H.) with ipsilesional neglect. We classified R.H.'s neglect based on a line bisection task (LB) using a video apparatus that created an incongruous set where sensory-attentional (ATT) and motor-intentional (INT) systems were directed towards opposing hemispace. R.H. had a primary INT deficit to act in or towards right hemispace and a secondary ATT deficit for stimuli in left hemispace. We then performed a two-part LB-cueing experiment with both ATT (read the letter at the end of the line) and INT (touch the end of the line) components. As predicted, we found a double dissociation: the rightwards INT cue improved his ipsilesional directional hypokinesia and the leftwards ATT cue improved his contralesional sensory inattention.
Correspondence: *Ronald L. Schwartz, University of Florida, Department of Neurology, 653 West 8th Street, Jacksonville, FL 32209, USA.*

J.C. ADAIR, D.L. NA, R.L. SCHWARTZ, & K.M. HEILMAN. Analysis of Primary and Secondary Bias in Neglect.
Using a video-based apparatus, we decoupled perceptual from premotor influences on line bisection performance in patients with hemispatial neglect and examined the relationship between bias type and lesion location. Primary attentional bias (AN) was found in 16 of 26, most of whom had lesions involving the posterior hemisphere. Primary intentional bias (IN) was associated with lesions of frontal–subcortical structures. Secondary bias was determined based upon whether decoupling decreased magnitude of deviation (concordant) increased deviation (discordant), or produced no secondary bias. Most patients showed secondary bias with 12 of 26 in the discordant group and 11 of 26 in the concordant group. Discordant secondary bias was more common in IN (7/10) than in AN (4/16) whereas concordant bias was more common in AN (10/16) than IN (1/10).
Correspondence: *John Adair, Department of Neurology, University of New Mexico, 2211 Lomas Blvd. NE, Albuquerque, New Mexico 87131, USA.*

V.W. MARK, C.V. FREDRICKS, & N. MONSON. Manual Cancellation Scanning Patterns in Acute Hemispheric Stroke and Age-Matched Control Subjects.
Cancellation sequences and temporal characteristics may be as affected by brain injury as is cancellation accuracy. We evaluated healthy and acute left or right hemisphere stroke patients on several measures of cancellation sequence and timing. We corroborated the observation that lesion laterality biases early orientation ipsilaterally. Left hemisphere damage significantly increased the time to search for individual targets. The groups differed insignificantly on measures of search organization, with right hemisphere lesion nonetheless causing the most disorganized search. Our results suggest that the laterality of cerebral injury may specifically disturb different aspects of cancellation scanning.
Correspondence: *Victor W. Mark, Department of Neuroscience, UND Medical Education Center, 1919 Elm Street North, Fargo, ND 58102, USA.*

D. GELDMACHER & A. KORI. Late-Emerging Ipsilateral Neglect Following Right Anterior Choroidal Artery Infarction.
Ipsilateral neglect on line bisection has been reported for short line segments and following frontal lesions. We report a case of late-emerging ipsilateral neglect following cerebral infarction in the distribution of the right anterior choroidal artery. Initially, the patient demonstrated left hemispatial neglect. He misbisected horizontal 250 mm line segments 42.6 ± 19.3 mm to the right to true midpoint. Line bisection performance was improved after 4 months, with reduction in the mean error to 22.4 ± 6.1 mm right of center. After 10 months, line bisections were made 26.0 ±

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4.9 mm to the *left* of true center. Bisection errors in radial and vertical axes improved, but there was no reversal of bisection direction. Frontoparietal disconnection and resolution of directional hypokinesia are postulated as the mechanisms underlying the emergence of ipsilateral neglect.
Correspondence: *David Geldmacher, Alzheimer Center, University Hospitals of Cleveland, 12200 Fairhill Road, Cleveland, OH 44120, USA.*

