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Abstracts

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**ADULT GRAND ROUNDS****Moderator: Rick Naugle****AGR1****Reversible frontotemporal dementia: verbal fluency content says it all***Walker LA, de Meulemeester C*

A 55-year-old gentleman (M.M.) presented with the cognitive and behavioural profile typically observed in frontotemporal dementia in the context of a diagnosis of spontaneous intracranial hypotension (SIH). Objective: Our goal is to expand upon the only other case report in the literature with this presentation of SIH (Hong et al., 2002), particularly with regard to useful assessment tools, and to illustrate that early diagnosis and treatment can hasten and maximize recovery of cognitive functions. Method: M.M. was healthy until 8 weeks prior to admission to the Neurology in-patient service. Symptoms then included severe orthostatic headache, as well as cognitive and personality changes. Diagnostic investigations included CT, EEG, and MRI (documenting pachymeningitis). He underwent neuropsychological evaluations both prior to, and following, treatment with a tapering dose of corticosteroids. Results: The initial neuropsychological evaluation documented significant cognitive impairment with a predominance of executive dysfunction. Following treatment a second evaluation revealed a marked improvement in both cognition and behaviour, such that most aspects of functioning reached estimated pre-morbid levels. Conclusions: Discussion highlights the utility of using both quantitative and qualitative measures of executive functioning. Regarding the latter, it is emphasized that process variables (e.g., verbal fluency content) can often be similarly revealing as normative-based comparisons in terms of their ability to reflect underlying dysfunction. The need for rapid diagnosis and treatment of SIH to yield a favourable cognitive and behavioural outcome is also discussed.

**AGR2****Neuropsychological and neuropsychiatric manifestations of acute and recovered Cushing's disease***Sarazin F, Antochi R*

Objective: Cushing's disease (CD) has been associated with a variety of neurocognitive and psychiatric manifestations. While gradual improvement occur after treatment and return of cortisol levels to normal, residual cognitive sequelae may remain. Given the dearth of longitudinal studies, these have yet to be described. The present case report delineates neurocognitive and neuropsychiatric manifestations during acute CD and following recovery. Method: This is a single case study of a 42-year-old premorbidly high functioning elementary teacher with no prior psychiatric history diagnosed with CD following two years of gradual CD-related changes in health and physical appearance. Despite initial treatment with transphenoidal hypophysectomy, hypercortisolemia with its associated medical and psychiatric complications persisted. She derived limited benefit from psychotropic medication and subsequently underwent bilateral adrenalectomy. Neuropsychological assessments were conducted pre- and post-adrenalectomy. Results: Significant pre-surgical cognitive deficits were documented in complex attention, speed of processing, expressive language, visuoconstruction, visual orga-

nization, abstraction, problem solving, executive functions, memory, and learning. Verbal and visual abilities were equally affected. Six months post-adrenalectomy, higher mental functions had significantly improved to generally within high average and superior ranges. Residual mild–moderate deficits persisted in visual memory and learning, visual planning and complex visuoconstruction, as well as attention under conditions of interference. Psychotropic medication was no longer required and psychiatric symptoms had completely resolved. Conclusion: Neurocognitive and neuropsychiatric changes associated with sustained hypercortisolemia are reversible with stabilization of cortisol. In this single case report, residual cognitive sequelae were highly circumscribed, self-limiting, and reflected greater visual processing deficits.

**AGR3****TBA****FORENSIC GRAND ROUNDS****Moderator: Robert L. Denney****FGR1****Competency assessment guideline based on a case of someone found permanently incompetent from dementia who was later found not to have dementia***Stewart R, Vega J*

Objective: To suggest evaluation guideline based on a case of someone found permanently incompetent due to dementia (with charges dropped) who, two years later following another charge, was found not to have dementia. Method: Mr B was charged with drug and driving violations in January of 2000 after a traffic accident. He had four evaluations in 2000 and 2001, and was found permanently incompetent in 2002. After new charge in 2004 he was found incompetent based on previous evaluations. Previous and current evaluations are compared. Results: The previous evaluators (MDs, PhD) performed outpatient evaluations without significant other interview and with some, but not comprehensive, cognitive or effort assessment. While scores were poor (such as a Mini Mental State of 16), some were so poor as to suggest effort problems (2 of 50 on the CAST-MR). Effort/malingering tests were not given. In 2004 he was admitted to a forensic hospital. Effort tests showed good effort, he had a Mini Mental State of 30, and some minor cognitive problems. In the state where this evaluation was done (Colorado) funding for competency evaluations is limited. Conclusion: Results would suggest that (a) significant other interviews be incorporated for outpatient evaluations; (b) atypical patterns prompt a recommendation for more thorough and/or inpatient assessment including a standard neuropsychological test battery; (c) effort tests be given when cognitive problems are a cause of the incompetency.

**FGR2****Chronic fatigue syndrome and alexithymia: a multiplicative interaction***Schutz LE, Schutz JA*

Objective: Chronic fatigue syndrome, once regarded as a dubious taxon, is accepted by NIH and addressed by a growing neuropsychological literature. British neurologists call it myalgic

encephalomyelitis. It is a diagnosis of exclusion of, among others, affective and somatoform disorders. Because the condition creates unusual vulnerability to exertion and stimulation, valid behavioral presentations can include a wide range of unusual symptom patterns. Method: A full neuropsychological IME was conducted at the patient's home at the carrier's request. Results: This case met CDC criteria, with disabling fatigue, weakness, irritability, headache, photophobia, and marked loss of recent memory and attention shown on alternate forms readministered late in sessions. This attorney had been receiving disability benefits for 15 years, while home-schooling two young, disabled daughters. She showed striking symptom variability, progressing to and then recovering fully from marked, dramatic symptomatology across 4-h sessions, contradicting her self-report. Her inconsistency, in context of potential secondary gains, raised concerns about symptom validity. Conclusions: The CARB, TOMM, MMPI-2, and close observations instead depict a markedly driven, lifelong alexithymic coping style of investing extreme effort whenever possible. This pattern is known to aggravate chronic pain disorders, and in this case aggravated her fatigue and consequent cognitive impairment and physical disability. Self-insight was virtually nil. The insurer's in-house neuropsychologist concurred, describing the behavior as "a fascinating pattern I have never seen in many years and thousands of cases."

### **FGR3**

#### **Forensic evaluation of a mold (repeated water intrusions) neurotoxicity case**

*Singer RM*

Objective: The scientific literature supports the possibility of neurotoxicity with extended exposure to repeated indoor water intrusions and mold development. This case expands the existing literature and demonstrates a method for presenting forensic neuropsychological data. Method: A 54-year-old woman, with two children and 14 years of marriage, divorced after the onset of her illness, had successfully owned and managed two businesses, and was actively self-employed at the time of examination, albeit at a reduced level of function. After relocation to a domicile subject to repeated water intrusions from a poorly designed roof and periodic ground flooding, she developed pain, difficulty with concentration and memory, headaches, light sensitivity, sleep disorder, depression, and weight gain. Visible mold, and mold counts elevated more than three times the recommended limit at more than one site in the domicile were found, including 1,035,790 CFU/m<sup>3</sup> *Stachybotrys chartarum*. Mayo Clinic diagnosed her with fibromyalgia. Elevated mycotoxin antibodies were found. Results: Premorbid cognitive function was estimated to be at the 84th percentile. The Neurotoxicity Screening Survey showed a constellation of symptoms consistent with neurotoxicity. Deficit findings included WAIS-III Perceptual Organization, 32nd percentile and Processing Speed, 39th percentile; Ruff Selective Reminding, 2nd percentile; Stroop Color–Word Test, 18th percentile; and Army Trailmaking Test, 24th percentile. Mood, emotions, and personality were well within normal limits. Conclusions: This case illustrates classic findings of neuropsychological dysfunction following exposure to a known neurotoxic situation (repeated water intrusions), albeit with few case reports in the neuropsychological literature.

**PEDIATRIC GRAND ROUNDS****Moderator: Philip S. Fastenau****PGR1****Cognitive decline in a Latino boy with multiple sclerosis***MacAllister WS, Krupp LB, Milazzo M, Christodoulou C, Belman A*

**Objective:** Though multiple sclerosis (MS) is considered a disease of young adulthood, as many as 5% of cases experience onset prior to age 18. Onset before puberty is rare. A small body of research describes deficits experienced by these individuals. Longitudinal cognitive changes in a pre-pubescent Latino boy are presented. **Method:** A 4-year-old bilingual Latino boy developed a ‘flu-like’ illness followed by optic neuritis and ataxia one month later. MRI demonstrated multiple white matter lesions. He was treated with steroids and was clinically stable for one year. However, follow-up MRI demonstrated new lesions. At the age of 6 he developed hemiparesis and ataxia with more lesions on MRI. He was again treated with steroids and then placed on interferon beta-1a. Brief neuropsychological screening was within normal limits, though there were mild reading deficits. In the next 18 months he experienced five subsequent relapses. **Results:** Neuropsychological reevaluation at the age of 8 demonstrated decline. Complex and sustained attention were impaired. Retrieval deficits were evident for verbal memory. Graphomotor construction declined from baseline. Word finding was severely impaired, even when responses were allowed in Spanish or English. Grip strength and dexterity were severely impaired bilaterally. **Conclusions:** This case demonstrates cognitive decline in a Latino boy with MS that appear related to the severity of disease activity. Consistent with findings in adult MS, memory and attention were affected. Interestingly, word finding, a function less frequently affected in adult MS, was an area of severe deficiency even when allowances were given for bilingualism.

**PGR2****The girl most likely to succeed, severe TBI and all***Schutz LE*

**Objective:** To describe an unusually strong recovery from a severe and focally-disabling traumatic brain injury. This 16-year-old honor student suffered head trauma when her car skidded laterally into a tree. At the point of impact, she suffered a left parietal contusion, hematoma, and intraventricular bleed. She remained in coma for 17 days. Neuropsychological testing found profound speed, executive, mnemonic, and reading comprehension deficits. **Method:** She was provided with intensive postacute cognitive rehabilitation in a holistic-model program, augmented by a module for preparing students to return to school. **Results:** Using the rigorous information processing and organizational strategies, initially under the guided supervision of her mother but ultimately with full independence, she returned to her track of honors and AP courses and finished with straight A's. At the large public university close to her home, neuropsychologist and mother both aided her professors to honor her accommodations: tape recording all lectures and receiving extended testing time. She received her BA summa cum laude with a 3.95 GPA, and pursues a career as an English teacher. **Conclusion:** This case illustrates the exceptional, generalized academic recovery that can be

attained with sufficient motivation, persistence, family support, and the requisite compensation strategies.

### **PGR3**

#### **When family history is critical to the diagnosis: deaf siblings with language delays**

*Morere D*

**Objective:** Diagnosing a primary language disorder in a deaf child is difficult, as there is generally the question of the impact of delays in, and adequacy of, language exposure. When a child has extraordinary delays in language exposure, determining the nature of the language delays becomes almost impossible unless other information can clarify the case. **Method:** A profoundly deaf 12-year-old who was not diagnosed with hearing loss until age 5 was referred for severe language delays. A comprehensive neuropsychological evaluation was administered and family, medical, language, and educational history taken. **Results:** The data and history strongly suggested a primary language disorder, but with the extreme delay in language access such a determination was debatable. However, the client had a younger sibling whose hearing loss was diagnosed in a more timely manner. Despite appropriate and intensive early intervention for the hearing loss, at age 7 the second child was essentially nonverbal. Although there was no other family history of either deafness or language disorders, both children presented with severe language delays and similar skill/deficit patterns on assessment. **Conclusion:** While the older sibling's language deficits appeared to be in excess of expectations even considering the delayed language exposure, a definitive diagnosis would have been unclear had the second child not presented with severe language deficits despite early, appropriate intervention. When a case is complex, a complete history is critical. Although testing can suggest diagnoses, in the absence of the data from the history, a diagnosis may be missed.

### **Poster Session A**

#### **DEVELOPMENTAL AND PEDIATRIC: ATTENTION DEFICIT HYPERACTIVITY DISORDER**

##### **A1**

#### **Sensory–motor differences in attention deficit hyperactivity disorder and traumatic brain injury**

*Shunk A, Davis AS, Dean RS*

**Objective:** Individuals with a diagnosis of attention deficit hyperactivity disorder (ADHD) and individuals with a traumatic brain injury (TBI) often present similar cognitive deficits such as inattention, distractibility, and memory difficulties. Additionally, ADHD has a tendency to be overdiagnosed, while TBI is often underdiagnosed, or misdiagnosed. Combined with the comorbidity of ADHD and TBI, these difficulties interfere with differential diagnosis. **Data selection:** The present study examined the differences in the sensory–motor functioning of a group of 40 individuals with ADHD (mean age = 17.5 years; S.D. = 6.16) and 40 individuals with TBI (mean age = 20.9 years; S.D. = 11.2). All participants were administered the Dean–Woodcock Sensory Motor Battery (DWSMB). **Data synthesis:** By analyzing a MANOVA, the change in the combined dependent variable of the 35 variables of the DWSMB

was significantly related to diagnosis, Wilks' Lambda = .011,  $F(35, 44) = 2.081$ ,  $P < .05$ . Subsequent univariate tests found significant differences among 5 of the 11 Simple Sensory tasks; 14 of the 15 Cortical Motor and Complex Sensory tasks; and 6 of the 9 Subcortical Motor and Auditory/Visual Acuity tasks. Results indicated that individuals who have ADHD performed consistently better than individuals with a TBI. Conclusions: The DWSMB was successful in identifying a large number of sensory, cortical and subcortical motor differences between individuals with TBI and ADHD. Individuals with ADHD scored significantly higher across three broad factors of the DWSMB. This poster will discuss the implications of this study for practitioners and directions for future research.

## A2

### **A comparison of achievement in ADHD subtypes in a school age population**

*Briker L, Mohrland M, Harvey D, Stack M, Golden C*

**Objective:** The current study explored the true variation in arithmetic and reading skills among ADHD subtypes **Method:** Participants included in this study were 195 children who were ADHD-Inattentive (38), ADHD-Hyperactive (10), ADHD-Combined (80), or neither condition (No Diagnosis Control group) (67) and fell between the ages of 6 and 15. Overall, the four groups together had a mean age of 9.3 years (S.D. = 3.0) and a mean education of 3.7 years (S.D. = 2.8). There were 143 males (73.3%). Most subjects (65%) classified themselves as White (65.1%). Eighty-seven percent were right-handed. The four groups were administered the reading and arithmetic portions of the Wide Range Achievement Test (WRAT3). **Results:** Two univariate analysis of variances (ANOVAs) were run to determine whether significant differences exist between the groups. Results were significant for both variables. Post hoc tests showed that this difference was due to differences between the ADHD-Combined and No Diagnosis group with the Control group scoring approximately 8 points higher on both. **Conclusions:** Based on the findings of the study, the individuals with ADHD combined type perform more poorly than those with only inattentive or hyperactive type. There was a statistically significant difference between the Control group and the ADHD-Combined group. These results suggest that ADHD-Combined type exerts a deleterious effect on the acquisition of reading and arithmetic skills. Limitations of the present study are that it failed to eliminate subjects with co-morbid disorders. Clinical implications and possible threats to validity will be discussed.

## A3

### **The relationship between teacher report and objective psychological testing in assessment of attentional deficits among children**

*Collins M, Harvey D, Foley J, DenBesten N, Golden C*

**Objective:** This study examined degree of consistency between scores from teacher reports and results from objective measures of attention. It was hypothesized that scores from teacher report forms would show an inconsistent relationship with scores from objective measures of attention due to their sampling of different behaviors. **Methods:** Participants included 65 children administered the CBCL and CRS-R as part of a comprehensive neuropsychological assessment. Ages ranged from 6 to 17 years ( $M = 9.2$ , S.D. = 2.8). Most were Caucasian. The

sample was predominately male (72%). All participants were referred for confirmation of AD/HD diagnosis, and all completed an extensive neuropsychological battery. Results were analyzed using bivariate correlational procedures to examine the relationship between CBCL and CRS-R Teacher Report Form attention rating scales, and scores from the WISC-III Freedom from Distractibility Index and Digit Span subtest. Analyses were conducted at a .05 family-wise alpha level. Results: Scores for each of the dependent measures were generally in the abnormal range. However, results showed no significant linear relationship between scores from the CBCL Teacher Report Attention Problems scale and the CRS-R Teacher Daydream Scale with either the WISC-III FDI or Digit Span scores. Conclusions: Results suggest inconsistencies between teacher reports of attention problems among diagnosed AD/HD children and their attentional performance on objective testing, with no significant relationship between these measures. The results indicate the need to not rely on single methods of gathering information or of concluding that elevated scores on these measures have the same interpretation.

#### A4

##### **Executive functioning in individuals with comorbid attention-deficit/hyperactivity disorder and cannabis abuse or dependence versus age-matched peers diagnosed with attention-deficit hyperactivity disorder**

*Gmyrek A, Weden S, Culotta V*

Objective: This study will examine the impact of comorbid cannabis abuse or dependence and attention-deficit/hyperactivity disorder (ADHD) on executive functioning. Of particular interest is whether moderate amounts of cannabis use mitigate or exacerbate cognitive weaknesses associated with ADHD. Method: Twenty-eight adolescents whose diagnoses included cannabis abuse and ADHD (Cannabis/ADHD) were matched by age and gender to 28 individuals whose diagnoses included ADHD, but not cannabis abuse (ADHD Only). Each group included 23 males and 5 females and the mean age of participants was 17 years. Participants underwent comprehensive neuropsychological evaluation at an outpatient behavioral health clinic. Results: Analyses revealed a significant difference in verbal intelligence such that individuals in the ADHD Only group had significantly higher verbal intelligence scores as measured by the Wechsler scales ( $M = 111.5$ ,  $S.D. = 19.9$ ) than individuals in the Cannabis/ADHD group ( $M = 101.6$ ,  $S.D. = 12.1$ ),  $t(88.3) = -2.1$ ,  $P < .05$ . There were marginally significant differences in favor of individuals in the ADHD Only group on measures of response inhibition, visual recall, and visual attention ( $P_s < .10$ ). Conclusions: Results of this study indicate few differences between individuals in the Cannabis/ADHD group and those in the ADHD Only group. Based on these results, it appears that moderate cannabis use among adolescents diagnosed with ADHD does not exacerbate cognitive weaknesses. This finding has implications for education as academic weaknesses may be attributed to substance abuse rather than ADHD, when the latter may be the primary cause of weaknesses.



**A5****Differential cognitive processing performance of children***Trinkle JM, Davis AS, Dean RS, Woodcock R*

**Objective:** attention-deficit-hyperactivity disorder (ADHD) is the most researched childhood disorder, and LD is the most common special education diagnostic category. Although children with these disorders are distinguishable from children without neurological deficits, these two disorders have high co-morbidity and similar psychoeducational and behavioral profiles. The purpose of the current study was to investigate and differentiate cognitive processing differences in children diagnosed with either ADHD or LD according to the Cattell–Horn–Carroll (CHC) and Gf–Gc cognitive processing theory. **Data selection:** This study examined 369 children (mean age = 11.5 years; S.D. = 3.2) with a diagnosis of ADHD, while 194 (mean age = 11.8 years; S.D. = 3.5) children with a diagnosis of a learning disability. All individuals were referred for a neuropsychological evaluation and were diagnosed by a clinical neuropsychologist. Each participant received 14 cognitive subtests from the Woodcock–Johnson Psycho-Educational Battery—Revised. **Data synthesis:** A MANOVA indicated that cognitive differences existed between the ADHD and the LD groups, Wilks' Lambda = .852,  $F(24, 538) = 3.890$ ,  $P = .000$ . Subsequent univariate tests indicated that the children with an ADHD diagnosis did significantly better on 13 subtests and nine indexes, such as Long-Term Retrieval (Glr), Short-Term Memory (Gsm), Processing Speed (Gs), Visual Processing (Gv), Verbal Comprehension-Knowledge (Gc), and Fluid Reasoning (Gf). **Conclusions:** The results indicated that children with ADHD and LD disorders have differing processing bases to which the CHC theory is sensitive. This poster will discuss implications for practitioners and directions for future research.

**A6****An exploratory look at the differences between attention-deficit hyperactivity disorder and conduct disorder on common neuropsychological tests***Miller S, Korman B, Mohrland M, Golden C*

**Objective:** The purpose of this study was to conduct an exploratory analysis regarding the differences of functioning between children diagnosed with attention-deficit hyperactivity disorder (ADHD) and conduct disorder (CD) on common neuro-psychological tests. **Methods:** The sample included 243 clinic-referred children diagnosed as either ADHD, CD, or having both ADHD/CD. One hundred and ninety-two children were diagnosed ADHD, 40 were diagnosed CD, and 11 subjects had both ADHD/CD. Subjects ranged in age from 4 to 17 years of age ( $M = 9.7$ , S.D. = 3.12). The sample was 63.4% Caucasian, 19.3% African American, 13.2% Hispanic, and 4.1% other, and predominantly male. One-way ANOVAs were conducted to compare cognitive (WISC-III), memory (WRAML), and portions of the Halstead–Reitan Neuropsychological Battery. **Results:** Significantly lower mean scores for the CD group were found on the Arithmetic, Vocabulary, Comprehension, Picture Completion, Coding and Object Assembly subtests and the Verbal and Full Scale Indexes of the WISC-III, and the General and Picture Memory, Verbal and Visual Learning, and Verbal Learning Recall of the WRAML. The ADHD group performed lower on Finger Tapping (Dom and Non-Dom) and time to complete Trails B. **Conclusion:** Results indicate that despite their high co-morbidity, particular significant

differences exist between the ADHD and CD diagnoses in the areas of cognitive and memory functioning. Also, children with co-morbid ADHD and CD do not perform at a lower level on common neuropsychological tests. Theoretical and potential implications will be explored.

#### **A7**

##### **Executive function profiles of children with sluggish cognitive tempo**

*Crawford JS, Isquith PK, McQuade DV, Roth RM*

**Objective:** Since the introduction of ADHD as a diagnostic entity, child psychiatrists and psychologists have intermittently endorsed the notion of sluggish cognitive tempo (SCT) as an associated subtype. While ADHD is considered a disorder of executive function (EF), little is known about EF in children with SCT. We examined EF profiles of children with SCT versus those with ADHD subtypes and controls. **Methods:** Parents of children clinically diagnosed with SCT ( $n=24$ ), ADHD-I ( $n=32$ ), ADHD-C ( $n=35$ ) or without psychiatric difficulties (Control;  $n=87$ ) completed the Behavior Rating Inventory of Executive Function (BRIEF). **Results:** Profile analysis revealed that children in diagnostic groups exhibited different profiles of EF on the BRIEF ( $P<.001$ ). Planned contrasts ( $P<.05$ ) revealed that: (1) the SCT group was rated higher than controls on all scales except Inhibit; (2) the ADHD-C group was rated as having significantly greater difficulty on the Inhibit scale than all other groups; and (3) the SCT group was distinguishable from all others by an elevation on the Initiate scale. Sixty percent of the SCT group had clinically elevated Initiate scores ( $T>65$ ) versus 31% for both ADHD groups and 0% for the control group. **Conclusions:** Children with SCT or ADHD-I may be distinguishable from those with ADHD-C based on difficulties with inhibitory control, while children with SCT may be further distinguishable from those with ADHD-I based on difficulties with initiation. These data provide support for further consideration of SCT as a subtype of ADHD.