M. KIM, D. NA, K. KIM, J. ADAIR, R. SCHWARTZ, & K. HEILMAN. Ipsilesional Neglect: Incidence, Behavioral, and Anatomic Features.
To learn the incidence, behavioral and anatomic features of ipsilesional neglect (IN) we studied 30 patients with neglect with cancellation and line bisection tasks. We also used a video apparatus that dissociates perceptual–attentional from premotor–intentional determinants of performance. Six (20%) patients showed evidence of IN. IN was observed only in the line bisection tasks. Three patients evolved during recovery from contralesional neglect. All cases had lesions involving frontal–subcortical circuits. Four patients showed a perceptual–attentional ipsilesional bias and 2 patients showed premotor–intentional ipsilesional bias. These results are compatible with an account of IN as resulting from stimulus-dependent "approach" behavior toward the left side of percept space after right brain injury.
Correspondence: *Kenneth M. Heilman, Department of Neurology, University of Florida, P.O. Box 100236, Gainesville, FL 32610-0236, USA.*

Special Topic Speaker/11:00 a.m.–12:30 p.m.

SPACE NEUROSCIENCE

David Liskowsky

SATURDAY AFTERNOON, FEBRUARY 8, 1997

Paper Session 20/1:30–3:20 p.m.

FRONTAL LOBES—2

R. KRIKORIAN. Cognitive Planning Ability As Measured by the Porteus Maze Test Predicts Aspects of Mood and Personality Functioning.
This study was designed to be an initial exploration of the relationships among planning ability and certain aspects of mood and personality functioning in a nonclinical sample. Ninety-four undergraduate participants were administered mood and personality scales along with a cognitive protocol including the Porteus Maze Test (PMT) and measures of attention and new learning ability. Poorer performance on the PMT was associated with greater depression and anger, decreased vigor, and greater overall mood disturbance. Also, performance on the PMT was negatively related to the personality trait factor, *Organization*, an index of orderliness and discipline in daily activities. These data suggested that while enhanced emotional distress was related to less efficient planning ability, greater internal cognitive planning capacity lessened the need for external organization.
Correspondence: *Robert Krikorian, Department of Psychiatry, University of Cincinnati College of Medicine, 231 Bethesda Avenue, Cincinnati, OH 45267-0559, USA.*

J.M. CUNNINGHAM, N.H. PLISKIN, & J.E. CASSISI. Predicting Confabulation With Measures of Memory and Executive Function.
Confabulation has been associated with memory impairment and executive dysfunction. Multiple regression analyses were conducted separately for three confabulation ratios using measures of memory (CVLT recognition hits) and executive function (WCST percent perseverative error and Trail Making Test Part B). For the 63 clinical patients in this study, the Trail Making Test Part B emerged as the only significant predictor of confabulation and accounted for 10 to 22 percent of the variance ($p < .01$). The WCST and CVLT scores did not contribute significantly ($p < .05$) to the predictive power beyond that provided by TMT B. These results lend further support for the critical role of executive dysfunction, as measured by the TMT B, in the production of confabulation.
Correspondence: *Joseph M. Cunningham, Department of Neurology, Section of Neuropsychology, MCW Clinic at Froedtert, 9200 West Wisconsin Avenue, Milwaukee, WI 53226, USA.*

M. LEDUC, L.M. GRATTAN, J.E. HERRON, D.R. GREENBERG, & P. J. ESLINGER. Deficits in Social Self-Awareness After Orbital Frontal Lobe Damage.
Isolated deficits in social self-awareness have been documented after frontal lobe damage. Although the precise clinical–neuroanatomic correlations remain unknown, the possibility was raised that the orbital frontal lobe may provide the neural substrate for this specialized form of awareness. To test this hypothesis, 5 patients with focal, orbital frontal lobe damage were compared to 6 patients with restricted posterior ventromedial (PVM) damage on a self-awareness measure. Findings indicated the orbital frontal group demonstrated specific alterations in social self-awareness with no self-knowledge deficits in cognitive or instrumental domains. The direction of their social self-awareness deficits was toward overestimating their social difficulties. The PVM group demonstrated no awareness deficits. The orbital frontal regions may play an important, specialized role in monitoring social self-awareness.
Correspondence: *Lynn M. Grattan, Department of Neurology, University of Maryland Medical School, 22 S. Greene Street, Baltimore, MD 21201, USA.*