#### **A8**

##### **CNS vital signs (CNSVS) performance of ADD patients on and off stimulant medication**

*Johnson L, Gualtieri T*

**Objective:** To determine if the performance of ADD/ADHD patients is significantly improved on a computerized cognitive screening instrument (CNSVS) following administration of a test dose of stimulant medication. **Method:** Participants were 120 patients (age range 10–22) referred to a private neuropsychiatric clinic for evaluation and treatment for ADD. The CNSVS battery yields standard scores (mean = 100; S.D. = 15) in five domains: Memory, Psychomotor Speed, Stroop Reaction Time, Cognitive Flexibility, and Complex Attention. **Results:** The performance of ADD/ADHD patients differed from normal controls in all domains. Following administration of a test dose of stimulant medication the performance of the ADD/ADHD patients was significantly improved on all domain scores with the exception of Memory ( $P<.001$ ). **Conclusion:** A computerized battery, such as CNSVS, is a useful tool in the diagnosis of ADD/ADHD and evaluation of stimulant medications.

**A9****What measures increase diagnostic accuracy in ADHD?***Hill BD, Singh AN, Pella RD, Garcie-Merritt HR, Gouvier W*

Objective: What measures are associated with a diagnosis of ADHD in adults? Subjects: Four hundred and eighty-seven individuals (mean age of 24.3 years) who were evaluated at a university clinic. The sample was: 48.8% male and 51.2% female; average education 13.63 years. Racial demographics: 88.6% Caucasian, 8.3% African American, 1.4% Hispanic, 0.8% Asian, and 1.0% other. The following measures were used: WAIS-III, WMS-III, d2 Test of Attention, Trails A and B, Wender Utah Rating Scale, Woodcock–Johnson III, PAI, and Conners' CPT. Results: A one-way ANOVA was utilized. The following were significantly impaired in those who received an ADHD diagnosis: WMS-III working memory ( $F=7.87, P<.05$ ); WAIS-III processing speed ( $F=3.89, P<.05$ ); d2 total number ( $F=12.62, P<.05$ ) and TNE ( $F=7.85, P<.05$ ); WJ-III reading fluency ( $F=4.26, P<.05$ ) and understanding directions ( $F=3.07, P<.05$ ); CPT hits percentile ( $F=4.47, P<.05$ ), omissions percentile ( $F=11.06, P<.05$ ), response time  $t$ -score ( $F=3.06, P<.05$ ), response time SE  $t$ -score ( $F=16.52, P<.05$ ), variability of SE  $t$ -score ( $F=14.49, P<.05$ ), and hit RT ISI change  $t$ -score ( $F=6.43, P<.05$ ). Conclusion: Neuropsychologists frequently interpret indexes and subtests that they suspect are impaired in ADHD. The results of this study call into question the validity of using some of these subscales and indexes to bolster clinical decision making in ADHD.

**A10****Classification and regression tree analysis of individuals with ADHD***Stage KA, Davis AS, Finch WH, Trinkle JM, Dean RS*

Objective: The diagnosis and treatment of attention-deficit-hyperactivity disorder (ADHD) is complicated by the high comorbidity of other disorders and subsequent similar patterns of performance on neuropsychological measures. For example, individuals with ADHD may demonstrate cognitive profiles similar to individuals with learning disabilities, traumatic brain injuries, and social–emotional problems. Exploring non-cognitively based indicators of ADHD, such as sensory–motor skills, will aid in differential diagnosis. Data selection: This study examined the sensory–motor performance of 118 individuals with ADHD (mean age = 12.4 years, standard deviation = 5.51 years) and 950 normal individuals (mean age = 29.7 years, standard deviation = 21.3 years). All participants were administered the Dean–Woodcock Sensory Motor Battery (DWSMB). Data synthesis: Classification and Regression Trees (CART) analysis uses a set of variables to distinguish groups from one another, which will aid in clinical judgment of which subtests to administer for a differential diagnosis. CART also develops a hierarchical tree that separates the groups. A six-node decision tree was gauged the most parsimonious and statistically powerful. The primary separator variable was Clock Construction, with a secondary separation variable of Finger Localization. The resubstitution classification rate was 90%. Conclusions: Clock Construction was an extremely powerful separation variable for the groups of individuals with ADHD and normal individuals. Indeed, 94.9% of the individuals with a Clock Construction  $W$ -score above 495.5 were classified as normal. This poster will discuss the limitations of this study, the findings, and implications for practitioners and future research.

**DEVELOPMENTAL AND PEDIATRIC: LEARNING DISABILITY****A11****Phonological-core model versus double-deficit hypothesis in visuo-perceptual-orthographic reading processes***Mano QR, Osmon DC, Klein L*

**Objective:** This study examined whether the phonological-core model or the double-deficit hypothesis of dyslexia accounts for performance differences on extant visuo-perceptual-orthographic tasks from the experimental learning disability literature. **Method:** The sample consisted of 150 college students ( $M=24$ ; 61% female, 39% male). Within this sample four groups were compared: (1) good phonologic/good orthographic readers, (2) good phonologic/poor orthographic readers, (3) poor phonologic/good orthographic readers, and (4) poor phonologic/poor orthographic readers. Groups were determined by scores on subtests from the Woodcock–Johnson-III. The following tasks were adapted from prior research: Letter-Decision Time, Letter-Inspection Time, Word Matching, Illusory-Conjunction, Homophone Selection, Pseudohomophone Selection, and Word Jumble. Reaction time and error rates were collected. **Results:** Two important findings emerged: (1) a two-way MANOVA revealed a main effect for orthography [ $F(4, 142)=3.128, P=.01$ ] but not for phonology [ $F(4, 142)=1.01, P=.40$ ] or an interaction [ $F(4, 142)=0.656, P=.62$ ]; and (2) good orthographic readers exhibited healthier Early Perception [ $F(1, 146)=6.043, P=.01$ ] and Late–Post Perception [ $F(1, 146)=4.245, P=.04$ ], with a trend in Speed [ $F(1, 146)=2.810, P=.09$ ]. **Conclusion:** Results support the double-deficit hypothesis by showing that performance differences on these experimental tasks are best accounted for by orthographic group membership. Contrary to the phonological-core model, phonological processing is a separable entity that does not substantially affect visuo-perceptual-orthographic processes.

**A12****Information processing subtypes and delinquency***Figuroa M, Sheehan C, Garcia J, Hernandez K, Golden C*

**Objective:** The present study attempts to find a correlation between a specific learning disability and future delinquency. This study hypothesized that children with a verbal learning disability, as a group, are more prone to delinquency and future psychopathology. Previous research distinguished nonverbal disabilities (NVLD) from verbal disabilities (VLD) and differentiated distinct patterns of central processing abilities leading to academic achievement and behavioral difficulties. A nonverbal disability characterizes a weakness in visual–spatial-organization, tactile-perception, psychomotor and nonverbal problem solving skills as opposed to the weaker verbal skills in the LD group. **Method:** Eighty-nine students ( $N=31$ , NVLD and  $N=58$ , VLD) between the ages of 6 and 16 who were diagnosed with these disorders were included in the study. The mean age for the nonverbal group was 10 and composed of 60% male. The verbal learning disability group has a mean age of 9 and was over 80% male. The nature of the disability was defined by a comprehensive neuropsychological and achievement battery. Dependent variables included the Achenbach parent–teacher delinquent behavior and social problems scales, the Conner’s teacher asocial scale, the PIC-social skill scale and the MMPI-A

social isolation scale. Results: Statistical analysis found no significant correlations indicating that group membership predicted delinquency or social problems on the rating scales employed in this study. Conclusion: The results were inconsistent with the hypothesis that a specific type of LD would be more predictive of current social and delinquency problems. This preliminary data needs further investigation.

### **A13**

#### **Examining visual–verbal associations in children with and without reading disorder**

*Klein ER, Littlefield LM*

Objective: The purpose of this study was to investigate verbal working memory before and after providing semantically associated sentences for learning symbol–word pairs. Method: Using repeated measures ANOVA, 20 children with Reading Disorder (RD) and 20 age-matched normally-achieving peers (mean 10 years) were compared on free verbal recall and recall for 15 symbol names before and after training sentences using the Association Memory Test (Klein & Littlefield, 2000). All subjects were middle class from Maryland. RD subjects were from a private learning disabilities school with normal cognitive skills and a diagnosed reading disorder. Twenty NA students were chosen from a local school and did not have diagnosed disabilities according to records. Results: Results demonstrated RD children experienced more difficulties on measures of complex auditory–verbal working memory than did NA peers. RD students performed significantly poorer on free word recall after one presentation of novel visual–verbal pairings before and after training sentences ( $P < .01$ ). The RD group evidenced fewer gains, learning half as many symbol–word pairings than did their NA matched peers. Conclusion: RD students performed significantly poorer than NA peers on word recall ability before and after semantic training sentences. The RD students had greater difficulty using semantic elaborations to assist them in recalling the names of novel symbols. Since reading is a language-based process requiring the ability to convert a series of symbols into a verbal counterpart, precise visual–verbal associations are crucial. Findings have important implications for identifying young children with potential reading impairment.

### **A14**

#### **Memory deficits in children with reading disorders**

*Weniger R, Adams W*

Objective: Approximately 5% of children in the United States meet criteria for being diagnosed with a reading disability (RD). There is consensus in the literature that memory functioning is a critical component RD, but little investigation has been undertaken to define this role clearly. The purpose of this study is to examine memory functioning in children with RD using a commonly used memory measure. Method: Participants consisted of 24 children, age 7–14 ( $M = 10.63$ ,  $S.D. = 1.84$ ), who have been identified as RD by their school districts through psychoeducational assessment. Eligible participants were administered the WRAML2. The WRAML2 is a recently normed, comprehensive memory battery that measures the recall and recognition of verbal and visual stimuli. Control group participants were obtained from the national standardization sample of the WRAML2 and were matched according to age and gender. Results: WRAML2 subtest means were compared using related samples  $t$ -tests.

Effect sizes were calculated using Cohen's *d*. Children in the RD group demonstrated weaker performance than controls on the following subtests: Design Memory,  $t = -3.09$ ,  $P < .003$ ,  $d = .90$ ; Number–Letter,  $t = 2.87$ ,  $P < .003$ ,  $d = .85$ ; and Symbolic Working Memory,  $t = -2.87$ ,  $P = .037$ ,  $d = .71$ . Discussion: Children with RD demonstrated specific and selective memory deficits on the WRAML2. These deficits appear to be associated with the encoding and processing of rote, symbolic stimuli (i.e., numbers, letters, shapes). An awareness of these deficits may assist with the accurate diagnosis and appropriate treatment of children with RD.

### A15

#### **Visual–spatial information processing in 6–8-year-old children with functional immaturity of cerebral regulatory systems**

*Melikyan ZA*

Objective: Functional immaturity of cerebral regulatory systems (CRS) is one of the most common causes of cognitive disorders in children that leads to poor school performance. EEG studies demonstrated that CRS immaturity in children may be due to the immaturity of frontal–thalamic (IFTS) or nonspecific regulatory (INRS) systems. Present study reveals differences in visual–spatial information processing between these two groups. Method: EEG data analysis revealed 12 children with IFTS, age 6–8-year-old (y.o.) (mean 7.6 y.o.) which were compared to 13 children with INRS age 6–8 y.o. (mean 7.2 y.o.). These were first or second-graders from a regular primary school. 3D table drawing and copying of 3D house picture (Luria's tests modified for children) were administered. Results: Different patterns of visual–spatial information processing in two groups of children were revealed. Children with INRS significantly ( $P = .001$ ) more often had difficulties in drawing 3D tables as compared to IFTS group. Demonstration of correctly drawn 3D table did not improve their drawings significantly. Depicting 3D features in copying picture of a house was equally difficult to both groups of children. Drawings of INRS children were significantly ( $P = .04$ ) more often characterized by imprecise angles' dimensions and elements' sizes, details were not on their places. Children with IFTS tended to simplify their drawings and omit some details. Conclusions: Present results allow to provide an individualized approach to cognitive assessment and rehabilitation for children with CRS immaturity.

### A16

#### **Unilateral periventricular nodular heterotopia may be less likely to cause reading impairment than bilateral periventricular nodular heterotopia: case report**

*Sokol DK, Golomb MR, Carvalho KS, Edwards-Brown M*

Objective: Bilateral periventricular nodular heterotopia are cortical malformations associated with seizures and impaired reading in people with normal intelligence. It is not known if unilateral heterotopia are also associated with reading impairment. The objective of this study was to examine reading ability and intelligence in a boy with unilateral periventricular heterotopia. Methods: A 16-year-old boy with left periventricular heterotopia and left temporal lobe dysplasia diagnosed by magnetic resonance imaging was evaluated using the Wechsler Intelligence for Children—Third Edition (WISC-III), Luria Nebraska Neuropsychological Battery-Form 1 (LNNB), Gray Oral Reading Test (GORT), and Wide Range Achievement Test—Revision III

(WRAT-III). He had epilepsy which at the time of testing was well controlled with lamotrigine. He was having academic difficulties. Results: The patient had a WISC-III Full Scale IQ score of 104, a Verbal IQ score of 114, and a Performance IQ score of 93. His Processing Speed Index was 64 (1 percentile). His GORT Oral Reading Quotient was 103 (58 percentile) with adequate reading rate, accuracy, frequency, and comprehension for age. On the LNNB, none of the 11 clinical scales or 5 ancillary scales was above the critical level 61. On the WRAT-III, his reading standard score was 94 at the high school level (34 percentile). Conclusions: The patient had normal reading ability. His slow processing speed contributed to his academic difficulty. We hypothesize that children with unilateral periventricular heterotopia may be less likely to develop reading impairment than children with bilateral heterotopia because there is less cortical involvement.

#### **A17**

#### **Modification of the neuropsychological substrates of reading disability via EEG operant conditioning: a case study**

*Riss RH*

Objective: Neuroimaging studies reveal differences in cortical activation patterns between dyslexics and good readers during reading tasks. Dyslexic readers demonstrate attenuated activation and delayed onset in the superior temporal gyrus and anterior gyrus during reading. Decreased correlation of activity between left temporoparietal structures has also been reported. Compensatory recruitment of left anterior and right hemisphere regions is only partially successful, leading to a less fluent and more effortful reading style. Compensatory strategy training has demonstrated limited efficacy, typically yielding improvements in reading scores of less than 1/2 standard deviation even after 100 or more hours of intervention. We describe a novel intervention for direct modification of the electrocortical substrates of reading disability, via operant conditioning of the EEG during reading task conditions. Method: Electrocortical correlates of reading performance were examined in a 16-year-old subject with 10 years of special education for reading disability. Over twenty-five 30-min sessions, electrophysiological patterns associated with efficient reading were reinforced via EEG operant conditioning. Results: Gains of 1–3 standard deviations were noted on standardized reading tests. Corresponding changes in left lateral hemisphere electrophysiological activation patterns during reading task conditions were identified. Conclusions: Preliminary data supports a role for direct modification of the functional electrophysiological substrates of reading disability via operant conditioning as a promising addition to current interventions.

#### **DEVELOPMENTAL AND PEDIATRIC: OTHER**

#### **A18**

#### **Proton spectroscopy and neuropsychological outcome following neonatal asphyxia**

*Nichols JG, Freier MC, Holshouser BA, Shu S, Burley T, Ashwal S, Zaytsev L*

Objective: To evaluate the association of long-term neuropsychological outcome and 1H-magnetic resonance spectroscopy (1H-MRS) in children following perinatal hypoxic-ischemic encephalopathy (HIE). Based on previous studies, lower *N*-acetylaspartate (NAA) ratios

and higher lactate and choline/creatine (Cho/Cre) ratios were predicted to correlate with long-term neuropsychological impairment. Method: Eight children with HIE and one control born at Loma Linda Children's Hospital (1994–1999) who received 1H-MRS (STEAM; TR/TE = 3000/20 ms) between 3 and 49 days ( $M = 10.67$ , S.D. = 14.65) and the NEPSY between 3.3 and 7.7 years ( $M = 5$  years, S.D. = 20 months) were included. Metabolite ratios and lactate were measured in an 8-cm<sup>3</sup> region encompassing primarily occipital gray matter. Results: Presence of lactate and increases in Cho/Cre were associated with lower scores in language ( $r = -.789$  and  $-.739$ ,  $P < .05$ ), sensorimotor ( $r = -.722$  and  $-.721$ ,  $P < .05$ ), visuospatial ( $r = -.873$  and  $-.825$ ,  $P < .05$ ), and memory ( $r = -.821$  and  $-.790$ ,  $P < .05$ ). Lactate was associated with lower scores in attention ( $r = -.849$ ,  $P < .05$ ), although Cho/Cre was not. NAA/Cho and NAA/Cre did not correlate significantly with outcome, although there was a trend for lower ratios levels to be associated with poorer outcomes. Conclusions: Although influenced by the small sample size, the results suggest that the presence of lactate and increased Cho/Cre may be good early indicators of neuronal injury and long-term neuropsychology outcome following perinatal HIE. However, larger prospective studies are needed.

#### A19

##### **Paradoxical effects of familial alcoholism on amygdala volumes in children with and without psychiatric diagnoses**

*Voelbel GT, Bates ME, Buckman JF, Pandina G, Hendren R*

Background: Smaller right amygdala volumes have been reported in individuals with familial alcoholism. Studies assessing amygdala volumes in individuals with psychiatric diagnoses rarely control for family alcoholism. The present study assessed the relationship of familial alcoholism and amygdala volumes in youths diagnosed with ASD or bipolar disorder and a group without any psychiatric disorder (NC). Methods: Children diagnosed with BP ( $N = 15$ ), ASD ( $N = 22$ ), and NC ( $N = 11$ ) were given a brain MRI from which the amygdala was segmented. Parents were assessed for familial alcoholism with a standardized family history interview. The density of family members with an alcohol use problem was the dependent measure. Controlling for gender and intracranial volume, the relationship of familial alcoholism to amygdala volume was examined. Results: No significant group differences for amygdala volume were revealed. The relationship between familial alcoholism and amygdala volume suggests higher density of familial alcoholism was associated with smaller left and right amygdala volumes in controls, but larger left and right amygdala volumes in children with BP, and larger left amygdala in ASD children. Conclusions: The inverse relationship between the density of familial alcoholism and right amygdala volume in control subjects replicated previous findings, but was not generalizable to children with BP or ASD. The paradoxical effect of familial alcoholism in the diagnostic groups warrants further study, but may suggest the psychiatric disorder overrides neuroanatomical changes often observed in children with ASD and BP disorder.



**A20****Children's visual scanning efficiency: application of a modified Bells Test***Bloomer RH*

**Objective:** To develop a visual scanning efficiency tool for children and youth. Visual scanning efficiency is a function of complex neural circuits involving pathways from the motor control areas in the cerebellum to the frontal eye fields. Deficient visual scanning efficiency is a common attribute of children and youth with neurological, reading, learning, and attention disorders. The Bells Test, developed by Gauthier et al. (1985), originally successful in detecting hemi-inattention in Parkinson's disease was modified for application with a preadolescent population. **Method:** The Modified Bells Test (MBT) is an expanded format to 11 in. × 17 in. with increased number of target bells and distractors. This allowed coverage of a major portion of the visual field and increased reliability. The MBT is timed and the learner numbers each successive bell. Response Speed measures from the Developmental Neuropsychological Assessment allow correction for individual differences in speed of response. **Results:** The MBT was standardized on a normal school population of 285 learners, grades 1–6. Highly reliable (mdn  $r = .90$ ) standard scores for Visual Search Efficiency and both vertical and horizontal bias were developed. The MBT provides the examiner with a specific graphic search path for each learner in addition to the standard scores. We present examples of efficient, inefficient and disabled youth, as well as evidence relating scanning efficiency to academic success.

**A21****Neuropsychological impairment following thalamic AVM hemorrhage: a case study***Lavach JF*

**Objective:** Vascular malformations account for approximately 11% of intracerebral hemorrhages, and typically result from a congenital abnormality of anomalous, dilated capillaries which results in shunting of blood from the arterial to venous side. Although cerebral AVMs are more common in young adults aged 20–40 years, the case presented describes a thalamic AV malformation in an 11-year-old normotensive middle-school student presenting at the emergency room with “acute headache and neurologic deficits.” **Method:** Imaging revealed a hemorrhaging thalamic AV malformation resulting in right hemiparesis, right sensory deficits, and right visual field defect. Subsequently, the lesion was determined to be amenable to stereotactic radiosurgery, with periodic follow-up over an ongoing 2-year period. Upon returning to school, the subject was described as “experiencing memory problems, attention/concentration difficulty, processing inefficiency, perceptual problems, intellectual functioning considerably below his pre-morbid level and “bumping into things.” **Results:** The Halstead-Reitan Neuropsychological Battery, WISC-III, Stroop Color and Word Test and Bender Visual Motor Gestalt Test revealed cognitive confusion and perseveration, perceptual, visuospatial, and sensory difficulty, as well as deliberate and slow mental processing, attention and concentration difficulty, right visual field deficit, and right hemiparesis which required that he learn to use his left hand. **Conclusions:** An IEP included modified curriculum, full-time in-school placement, weekly communication between teachers and parents, and neuropsychological monitoring. Stereotactic radiosurgery resulted in a 73% obliteration rate. Recent assessment indicated

neuropsychological performance to fall within the moderately impaired range as opposed to the original significantly impaired categorization.

## **A22**

### **Confirmatory factor analysis of the Children's Category Test Level 1**

*Knatz DT, Mayfield J, Allen DN*

**Objective:** Confirmatory factor analysis was used to validate the factor structure of the Children's Category Test Level 1 (CCT-1) in a clinical sample. An exploratory factor analysis of the standardization sample in normal children indicated a two-factor solution, which was also hypothesized for the current study. **Method:** One hundred and twenty-three children were administered the CCT-1. The majority of the children had sustained traumatic brain injury, although other neurological and psychological conditions were represented. A series of confirmatory factor analyses were conducted to evaluate the validity of the two-factor solution. Incremental improvement in model fit was also examined by comparing the two-factor solution to one-factor and independence model solutions. **Results:** The two-factor model provided an excellent fit of the data ( $\chi^2 = 1.31$ , d.f. = 1,  $P = .25$ ; AGFI = 0.95; CFI = 0.99; SRMSR = 0.017), and provided a significantly better fit than the one-factor model ( $\chi^2 = 17.597$ , d.f. = 2,  $P < .001$ ; AGFI = 0.66; CFI = 0.90; SRMSR = 0.075) and independence models. Subtests 2 and 3 loaded on one factor termed "Color Perception", while subtests 4 and 5 loaded on the second factor "Proportional Reasoning". **Conclusions:** The present data indicate that the Children's Category Test Level 1 is not a factorially pure measure of abstract reasoning. The two factors obtained in the current study with a mixed clinical sample are equivalent to those found in the literature using exploratory factor analyses in healthy normal children.

## **A23**

### **Early cognitive development in a twin pair with sickle cell disease: a case study**

*Wodka EL, Tarazi RA*

**Objective:** Recent research suggests that psychosocial risk factors predict more of the variance in neuropsychological functioning in pre-school age children with sickle cell disease (SCD) than disease-severity, at this age. The goal of this case study was to further examine the contribution of these risk factors to cognitive development in this population. **Method:** Participants included a twin pair (female [A]/male [B]) with SCD (HbSC) who participated in neuropsychological evaluations at age 40 months and 54 months. Information about disease severity (pain episodes, hospitalizations, and hemoglobin levels), and growth were collected routinely from age 3½ months to 54 months. Comparisons of neuropsychological measures and biomedical risk factors were conducted. **Results:** Results suggested that twin B had lower hemoglobin levels, more disease-related symptoms (more hospitalizations, transfusion), and poorer growth over time than twin A. Both children performed in the average to below average range across neuropsychological measures. Twin A achieved relatively better scores than twin B across evaluations and reliable change indices for repeated measures suggested that twin A demonstrated better relative improvement over time. Both children demonstrated little relative improvement on measures of fine motor skills and receptive language. **Conclusion(s):** Results of this case study further highlight the importance of environmental factors in cognitive devel-

opment of young children with SCD. Results also suggest that disease-related factors may affect early cognitive development, even in children with a less severe form of SCD. Interventions addressing both biomedical and psychosocial risk factors are necessary in order to promote cognitive development in this population.