P.M. PLENGER, J.I. BREIER, N. MULLANI, J.W. WHELESS, B.L. BROOKSHIRE, A.B. THOMAS, A.C. PAPANICOLAOU, & L. J. WILLMORE. Asymmetries in Frontal Lobe Glucose Uptake and Executive Functions in Temporal Lobe Epilepsy.
Recently there has been debate regarding the role of the hippocampus in Wisconsin Card Sorting Test (WCST) performance in temporal lobe epilepsy (TLE). One hypothesis asserts that hippocampal structures are critical because of reliance on working memory for successful performance on this task. A competing hypothesis contends that it is not hippocampal dysfunction, per se, but rather frontal lobe involvement due to the secondary "distal" effect of seizure activity. The present study analyzed the relationship of resting asymmetries in glucose uptake as measured by PET to performance on the WCST (percent perseverative errors) in a series of presurgical idiopathic TLE patients (12 left, 11 right). An index of intrahemispheric asymmetry ([ipsi − contra/ipsi + contra] where ipsi = ipsilateral to the side of seizure onset) in glucose uptake was derived for homologous areas in the frontal as well as temporal lobes. Regression analysis indicated that the relationship between asymmetry, indices and performance on the WCST was significant only for frontal lobe areas [$F(1,20) = 10.24$, $p < .004$]. Further analysis indicated that, for frontal lobes, as asymmetry decreases, performance on the WCST decreases as well. This latter finding suggests that impaired performance on the WCST may be related to bifrontal lobe dysfunction in TLE.
Correspondence: *Patrick Plenger, Department of Neurosurgery, University of Texas Medical School, Houston, 6431 Fannin, Suite 7.148, Houston, TX 77030, USA.*

J. BORTZ, J. WONG, D. BLUM, G.P. PRIGATANO, & R.S. FISHER. Differential Verbal Learning and Memory Characteristics in Frontal Lobe Epilepsy.
Different factors are believed to mediate frontal versus temporal lobe memory dysfunction. We compared the performance of 14 patients with frontal lobe epilepsy (FLE) to 40 patients with left and right temporal seizure foci (LT, RT) on CVLT indices presumedly sensitive to frontal lobe impairment.

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Contrary to expectation, most FLE scores were indistinguishable from temporal lobe patients, as was the pattern of significant findings: FLE subjects produced fewer perseverative errors and failed to benefit from recognition cuing. Followup investigation compared performance of FLE, RT and LT subjects to 13 patients with static frontal lesions (FL-L), who demonstrated the classic constellation of frontal deficits. Differential mechanisms may underlie memory disorders associated with FLE *versus* FL-L. Theoretical issues, clinical implications, and directions for future research are discussed.
Correspondence: *Jennifer J. Bortz, Section of Neuropsychology, Barrow Neurological Institute, 222 W. Thomas Road, Suite #406, Phoenix, AZ 85013, USA.*

P. J. ESLINGER, J. HOEPPNER, & M.W. McCANNA. Developmental Plasticity in Executive Functions After Early Frontal Lobe Lesion.
Studies were completed over 8 years in a male adolescent who sustained right dorsolateral prefrontal cortex lesion (Brodmann's areas 9 and 46) at 3 years of age. Striking difficulties have been observed in development of certain executive functions in social (self-regulation, self-awareness and empathy) and cognitive domains (attentional control, spatial planning, nonverbal problem solving, and organizational strategies in learning). Measured intellect, language and perception have been average. Behaviorally, impulse control has been evident but he lacks sensitivity in social settings. Social skills training has been moderately beneficial but family members continue to structure interactions and provide cues about inappropriate social responses. Findings support a crucial role for right dorsolateral prefrontal cortex in development of certain executive functions subserving spatial cognition and social behavior.
Correspondence: *Paul J. Eslinger, Division of Neurology, Hershey Medical Center, 500 University Drive, Hershey, PA 17033, USA.*

Paper Session 21/1:30–3:20 p.m.