#### **A24**

##### **Executive functioning and attentional regulation following stroke in pediatric patients with sickle cell disease**

*Dooley BC, Powless MR, Scott JP, Rennie KM*

**Objective:** One of the most devastating complications of sickle cell disease (SCD) is vascular occlusion in the brain (stroke). Overt stroke occurs in approximately 10% of children with SCD. Sub-clinical stroke is present in another 10–20% of children with SCD. There is little research that examines executive functioning and attentional regulation skills in pediatric patients, with SCD, following infarction. The purpose of this study was to examine specific difficulties in the area of executive functioning and attentional regulation in pediatric patients with SCD following stroke. **Methods:** Eleven pediatric patients between the ages of 2 and 18 with SCD and infarction were recruited from a large Sickle Cell Clinic for this study. All participants underwent magnetic resonance imaging (MRI) to document their stroke. The Behavior Rating Inventory of Executive Function—Parent Form (BRIEF) was completed by all participants' parents to assess executive functioning. The Conners' Continuous Performance Test-II (CPT-II) was administered to all participants to examine attentional regulation. **Results:** Descriptive statistics were generated on demographic variables. Age-referenced *T*-scores on the BRIEF for the Behavioral Regulation Index, Metacognition Index, and Global Executive Composites were used in the statistical analysis. Age-referenced *T*-scores for omission errors, commission errors, reaction time and response time variability were examined for the CPT-II. **Conclusions:** Results suggest that difficulties with executive functioning skills and impaired reaction time are quite common following a stroke in pediatric patients with SCD. Moreover, these findings demonstrate the vulnerability of the frontal lobe systems to infarction, regardless of localization of injury.

#### **A25**

##### **Similarities and differences in symptomatology of blind/visually impaired non-autistic children and sighted autistic children**

*Arcari K, Lazar M, Goldberg K, Boyer B*

**Objective:** To investigate the similarities and differences observed between blind/visually impaired non-autistic children and sighted autistic children. When blind/visually impaired children present with autistic-type behavior, they are often diagnosed as having multiple disabilities, mental retardation, or both. It is widely accepted that early intervention for children with autism is the most effective approach in treating this disorder. This study attempts to define the symptomatology that diagnosticians such as neuropsychologists and developmental pediatricians, should attend to when evaluating autism in the blind/visually impaired population. In doing so, these children will be diagnosed earlier and receive the correct and appropriate treatment for the disorder of autism. **Method:** The parents of 16 children (eight blind/visually

impaired non-autistic and eight sighted autistic) were interviewed using the Gilliam Autism Rating Scale. Children were selected based on diagnosis of autism or blind/visual impairment without the diagnosis of autism. Subjects were recruited from a school for children with autism, two Wrap Around programs, and a school for the visually impaired and blind, all located in the Philadelphia area. Results: Significant differences were found between the two groups ( $P < .05$ ) in the domains of stereotyped behaviors ( $P = .01$ ), social interaction problems ( $P = .015$ ), and the Autism Quotient ( $P = .032$ ), with the autistic group demonstrating higher scores. Furthermore, these groups did not differ with regard to communication skills and the presence of developmental disturbances. Conclusion: Results of this study highlight primary autistic symptomology (stereotyped behaviors and social interaction problems) that may be used to differentially diagnose blind autistic children from blind non-autistic children, and help guide correct, earlier treatment.

#### **A26**

##### **Fusiform gyrus differences in children diagnosed with autistic spectrum disorders**

*Rha C, Locascio G, Voelbel GT, Hendren RL, Bates ME*

Objective: The fusiform gyrus (FG) has been identified as the area of the brain specialized for facial recognition, an ability that drives social relationships. Impairment in social relationships and inattention to faces are primary characteristics of children with autistic spectrum disorders (ASD). Functional magnetic resonance imaging studies have demonstrated hypoactivation of the FG in individuals with disorder. However, volumetric changes in the FG, especially in ASD children, have not been thoroughly researched. The purpose of this study was to identify potential differences in FG volumes between children with and without autistic spectrum disorder diagnoses. Method: In the present study, 15 ASD children and 15 control children underwent neuropsychological assessment and structural magnetic resonance imaging. FG volumes were compared between groups and correlated with social skill phenotypes. Results: The results reported here are based on a subset of data from a larger, ongoing study. Preliminary analysis revealed a trend towards larger right FG volumes in ASD children ( $P < .07$ ). It is expected that when more subjects are included, the trend may reach statistical significance. Increased right FG volume was significantly correlated with diminished ability on a face recognition task. Conclusions: Differences in FG volumes and social skill abilities may have implications for better understanding etiology and neurodevelopment in children diagnosed with ASD.

#### **A27**

##### **Toward the development of a neuropsychological profile on the NEPSY for children with autistic spectrum disorders**

*Young S, Gorman PW*

Objective: The purpose of the current study is to describe the neuropsychological profile on the NEPSY of children diagnosed with autistic spectrum disorders. Method: Subjects ( $N = 15$ ) were patients referred to a private neuropsychological practice for evaluation and ultimately diagnosed with autistic spectrum disorders. The ages ranged from 5 to 12 with a mean age of 7.8 and 80% were male. Diagnoses included Asperger's Disorder (six), Pervasive Develop-

mental Disorder, Not Otherwise Specified (five) and High Functioning Autism (four). As part of a comprehensive neuropsychological assessment, select subtests of a Developmental Neuropsychological Assessment (NEPSY) were administered. These subtests included the core battery of the NEPSY measuring Attention/Executive Functioning, Language, Sensorimotor, Visuospatial, and Memory abilities. Obtained scaled scores of the subtests were compiled to identify a typical neuropsychological profile of this group. Results: The results of this study revealed consistent strengths and weaknesses on the selected subtests of the NEPSY across the subjects examined. These findings contribute to the identification of a typical neuropsychological profile of children with Asperger's Disorder, Pervasive Developmental Disorder, NOS and High Functioning Autism. Conclusions: While further investigation is required to provide greater accuracy with the discriminate variables, the study highlights the usefulness of the NEPSY as both a screening tool for medical clinics and as a critical measure within neuropsychological test batteries.

#### **A28**

##### **D-KEFS evaluation of executive functioning with adults and adolescents with autistic spectrum disorders**

*Young S, Gorman PW*

Objective: The purpose of the current study is to describe the neuropsychological profile for executive functioning of adults and adolescents diagnosed with autistic spectrum disorders. Method: Subjects ( $N=18$ ) were patients referred to a private neuropsychological practice for evaluation and ultimately diagnosed with autistic spectrum disorders. The subjects's ages ranged from 14 to 37 with a mean age of 22 and 60% were male. Diagnoses included Asperger's Disorder (16) and High Functioning Autism (2). As part of a comprehensive neuropsychological assessment, select subtests of the Delis–Kaplan Executive Functioning System were administered. These subtests included: Trail Making Test, Verbal Fluency, Design Fluency, Color–Word Interference, Card Sorting, and the Tower Test. Obtained scaled scores of the subtests were compiled to identify a typical neuropsychological profile of this group. Results: The results of this study revealed consistent strengths and weaknesses on the selected subtests of the D-KEFS across the subjects examined. These findings contribute to the identification of a typical neuropsychological profile of adolescents and adults with Asperger's Disorder and High Functioning Autism. Conclusions: While further investigation is required to provide greater accuracy with the discriminate variables, the study highlights the usefulness of the D-KEFS as both a screening tool for medical clinics and a critical measure within neuropsychological test batteries.

#### **A29**

##### **Serial neuropsychological assessment of a child with resolving herpes encephalitis**

*Bujoreanu I, Holler K*

Herpes encephalitis is identified in approximately 1 of 250,000 persons, with approximately 30% of cases in the pediatric population. Course depends upon type of infection (mucocutaneous, disseminated, encephalitis) and severity; frequent complications include seizures, behavioral disturbances, cognitive impairment, and motor dysfunction. Some children experi-

ence relapsing or persistence of HSV encephalitis, or postinfectious CNS demyelination. We present the case of an 8-year-old female with dramatic HSV infection and related white matter abnormalities on MRI as an illustration of developmental resiliency, but nevertheless, failure to progress neurocognitively even with successful treatment. Comprehensive neuropsychological assessments were completed at two time points: the first occurring soon after HSV was identified and 13 months later following intensive treatment with antibiotics and steroids. Diagnosis was given after a routine CT scan for a head injury that revealed severe swelling of the frontal lobes. History is positive for subtle changes in academic performance, but is negative for any symptoms associated with HSV. Serial MRI scans documented gradually resolving infection but with gross areas of abnormal signal persisting most prominently in the right tempo-parietal and frontal lobes. Results indicated unexpectedly good functioning on initial assessment but with a plateauing of neurocognitive abilities at the second assessment time point. Several conclusions are drawn from the case study including: (1) remarkable resiliency of the developing nervous system to accommodate even gross interference from infectious processes as seen on MRI, and (2) plateauing of neurocognitive progression associated with developmental points at time of infection (e.g., frontal executive myelination).

### A30

#### **California Verbal Learning Test—Children’s version and Children’s Memory Scale: test sensitivity to memory difficulties among children with epilepsy**

*Borden KA, Burns TG, O’Leary S*

Verbal learning and memory in children with epilepsy was evaluated with the California Verbal Learning Test—Children’s version (CVLT-C) and Children’s Memory Scale (CMS) to examine the sensitivity of each test to verbal learning and memory in this population. Participants included 22 children (6–16 years) with epilepsy who were referred for neuropsychological evaluations at a children’s hospital in the southwest. The clinical group was compared to 22 children who were administered both tests as part of the validity testing for the CMS. Independent *t*-tests were conducted with all CVLT-C indices, as well as verbal indices and subtests from the CMS ( $N=44$ ). Exclusionary criteria included attention-deficit/hyperactivity disorder, learning disabilities, and head injury. Although children with epilepsy performed within the average range across all indices and subtests, they performed significantly lower than controls ( $P<.05$ ) on the List A Trial 1 Recall, Long Delay Free- and Cued-Recall, and Correct Recognition Hits from the CVLT-C. The Verbal Immediate, Verbal Delayed, and Learning CMS indices were also significant. Examination of CMS subtests revealed that children with epilepsy performed significantly lower than controls on the Word Pairs subtest, but did not differ on the Stories subtest. These results suggest that children with epilepsy perform significantly lower than controls on multiple indices on both the CVLT-C and CMS, suggesting that both tests include measures sensitive to memory differences in children with epilepsy. Therefore, the impact of epilepsy on these indices is an important consideration when interpreting such measures.

**A31****Correlational analysis of the Vineland Adaptive Behavior Scales and the ABAS-II in children with epilepsy***Hamilton WG, Burns TG, Neale KM*

**Objective:** Within a pediatric seizure population, this study compared the Adaptive Behavior Assessment System-II (ABAS-II), a newer adaptive functioning measure with the Vineland Adaptive Behavior Scales (VABS). Few studies have examined the degree to which these parent report inventories are related, particularly within a pediatric neuropsychological population. **Method:** The participants included 27 pediatric patients with a seizure disorder. The average age of the sample was 5.91 (S.D. = 5.00). The sample was predominantly male (55.5%) and consisted of subjects who were 77.8% Caucasian, 11.11% African American, and 11.11% Hispanic. **Results:** Bivariate correlations were used to compare the overall adaptive functioning indices of the ABAS-II and the VABS, with results attesting to a significant relationship ( $P < .01$ ). Each of the ABAS-II Composite indices were significantly related to one or more VABS scales. **Conclusions:** The results suggest that the parent reports generated from the VABS and ABAS-II scales are related. However, not all scales purporting to measure similar constructs had the highest correlation between the two measures. The paper examines the degree of interrelationships and the support for both convergent and divergent validity.

**A32****Differential neuropsychological performance in children with right versus left frontal focus epilepsy***Walsh KS, Smith C, French C, Ries JK, Llorente A*

**Objective:** The impact of frontal lobe epilepsy (FLE) on cognition in children, and its developmental concomitants has received limited attention. Few studies have been conducted identifying differential patterns of performance based on localization (left/right), and significant levels of variability have been demonstrated. Transitory cognitive impairment associated with epileptiform discharges, precise lesion location, propagation of epileptiform activity, seizure frequency, age of onset, and a lack of sensitivity and specificity of neuropsychological measures have all been implicated in this variability. The current study examined FLE considering developmental factors relative to differential cognitive functions and identification of specific neuropsychological measures that may identify impairments associated with localization. **Method:** Ten children with FLE, age 12 ( $\pm 2.5$ ) years underwent a comprehensive presurgical neuropsychological assessment. Seizure onset was at 48 (38.8) months. Scores were expressed as  $z$ -scores allowing comparison between measures. Multiple regression analysis was applied in order to control for age effects. **Results:** After adjusting for age at seizure onset and age at evaluation, seizure localization significantly contributed to the explanation of variance when modeled on semantic verbal fluency ( $\Delta R^2 = 64\%$ ,  $P = .02$ ). **Conclusions:** The results identified a measure capable of differentiating left/right localization. The selective inclusion of children addressed developmental and maturational factors in the potential reorganization of functions following seizure onset and subsequent neurocognitive sequelae. Identifying neuropsychological measures that possess adequate sensitivity and specificity to detect subtle differences between left/right localization provides contributes to treatment, and

such information allows for proactive interventions for children with FLE in order to support independent functioning.

### A33

#### **A comparison of intra-operative and extra-operative language mapping among left hemispheric temporal resections**

*McDaniel S, Mitchel W, Domen C*

**Objective:** A comparison of intra-operative versus extra-operative language mapping was examined for differences in intelligence quotient (IQ) as measured by the Wechsler Achievement Intelligence Scale III (WAIS III) and memory assessed by the Memory Assessment Index (MAS) among patients needing left temporal resections. **Prediction:** patients undergoing intra-operative mapping will have better memory retention and unaltered IQ than patients that are mapped extraoperatively. **Data selection:** Ten epileptic patients scheduled for left temporal resection surgery (post-WADA) were tested pre-operatively with the WAIS III and the Memory Assessment Scale (MAS). A month after surgery they were retested. Seven patients were language mapped intraoperatively and three extraoperatively. **Data synthesis:** There is a significant difference in intra-operative ( $n=7$ ) versus extra-operative ( $n=3$ ) language mapping represented by a difference in the MAS attention scores. The intraoperative mapped patients maintained significantly higher attention memory ( $N=10$ ,  $t=2.384$ ,  $P<.05$ ) and overall higher global memory ( $P=.029$ ) than the extraoperative group. Results revealed no difference in IQ between the two groups, nor did IQ decrease significantly for either group. **Conclusions:** A comparison of intra- and extra-operative language mapping techniques comparing the WAIS III and the MAS scores between two groups of patients that underwent left-temporal resection surgeries. Our study had partial results from our prediction. Attention memory on the MAS was better maintained by the intraoperative group; however, there were no significant changes in visual and auditory memory for either group. Attention memory accounted for the overall global increase as well.

### A34

#### **Finger Tapping Test: revised norms for children**

*Cramond AJ, Jones C*

**Objective:** Normative data for the Finger Tapping Test (FTT) stratified by age and gender are presented for 200 community dwelling children, 8–10 years of age. **Method:** The normative sample consisted of 200 healthy children from four elementary schools in southeastern United States. The sample was relatively diverse: 72% White, 16% African American, 10% Hispanic, and 2% other, with a male to female ratio of 107:103. Any person with a history of neurological disease, psychiatric illness, learning disabilities and broken bones was excluded. Handedness was assessed by the Edinburgh Handedness Inventory. The FTT was administered according to the principles set forth by Spreen and Strauss (1998). **Results:** Performance of both dominant and non-dominant hands varied as a function of age and gender,  $P=.039$ . Norms were thereby stratified by age (8–10 years) and gender (male and female), males being fastest across all ages. **Conclusions:** Based upon sample size, strict exclusionary criteria, and population representativeness, norms presented in the current study are the most comprehensive for children



to date. The use of these norms in clinical settings will increase the degree to which neuropsychologists can use the FTT to detect cognitive impairment in school children of varying ages and gender.

### A35

#### **A comparison of receptive nonverbal processing abilities in children referred for evaluation of attentional and learning difficulties**

*Kimchi KM, Simpson Sweet RA, Zamorski SA*

**Objective:** The current study evaluated the receptive nonverbal communication skills of children diagnosed with learning and attentional difficulties. **Method:** Archival medical records of 33 students, aged 6-years through 19-years ( $M = 12.19$ ,  $S.D. = 3.2$ ) were consecutively reviewed. The sample was comprised of 20 males and 13 females with average intellect who were diagnosed with ADHD, LD, or NLD. The Diagnostic Assessment of Nonverbal Accuracy (DANVA) provided a standardized measure of the perception of affect in facial expressions and speech. **Results:** An ANOVA revealed significant differences between groups. The NLD group made more errors in perceiving emotion in the faces of children than the LD or ADHD groups ( $F = 4.5$ ,  $P = .019$ ). The NLD group also made more errors in their perception of affect within speech ( $F = 3.4$ ,  $P = .048$ ). Post hoc analysis continued to support these differences. Interestingly, no significant differences were found between groups in the judgment of emotion in adult faces or speech. **Conclusion:** Children diagnosed with NLD had greater difficulty than peers with ADHD or LD interpreting affect in children's faces and speech. These results support the DANVA's usefulness in evaluating these abilities in children and further our understanding of the nature of social skill difficulties apparent in children with NLD, LD, and ADHD. However, these difficulties do not appear consistent across peer and adult situations. The implications for assessing and remediating nonverbal communication skills are discussed.

### A36

#### **Receptive nonverbal processing ability and its relationship to social and behavioral functioning**

*Kimchi KM, Simpson Sweet RA, Zamorski SA*

**Objective:** This study compared boys' and girls' perception of emotion in faces and speech, and the relationship to symptom endorsement by informants on the CBCL. Previous research has suggested that nonverbal communication skills may be more important to the interpersonal functioning of girls than boys. **Method:** Archival neuropsychological records of 35 males and 15 female students, aged 6–18 years, evaluated in an outpatient setting, were consecutively reviewed for this study. The DANVA, a measure of auditory and visual perception of emotion, was administered. The CBCL provided a measure of social and behavioral functioning. **Results:** A significant Pearson correlation coefficient was evident between mother's endorsement of social problems and the ability to identify affect in peers faces ( $r = .8$ ,  $P = .01$ ). Analysis indicated that boys made significantly more errors than girls on the DANVA. However, among boys, errors on the DANVA were not related to behavioral reports on the CBCL. Conversely, the number of errors made by girls on the DANVA Child and Adult Faces tasks was related to parent reports of externalizing behaviors on the CBCL (Child  $r = .56$ ,  $P < .05$ ; Adult  $r = .53$ ,

$P < .05$ ). Conclusions: In this sample, children who evidenced difficulty interpreting affect in children's faces were reported by their mothers to have greater social difficulties. Between males and females, the boys made more errors judging affect in both faces and speech. However, perceiving affect in faces was related to externalizing behaviors only in the sample of girls.

### A37

#### **Development of lateralization of performance and factors involved**

*Soper HV, Barnhart M, McHale TJ*

Objective: There is very little empirical evidence on the development of lateral dominance. We had noticed substantial heterogeneity among children 2–5 years of age using a variety of tasks, with some children showing clear lateralization early but others randomly using hands for most tasks at a later age. However, we decided to reanalyze the data to look more closely at what they tell us. Method: Manual lateralization was assessed in 401 children aged 2–5 years on eight tasks of varying difficulty performed three times in one sitting. Eye (kaleidoscope) and pedal dominance (three tasks) were also assessed, as were hand length and performance on the Purdue Pegboard. The parent also filled out a birth history questionnaire. The assessments were conducted at various preschools in the area. Results: We found that level of skill required plays a role in the manifestation of laterality. Ambiguous, or inconsistent, lateralization within items does decrease with age, but there appears to be no relationship between lateralization and motor ability on the pegboard, but especially among the younger children manual difference in performance was highly correlated with laterality. There was no relationship between birth history score and handedness. Conclusion(s): Standard multiple item tests for determination of handedness among the young are not necessarily the best for, unlike adults, the skill involved is a strong factor. Manual motor ability, as assessed on the pegboard, is more highly associated with lateralization among 2- and 3-year-olds than among older children. Possible reasons for this are given.

## **NEUROPSYCHOLOGICAL DOMAINS PART I: ATTENTION**

### A38

#### **Convergent and divergent validity of the Gordon Diagnostic System in a heterogeneous, adult clinical sample**

*Carlozzi NE, Horner MD*

Objectives: Convergent and divergent validity of the Gordon Diagnostic System (GDS; Gordon, 1987), a measure of sustained attention, were examined. We hypothesized significant relationships between scores on GDS Vigilance and Distractibility tasks with scores on other measures of attention, but not with scores on measures of other domains (executive, language, visuospatial, memory functions). Method: Eighty-three veterans referred for neuropsychological assessment were administered GDS Vigilance and Distractibility as part of standard clinical evaluation. Other measures included in this study were selected to represent a range of cognitive functions: WMS-III Digit Span and Mental Control, Trailmaking, Wisconsin Card Sort, WASI, Verbal Fluency, Rey–Osterreith Complex Figure. Affective measures (BDI-II, MMPI-2) were also included. Results: GDS Distractibility commission errors were negatively correlated with Full Scale IQ ( $r = -.70, P = .002$ ). There were no other significant correlations

between scores on GDS tasks and other tests. Participants were then divided into those who scored lower ( $<1$ S.D. below published normative mean) versus higher on GDS Vigilance and, in separate analyses, Distractibility. High GDS Vigilance scorers outperformed low scorers on Trails B ( $P < .004$ ), with no other group differences. Conclusions: GDS scores were not related to scores on other attention measures. Better performance on GDS Vigilance was associated with better executive function. Fewer GDS Distractibility commission errors were associated with higher Full Scale IQ, possibly due to the restricted range of GDS scores. Results do not provide strong support for the convergent and divergent validity of the GDS as a measure of attention in adults.

### A39

#### **Improving attention and impulsivity on a standardized task with auditory binaural beats**

*McMurray JC, Katz GS*

**Objective:** This study tested whether auditory binaural beat stimulation (ABBS) could improve measures of inattentiveness and impulsivity in individuals with attention-deficit/hyperactivity disorder (ADHD). Previous research shows that ABBS elicits a frequency-following hemispheric normalization of deficient electroencephalographic (EEG)-measured beta brainwaves concurrent with ADHD. **Methods:** Eighteen individuals with ADHD aged 6–49 years were recruited from psychological counseling offices and from a University-based disability resource center. Participants had no hearing impairment, closed head injury, or seizure disorder. The group contained 11 males (27% children) and 7 females (14% children). Cultural representation included 11% Asian, 5.6% Filipino, 17% Middle-Eastern, and 66% Caucasian. A modified Conners' Continuous Performance Test 3.0 (CPT) measured inattention and impulsivity derived from omission and commission errors. Additionally, EEG activity from Cz was recorded and analyzed. ABBS was alternatively absent and then present during two test phases. **Results:** The binaural beat phase showed significantly higher attentiveness,  $n^2 = 0.236$ , 95% CI for the difference was 0.097–2.348,  $P = .035$ ; and significantly lower impulsivity,  $n^2 = 0.766$ , 95% CI for the difference was 1.673–2.994,  $P < .001$ . Absolute beta power was also significantly higher during the binaural beat phase, 95% CI for the difference was  $-9.072$  to  $-4.913$ ,  $n^2 = 0.748$ ,  $P < .001$ . **Conclusion:** Significantly higher levels of attentiveness and lower levels of impulsivity were associated with ABBS in the EEG beta-frequency range. It is likely that ABBS may be effective in addressing inattention and impulsivity in ADHD individuals.