DEMENTIA—5

M.F. MENDEZ, M.M. CHERRIER, & K.M. PERRYMAN. Differences Between Alzheimer's Disease and Vascular Dementia on Information Processing Measures.
This study evaluated information processing differences between 30 vascular dementia (VaD) patients, 30 Alzheimer's disease (AD) patients, and 30 normal elderly (NE) controls. The patients were administered a complex reaction time test, a continuous performance test (CPT), and a neuropsychological battery. Compared to NE controls, both dementia groups had significantly slower motor reaction times and made more errors on the CPT. Compared to AD, the VaD patients were even slower in stimulus categorization time and had increasing omission errors and persistent commission errors throughout the CPT trial. VaD, which usually includes frontal–subcortical circuit injury, differentially impairs mental speed and stimulus response initiation and inhibition.
Correspondence: *Mario Mendez, Neurobehavior Unit (691/116AF), West Los Angeles VA Medical Center, 11301 Wilshire Blvd., Los Angeles, CA 90073, USA.*

S.P. CERCY, F.W. BYLSMA, & J. BRANDT. Longitudinal Correlates of Neuropathologically Confirmed Lewy Body Disease: Comparison With Alzheimer's Disease.
The clinical syndrome of mixed Lewy body disease (MLBD) remains poorly understood. This study contrasted longitudinally the clinical characteristics of patients with MLBD and patients with Alzheimer's disease (AD). Fifteen MLBD patients were matched on age and education with 15 AD patients. At baseline, MLBD patients displayed greater behavioral disturbance than AD patients. Over a 3-year period, MLBD patients showed more rapid global cognitive decline, and earlier and more severe movement disorder and physical dependency. Reliable predictors discriminating between MLBD and AD at baseline (86% accuracy overall) were greater behavioral disturbance and absence of hallucinations. The results represent the first description of clinical progression in a group of MLBD patients and help establish preliminary criteria for the reliable differential diagnosis of MLBD and AD.
Correspondence: *Steven P. Cercy, Department of Psychiatry and Behavioral Sciences, Jefferson Medical College, Wills Eye Hospital, 8th Floor, 900 Walnut Street, Philadelphia, PA 19107, USA.*

T. LINEWEAVER, D. SALMON, W. HEINDEL, & J. PAULSEN. Memory for Motor Movements in Patients With Alzheimer's and Huntington's Disease.
Previous demonstrations that motor skill learning is spared in Alzheimer's disease (AD) patients but impaired in Huntington's disease (HD) patients suggests that this learning is mediated by the basal ganglia structures damaged in HD, and not by cortical/hippocampal structures affected in AD. A question that remains is whether explicit memory for motor movements is mediated by basal ganglia or cortical/hippocampal structures. This study compared 14 AD patients, 14 HD patients, 20 young normal controls and 20 elderly normal controls on a movement memory recognition test that utilized high and low imagery movements. Both AD and HD patients were impaired, but did not differ from one another. Thus, explicit memory for movements may depend on the integrity of both basal ganglia and cortical structures.
Correspondence: *Tara L. Lineweaver, VA Medical Center, Room 116B, 3350 La Jolla Village Drive, San Diego, CA 92161, USA.*

M.C. CARLSON, J. BRANDT, L. KRAFFT, & T. HEITZMAN. Attentional Impairment in Presymptomatic HD Patients.
Early cognitive symptoms typically associated with Huntington's disease (HD) include deficits in concentrating, organizing information, and benefiting from the regularity or predictability of spatial movements. We tested the possibility that preclinical HD is associated with early changes in the ability to use spatial cues to isolate target information amidst distraction. To do this, we used a brief reading with distraction task to examine reading time and comprehension in the absence *versus* presence of distraction (marked by font type) in either predictable or unpredictable locations. In a single-blind study, 22 healthy individuals who tested positive and 26 individuals who tested negative for the genetic mutation responsible for HD were given the reading with distraction test and the Quantitative Neurologic Exam (QNE). Results indicated that the presentation of distraction in fixed predictable relative to unpredictable locations amidst target text facilitated the performance of HD mutation-negative controls but did not facilitate the performance of HD mutation-positive participants. Thus, this brief test appears to be a sensitive preclinical indicator of attentional changes associated with HD.
Correspondence: *Michelle C. Carlson, Division of Medical Psychology, Psychiatry & Behavioral Sciences, Johns Hopkins Hospital, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