### A40

#### **Principle components analysis of popular neuropsychological attentional measures**

*Pella RD, Hill BD, Singh AN, Garcie-Merritt HR, Stewart H, Gouvier W*

**Introduction:** The objective of this study was to explore dimensions of attention shared by popular neuropsychological measures of attention and concentration. **Method:** We conducted a systematic chart review of individuals over the age of 16 ( $N = 590$ ) presenting at a university psychological services clinic for psychoeducational assessment. Participants had a mean age of age of 22.3 (S.D. = 8.87). Each subject was administered a comprehensive psychoeducational battery. Of the total sample, 333 were male (51.5%) and 314 females (48.5%). Ethnicity was also reported as follows: 564 Caucasians (89.1%), 49 African Americans (7.7%), 7 Asians

(1.1%), 8 Hispanics (1.3%), and others (0.8%). Based on common attentional tests, 134 participants were selected. Principle components analysis was conducted on selected subtests of the Woodcock–Johnson III, WAIS-III, Trails A and B, Connors' CPT, and d2 Test of Attention. Results: Four factors emerged to explain 62.45% of the variance in the measures. The first factor was named Complex Response Speed and included subtests from the WJ-III and WAIS-III. Factor 2, Vigilance Performance, was comprised of CPT indexes. The third factor, Scanning/Tracking, consisted of Trail making tests A and B. A fourth factor, Visual Tracking, also emerged and was represented by d2 subscales. Conclusions: While this analysis adds support for a multidimensional conceptualization of attention, we failed to replicate findings in the literature reporting two and three factor solutions. Additionally, our loadings differed from other four factor solutions that have been reported.

#### **A41**

##### **The effects of symptoms of inattention on digit span performance from the WISC-IV in a clinical population**

*Wellington TM, Nussbaum NL*

Objective: ADHD is considered one of the most prevalent childhood psychiatric problems and previous studies found deficits in working memory in children with ADHD. The present study examined aspects of working memory and measures of inattention and impulsivity in 28 children (ages 8–14) referred for neuropsychological clinic for testing. Methods: Seventeen children met criteria for attention deficit/hyperactivity disorder with significant symptoms of inattention (Combined type and Predominate Inattentive type). Eleven children did not have symptoms of inattention, and met criteria for a learning disorder in reading, written expression or NOS. Results: Children with significant symptoms of inattention ( $M = 0.94$ ,  $S.D. = .75$ ) show significant less pre-ceiling errors than children with learning disorders ( $M = 1.73$ ,  $S.D. = 1.01$ ) on the forward trial of the Digit Span subtest from the WISC-IV ( $F = 5.4$ ,  $P = .029$ ) in this clinical sample when age and Full Scale IQ were controlled. This accounted for approximately 20% of the variance and power was moderate (0.61). The errors on the forward trial of the Digit Span subtest showed a moderate negative correlation with Hit Rate Standard Error ( $-0.66$ ,  $P = .001$ ), Variability ( $-0.63$ ,  $P = .01$ ), and Number of Commissions ( $-0.50$ ,  $P = .015$ ) components of the Conner's Continuous Performance Test. Conclusions: This suggests that in this clinical population children with symptoms of inattention perform better on the forward trial of the Digit Span than children with learning disorders, although they are performing poorly on measures of attention and impulsivity.

#### **NEUROPSYCHOLOGICAL DOMAINS PART I: EXECUTIVE FUNCTIONS**

#### **A42**

##### **Predicting higher order cognitive functioning with the Delis–Kaplan Executive Functioning System's Trail Making Test**

*Hall J, Davis AS*

Objective: Deficits in executive functioning may contribute to impaired scores on IQ tests. The Delis–Kaplan Executive Functioning System (D-KEFS) is a collection of nine measures of

executive functioning, including five conditions of a trail making test. Although the test manual reports relationships between the D-KEFS and measures of executive functioning, more information is needed regarding the relationship between the D-KEFS and cognitive functioning. Data selection: Correlation and regression analysis was used to examine the relationship between the Trail Making Test and higher order cognitive processing. A sample of 64 college students (mean age = 19.89 years, S.D. = 3.626 years) was administered the five conditionals of the D-KEFS Trail Making Test and the Wechsler Adult Intelligence Scale—Third Edition. Data synthesis: Correlations were calculated for the five trail making tests of the D-KEFS and Verbal, Performance, and Full Scale IQ on the WAIS-III. Correlations between tests ranged from  $-.215$  to  $.251$ . The best correlation was between condition 4 (Number–Letter Sequencing) and WAIS-III Full Scale IQ. The poorest correlation was between condition 5 (Motor Speed) and Full Scale IQ. Regression analysis was also performed between the five Trail Making Tests and WAIS-III Verbal ( $R^2 = .155$ ), Performance ( $R^2 = .129$ ), and Full Scale IQ ( $R^2 = .169$ ). Conclusions: Correlations showed relatively low correlations between the D-KEFS' Trail Making Tests and higher order cognitive processing. Regression analysis revealed the D-KEFS' Trail Making Tests are poor predictors of higher order cognitive processing.

#### **A43**

#### **The internal consistency of the Delis–Kaplan Executive Functioning System's Trail Making Test**

*Hall J, Davis AS*

Objective: Executive functions are described as higher order processes, such as creativity, abstract thinking, and reasoning; processes often overlooked in cognitive assessments. The Delis–Kaplan Executive Function System (D-KEFS) is the first nationally normed test designed exclusively for the assessment of executive functioning. Some of the measures, such as the Trail Making Test, are modifications of classic neuropsychological measures. However, there is a paucity of published studies which attest to the reliability and validity of the D-KEFS. Data selection: This study examined the intercorrelations between the five measures on the D-KEFS Trail Making Test. A sample of 64 college students without any reported mental or physical disorders (mean age = 19.89 years, S.D. = 3.626 years) participated in this study. All participants were given the complete D-KEFS battery. Data synthesis: Correlations were calculated for the five trail making tests of the D-KEFS. Correlations between the five tests ranged from  $.091$  to  $.698$ . The best correlation was between condition 2 (Number Sequencing) and condition 3 (Letter Sequencing). The poorest correlation was between condition 4 (Number–Letter Sequencing) and condition 5 (Motor Speed). Conclusions: Generally, intercorrelations between the five measures of the Trail Making Test of the D-KEFS show a strong, positive relationship. It is possible the poorest correlation, between Number–Letter Sequencing and Motor Speed, could be caused by the tests tapping different attributes. This poster will elaborate on the limitations of this study, the findings, and the implications for future researchers.

**A44****Executive functioning and observed versus self-reported measures of functional ability***Mitchell MB, Harris J, Miller L*

**Objective:** The present study investigated the relationship between measures of executive functioning and both observed and self-reported functional ability. It was hypothesized that performance on a direct assessment of functional ability would show a stronger correlation with performance on measures of executive functioning than a self-report measure of functional ability. **Method:** Participants were 30 Caucasian independent older adults (5 male, 25 female) from retirement centers in Northeast Georgia (mean age = 82.6, S.D. = 5.4; mean level of education = 13.8 years, S.D. = 2.4). Participants were administered two measures of planning: the Delis–Kaplan Executive Function System (D-KEFS) Trail Making Test and the Tower Test; two measures of cognitive fluency: the D-KEFS Verbal Fluency and the Design Fluency Test; the Older American Resources and the Services ADL and IADL scale (OARS); and the Direct Assessment of Functional Status, Revised edition (DAFS-R). **Results:** There was a significant correlation between planning ability and the DAFS-R ( $r = .587$ ,  $P = .001$ ) but not the OARS ( $r = .297$ ,  $P = .111$ ). Cognitive fluency was significantly correlated to both the DAFS-R ( $r = .529$ ,  $P = .003$ ) and the OARS ( $r = .412$ ,  $P = .024$ ). **Conclusions:** Executive abilities have a stronger correlation with the DAFS-R than the OARS. Results indicate that self-report measures may not be sensitive to early decline in functional ability. Therefore, measures of executive functioning are useful in detecting early decline in functional ability that otherwise may not be detected by the typical self-report measures used in clinical settings.

**A45****Sensitivity of the Comprehensive Trail Making Test to brain injury in adolescents***Armstrong CM, Mayfield J, Allen DN*

**Objective:** The current study examined the sensitivity of the Comprehensive Trail Making Test (CTMT; Reynolds, 2002) to neurocognitive deficits in a sample of adolescents with brain injury. The CTMT consists of five standardized tasks designed to assess specific aspects of inhibition and set-shifting which are not evaluated by the original Trail Making Test. The CTMT was normed on a large sample (ages 11–74) that was representative of the U.S. population. Psychometric studies of the normative sample suggest adequate reliability and validity. However, to date, no studies have examined the CTMT's sensitivity to brain damage in adolescents. **Method:** Participants included 19 adolescents with verified brain damage, primarily traumatic brain injury. Mean age was 16.0 years (S.D. = 1.9 years), mean IQ was 79.1 (S.D. = 39.9), and Glasgow coma scale scores indicated severe brain injury (mean = 5.5; S.D. = 3.8). Participants were individually administered the CTMT an average of 16.3 months (S.D. = 15.5) following injury. Raw scores (time to complete each trial) were converted to *t*-scores which were subjected to statistical analysis. **Results:** The sample performed approximately 2S.D. below the normative sample mean on each CTMT trial, and single sample *t*-tests indicated that these differences were significant ( $P < .0001$ ). Correlations calculated between Glasgow coma scale scores and each CTMT trail ranged between .35 and .52. The recommended cut-off for brain damage (scores 1.5S.D. below the normative sample mean) correctly classified 94.4%

of the participants. Conclusion: Results suggest that the CTMT is sensitive to brain damage in children and adolescents, and also exhibits moderate correlations with severity of injury.

#### **A46**

##### **Early music training and executive function**

*Sabir SM, Blakely L, Alfano DP*

Objective: Previous research has suggested that early music training may influence brain development and organization. For example, recent studies utilizing functional MRI have revealed that early music training is associated with increased activation of the frontal lobes. It has yet to be demonstrated, however, whether the relationship between early music training and increased frontal lobe activation has corresponding effects on executive functions associated with frontal lobe function. The objective of this study was therefore to assess the influence of early music training on executive function. Method: Twenty-three university-level musicians majoring in music performance and 17 undergraduates with no music training or experience, matched for age, education, and general level of intellectual functioning, completed a battery of commonly used measures of executive function, including the Stroop Color and Word Test, the Trail Making Test, the Mazes subtest from the Wechsler Intelligence Scale for Children—Revised, and the Controlled Oral Word Association (FAS) Test. The musicians group had an average of 10.9 years (S.D. = 3.5) of formal music training and had started formal music training at a mean age of 8.1 years (S.D. = 4.0). Results: Results revealed significantly better performance of the musicians group on the Color and Word portions of the Stroop Test, and marginally better performance on Part B of the Trail Making Test and two out of five Mazes. Conclusion: These findings provide some support for the idea that early music training has a positive effect on executive functions associated with frontal systems.

#### **A47**

##### **Cognitive switching deficits reflected in the EEG**

*Morgan EA, Sherlin L, Baird BR, Shearer CG*

Objective: Response inhibition is an executive function attributed to the prefrontal cortex thought to allow control over cognitive switching, or responding when there is a change in task content or demand. Impairment in response inhibition has been observed in a number of clinical populations. The purpose of the present study is examination of the correlation between current source density and cognitive switching tasks in individuals who demonstrate attention deficits. Method: Participants were 18 individuals referred to an outpatient clinic for evaluation of attention problems. The Delis–Kaplan Executive Function System (D-KEFS) was administered and EEG was recorded for each participant. The four subtests purported to measure cognitive switching were utilized in this study. Brain electrical activity was digitally recorded, edited, and subjected to quantitative spectral analysis with eyes closed awake condition. Cross spectra were averaged and LORETA correlation maps computed and displayed using LORETA Key viewer software. Results: Three of the four subtests were positively and significantly correlated with each other. LORETA findings show positive correlations between the following subtests and frequency band ranges: Letter–Number Sequencing and 4–7 Hz (inferior parietal lobe); Design Fluency and 2–8 Hz, 16–20 Hz, and 20–24 Hz (left temporal

lobe); and Color Word Interference and 2–4 Hz and 4–8 Hz (precuneus and right parietal lobe). Conclusions: Based on the results of the present study, cognitive switching does not appear to be a single construct. Additionally, it is not localized, but mediated by multiple pathways. Slowing reflected in the EEG was common to the subtests with significant correlations.