J. CAMPODONICO, E. AYLWARD, A.M. CODORI, & J. BRANDT. Cognitive and Neurologic Correlates of Striatal Atrophy in Healthy Persons Carrying the Genetic Mutation for Huntington's Disease.
This study examined whether estimated volume of the neostriatum (caudate + putamen) correlated with cognitive performance and neurologic functioning in 13 healthy adults with the Huntington's disease (HD) mutation. After controlling for age, those persons with smaller striatal volumes on MRI had higher neurological impairment scores and displayed slower mental speed and worse verbal learning than those with larger volumes, although none met even liberal criteria for diagnosis. The correlates of striatal size in our healthy subjects parallel those observed in symptomatic HD patients with more advanced striatal pathology, possibly reflecting the earliest manifestations of disease.
Correspondence: *Jeffrey Campodonico, Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

R. FAMA, E.V. SULLIVAN, P.K. SHEAR, D.A. CAHN, J.A. YESAVAGE, J.R. TINKLENBERG, & A. PFEFFERBAUM. Verbal and Nonverbal Fluency Performance in Alzheimer's Disease and Parkinson's Disease.
This study examined verbal and nonverbal fluency in normal aging, Alzheimer's disease (AD), and Parkinson's Disease (PD). We compared 38 AD, 20 PD, and 51 normal controls (NC) on semantic, phonological, and nonverbal

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fluency tasks. AD patients were significantly impaired relative to PD and NC on all three fluency measures. Fluency impairment in AD may indicate either a generalized deficit in spontaneous generation of information or separate deficits in phonological and visuospatial as well as semantic processing. PD patients were significantly impaired compared to NC on nonverbal and semantic fluency tasks, but not on the phonological fluency task. This pattern of impairment suggests disability in generating information is not a generalized deficit in PD. Furthermore, semantic and nonverbal fluency performance show significant decline in normal aging and thus, may be particularly susceptible to age-related neurodegenerative diseases.
Correspondence: *Rosemary Fama, Psychiatry Service, VA Palo Alto Health Care System, Palo Alto, CA 94304, USA.*

Paper Session 22/1:30–3:20 p.m.

TRAUMATIC BRAIN INJURY

G. IVERSON, M. LOVELL, & S. SMITH. Does Brief Loss of Consciousness Affect Cognitive Functioning After Mild Head Injury?
Loss of consciousness often is considered an important variable when estimating head injury severity. The purpose of this study was to determine if loss of consciousness had any effect on the neuropsychological test performance of patients in acute recovery from a mild head injury ($N = 195$). Three groups of 65 patients were given a brief battery of neuropsychological tests within 1 week of sustaining a mild head injury. The groups, sorted on the basis of loss of consciousness (i.e., positive, negative, or equivocal), did not differ in age or education. There were not significant differences among the groups on any of the measures of attention, learning, memory, language, or executive functioning.
Correspondence: *Mark R. Lovell, Department of Psychiatry, Section of Psychology and Neuropsychology, Allegheny General Hospital, 320 East North Avenue, Pittsburgh, PA 15212, USA.*

R.N. DOWLER, D.L. HARRINGTON, K.Y. HAALAND, R.M. SWANDA, F. FEE, G.A. MALLORY, & K. FIEDLER. Profiles of Cognitive Functioning in Spinal Cord Injury and the Role of Moderating Variables.
Spinal Cord Injury (SCI) from a traumatic event such as a motor vehicle accident or a fall frequently is accompanied by a head injury. This study investigated whether clinically useful subtypes of normal and impaired cognition could be identified in a chronic SCI sample using a cluster analysis of neuropsychological test performance. A battery of 16 neuropsychological tests was administered to 91 SCI subjects and 75 control subjects. Composite scores for each factor were computed from a factor analysis of the battery, and these scores were then used in the cluster analysis. A six-cluster solution generated the most distinct and clinically relevant group profiles, which subsequently were validated through a blind sorting procedure and profile analysis techniques. The cognitive profiles were distinguished largely by normal or diminished functioning in the areas of memory, attention, processing speed, and/or executive functioning. Though the cognitive profiles may be directly related to the injury, age and premorbid intellectual ability were strong predictors of the profiles in some groups. Thus, the independent or combined effects of these moderator variables and a head injury may explain the different patterns of cognitive functioning after a SCI from a traumatic event.
Correspondence: *D.L. Harrington, Psychology 116B, VAMC, 2100 Ridgecrest Drive SE, Albuquerque, NM 87108, USA.*

D.X. CAPRUSO, D.L. MARASCO, & K.DES. HAMSHER. Persistent Postconcussive Syndrome: Relationship to Simulation of Malfunction and Psychopathology.
Thirty patients with persistent postconcussive syndrome (PPCS) were evaluated to determine whether their cognitive deficits were related to recovery time elapsed since trauma *versus* symptom invalidity and psychopathology. Symptom overendorsement on the MMPI–2 F Scale was predictive of disturbance in attention–concentration, but not memory deficit, on cognitive testing. Simulation of malfunction and the presence of psychopathology were associated with cognitive deficit in PPCS, whereas recovery time since trauma had no relationship to cognitive performance. These findings suggest that the cognitive deficits apparent in many patients with PPCS are related to simulation of deficit, symptom overendorsement, or the presence of psychopathology.
Correspondence: *Daniel X. Capruso, Neurodiagnostic Laboratory (B4), Buffalo General Hospital, 100 High Street, Buffalo, NY 14203, USA.*

M. MORRIS, J. LEWIS, C. DAVIS, & N. KRAWIECKI. Facial Affect Perception and Social Competence in Children With Acquired Brain Injuries.
Children with acquired brain injuries exhibit impairments in social–emotional functioning on parent report measures, but the specific behavioral deficits that impact their social competence have not been directly investigated. Facial affect perception was assessed in children with acquired brain injuries, and its relationship to parent ratings of social competence was explored. Children with traumatic brain injuries and brain tumors made more errors than normal controls on a facial affect perception task. Those children whose brain injuries occurred earlier in development were more impaired, consistent with previous findings of more significant cognitive deficits in children with earlier insults. The clinical relevance of these deficits is supported by their significant association with parent-rated social competence on two independent measures.
Correspondence: *Mary Morris, Department of Psychology, Georgia State University, Atlanta, GA 30303-3083, USA.*

C. FLAHERTY & P. ESLINGER. Impaired Lexical Access in Closed Head Injury: Selective Effects of Frontal Lobe Trauma on Semantic Fluency.
Lexical access measures require implementing either novel or routine search strategies for retrieving semantic knowledge. Paradigms typically provide a letter (novel) or category (routine) cue. We hypothesized that these tasks would differentiate mild *versus* severe traumatic brain injury (TBI) following closed head injury (CHI), with classification by either Glasgow Coma Score (GCS) or lesion site. Thirty CHI subjects were studied in the postacute recovery phase. Group differences were evident in total responses, classified by either GCS ($p < .02$) or lesion site ($p < .0006$), with higher category than letter fluency scores (GCS: $p < .006$; lesion site: $p < .0001$), but with no significant interaction effect. *Post-hoc* analysis attributed most of the GCS groups difference to fewer category responses after severe CHI, while that of the lesion groups was referable to fewer category responses within the frontal lesion group. While mild–moderate CHI affected novel lexical search and retrieval, severe CHI affected both routine and novel lexical search and retrieval. Furthermore, radiology classification associated the loss of both routine and novel search and retrieval ability with the presence of frontal lobe lesions.
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M. SHERER, P. BERGLOFF, W. HIGH, C. BOAKE, & K. GOLLAHER. Contribution of Impaired Self-Awareness to Predicting Employment Outcome After Traumatic Brain Injury.
Impaired self-awareness is a frequent symptom of traumatic brain injury (TBI) that is thought to influence patient outcome. However, there has been little investigation of the relative contribution of impaired self-awareness to outcome as compared to other factors such as severity of injury, chronicity, preinjury employment status, and level of cognitive functioning. The present study investigated prediction of employment outcome in TBI patients with the four measures mentioned above and a measure of patient self-awareness in a sample of 53 TBI survivors using multiple regression. Predictors selected in the best model included patient self-awareness, severity of injury, and level of cognitive functioning. Results supported clinician impressions that degree of patient impaired self-awareness influences employment outcome.
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