## NEUROPSYCHOLOGICAL DOMAINS PART I: LANGUAGE AND APHASIA

### A48

#### Qualitative analysis of the FAS test

*Irani Sivasegaran F, Mamikonyan E, Platek S, Mandel S, Swirsky-Sacchetti T*

Objective: The FAS test is traditionally analyzed with total number of words belonging to a phonemic category. The purpose of this investigation was to describe qualitative factors involved in FAS performance. Methods: Fifty mild traumatic brain injury (mTBI) patients referred for evaluations at a private clinic completed the FAS and WAIS as part of a larger neuropsychological battery. The sample consisted of mainly right handed individuals with injuries reportedly due to motor vehicle accidents. The mean age of the sample was  $43 \pm 12$  years with 52% males and 48% female. Ratings along abstract/concrete and word valence dimensions were completed separately by two blind raters ( $\kappa = 0.796$  and  $0.713$ , respectively). Results: Verbal IQ was normally distributed with an average verbal IQ of  $101 \pm 15$ . Word length was also normal (mean  $5.5 \pm 1.98$  letters and range of 2–13 letters/word). Patients were significantly more likely to produce concrete (60%) than abstract (40%) words. They were more likely to report neutral (64%) than positive (22%) or negative (14%) words. There was a significant relationship between verbal IQ and abstract/concreteness of words and word valence. There was no relationship between word length and verbal IQ ( $r = .161$ ,  $P = .31$ ) although total number of words produced correlated with verbal IQ ( $r = .47$ ,  $P = .002$ ). Conclusion: Qualitative analysis of the FAS test can provide additional insights into phonemic fluency performance. Results are discussed in the context of a mTBI population and future collection of qualitative normative data.

### A49

#### Multiple conditions affecting language and behavior in a deaf child

*Morere D*

Objective: Many etiologies of deafness place children at risk for additional conditions. Maternal infections can produce multiple sensory, motor, cognitive, and other neurological conditions. When severe language delays and behavioral dysfunction occur in such a child, especially when complicated by the presence of documented cortical abnormalities, determining the source of these conditions is a complex and difficult task. It is often resolved more by investigation than testing, as standardized testing and interpretation may be difficult due to the multiple impacts on the administration and data. Method: A child with multiple conditions including hearing, vision, motor and neurological dysfunction will be presented. Academic and language progress were limited despite intensive intervention. Behavioral issues interfered with progress, but did not fully explain the delays. Behavioral interventions have had limited and temporary success. Results: Limited testing was possible due to both time constraints



and client resistance. Observations in multiple settings, interviews, and an extensive review of previous testing and a range of records from early intervention to the present, in conjunction with the testing, indicated that a combination of neurologically based dyscontrol, communication frustration, and environmental impacts affected the client's behavior, and that a primary language disorder was present in addition to the impact of deafness, cognitive limitations, and behavioral interference. Conclusion: Sometimes, testing provides the least of the information. An extensive record review is time consuming, but may provide hypotheses, which can then be tested in an efficient manner using a combination of techniques in addition to the somewhat "non-standard" standardized testing that is possible.

#### **A50**

##### **The exaptation of manual dexterity for articulate speech: an EMG study**

*Higginbotham DR, Isaak MI, Domingue JN*

Objective: The investigation aimed to support the hypothesis that articulate speech is based in gestural communication by demonstrating a secondary response of the orbicularis oris (OO) when human participants made grip and point gestures. Method: Twelve right-handed adults aged 15–72 participated. A Nicolet Viking IV EMG was utilized to measure concurrent muscular contractions in the abductor pollicis brevis (APB) and orbicularis oris (OO) when participants executed a "Primitive Precision" (thumb and index finger) grip and the extensor indicis proprius (EIP) and OO in the point condition when participants pointed with the right index finger. The OO is the primary articulator for bilabials including /p/ and /b/. Participants completed four 1.5-s grip and four 1.5-s point trials preceded by a 3-s baseline control. Results: Concurrent EMG bursts in the OO revealed involuntary muscular contractions in response to both the grip and point motor acts. Conclusion: The response of the orbicularis oris (OO) during grip and point gestures supports the notion that articulate speech is based in gestural communication. The present EMG results converge with the findings of recent observations of sympathetic hand and mouth activity among nonhuman primates (Waters & Fouts, 2002) and human infants (e.g., Masataka, 1995), and with Gentilucci et al.'s (2001) spectrographic demonstration of the influence of grasping on articulation. The present results are consistent with theories suggesting that the gesture/speech relationship may be subserved by mirror neurons located in Broca's area.

#### **NEUROPSYCHOLOGICAL DOMAINS PART I: MEMORY AND AMNESIA**

#### **A51**

##### **Personality factors contributing to variations in memory performance**

*Nixon E, Fogle M, Korman B, Figueroa M, Golden C*

Objective: Previously, it was found that some personality variables significantly predicted memory performance in centenarians. The current study is to examine the relationship between personality factors and memory performance in a clinical population. Method: Participant data was taken from an archival database of clinical subjects. The participants consisted of 247 individuals with a DSM-IV clinical diagnosis between the ages of 18 and 55. Personality variables were taken from the MMPI, including K, Hy, Hs, D, and Pd as they have been

suggested as related to memory in previous studies. The memory variables were taken from performance on Digit Span and the index scores from the WMS-III. Vocabulary was also included as a measure of intellectual functioning. Mean scores were generally within 1 sd of average except for D and Pd which averaged 63.6 and 64.0, respectively. Results: In the bivariate analysis, significant correlations were found between: Vocabulary and Hypochondrias ( $r = -.158, P < .01$ ), Vocabulary and Psychopathic deviation ( $r = -.123, P < .05$ ), General memory and Depression ( $P = .001$ ), General memory and Psychopathic deviation ( $r = -.124, P < .05$ ), Auditory memory and Depression ( $r = -.183, P < .01$ ), Auditory Memory and Psychopathic deviation ( $r = -.131, P < .05$ ), Visual memory and Depression ( $r = -.17, P < .01$ ), and IMMEM and Depression ( $r = -.204, P = .001$ ). There were no significant results associated with Digit span performance. Conclusions: These results suggested a small relationship between MMPI scores and memory, but the relationship was not large enough to be clinically significant.

#### **A52**

##### **Working memory and the word length hypothesis: effects of reading rate and executive functioning on short-term memory**

*Korman B, Miller S, Mohrland M, Briker L, Golden C*

Objective: The present study investigated the relationship between reading rate and measures of executive functioning on auditory serial span. According to the Working Memory model, a faster verbal articulation rate should produce greater short-term retention for serial information than a slower rate. For this study, the correlations between two widely used neuropsychological measures of reading rate and a measure of serial memory span were computed to determine if they fit the Working Memory model. Method: Participants were 85 adults, ages 16–72, who were referred for a neuropsychological evaluation. Subjects were tested for auditory serial span using the Digit Span subtest of the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III) and their reading rates were determined from the reading portion of the Nelson Denny Reading Comprehension Test (silent reading) and the Stroop Word reading (oral reading). Additional measures of executive skills were included as well. Results: No significant relationship was found between auditory serial span and either silent reading rate ( $r = -.153, P = .082$ ) or oral reading rate ( $r = .034, P = .379$ ). Significant correlations were, however, discovered between auditory serial span and Stroop Color–Word reading ( $r = .216, P = .024$ ) and Category Test errors ( $r = -.312, P = .002$ ). Discussion: This study suggested that word length and reading rate are not related to short-term memory ability, but that executive abilities such as planning, sequencing, and shifting cognitive set may hold special significance with regard to serial memory functioning. Plans for future study in this area are outlined.

#### **A53**

##### **The developmental sensitivity of the WMS-III and WRAML2**

*Weniger R, Adams W*

Objective: The Wechsler Memory Scale, Third Edition (WMS-III) and Wide Range Assessment of Memory and Learning, Second Edition (WRAML2) are comprehensive memory

batteries that measure multiple components of memory functioning in adults. The purpose of this study is to examine and compare the developmental sensitivity of the WMS-III and WRAML2. Methods: Data generated by the national standardization samples of the WMS-III and WRAML2 was analyzed. This analysis involved specific subtests and indexes that measure the recall and recognition of verbal and visual stimuli. Mean subtest raw scores for each age group were converted to a common metric with the highest mean raw score represented by the numerical value of 1.0. Mean raw scores obtained by each additional age group were converted to a percentage of 1.0. Results: Data generated by the WMS-III and WRAML2 suggest that peak memory capacity is achieved and maintained through ages 20–34 years and is generally reduced to 75% by age 65–69. Memory then declines at a more rapid but steady rate of about 2–3% per 5-year period. There is some discrepancy between measures regarding the rate of verbal and visual memory decline. On both the WMS-III and WRAML2, recognition memory for verbal and visual stimuli remains fairly well intact in older adulthood (approximately 82–88%). Discussion: A comparison of WMS-III and WRAML2 data provides evidence regarding the developmental sensitivity of these instruments and provides information regarding the general rate and pattern of normal memory deterioration.

#### **A54**

##### **Computerized versus clinical testing: examining validity of cognitive assessment in sports-related concussion**

*Macher RB, Arnett PA, Echemendia RJ*

Objective: Though both pencil-and-paper and computerized neuropsychological measures are used to measure the effects of sports-related concussion, computerized measures have appeal in that they are usually faster, simpler, and less expensive to administer. However, minimal empirical research has been conducted that compares these approaches. This study was designed to test the relative sensitivity of commonly used paper-and-pencil versus computerized verbal memory tests. Method: Twelve collegiate athletes aged 18–22 (eight males, four females) were tested at baseline and post-concussion (mean = 4.8 (2.8) days post-injury). Immediate recall on The Hopkins Verbal Learning Test—Revised (HVLTR) and the Verbal Memory Composite from the ImPACT computerized neuropsychological assessment were administered. Results: Though within-subjects ANOVAs revealed no significant change from baseline to post-concussion on the HVLTR ( $P > .45$ ), there was a significant improvement on the ImPACT ( $P < .05$ ). There was no reliable change from baseline to post-concussion on the HVLTR for any participant, yet 3 of the 12 showed reliable improvement on the ImPACT. Conclusion: Our results indicate that the ImPACT Verbal Memory Composite appears more sensitive to change than the HVLTR. This may suggest that the ImPACT is more prone to practice effects than the HVLTR. Alternatively, given the variability in scheduling post-concussion assessment, it is possible that improved scores in the athletes reflected true recovery from the concussions that occurred in addition to typical practice effects. More research with a larger sample will help distinguish the two possibilities.

**A55****Effect of proactive and retroactive interferences on memory function in adults with temporal lobe epilepsy-evidence from the serial position curves***Chang Y, Bauer RM, Gilmore RL, Roper SN, Eisenschenk S*

**Objective:** The current investigation explored the roles of proactive interference (PI) and retroactive interference (RI) associated with verbal memory deficits in epilepsy patients with anterior temporal lobectomy (ATL). **Method:** Patients with unilateral ATL (15 left and 15 right) were administered a verbal list learning task (CVLT). All were left-dominant for language. Patients were matched on age, education, handedness, and seizure duration. The serial position curves on learning trials, and indices of PI and RI were calculated. **Results:** The data confirmed previous findings suggesting that left-ATL patients had worse verbal memory in both immediate and delayed recall than did patients with right-ATL. Left-ATL patients showed significant declines in recall from the primacy portion of list B compared to the first learning trail of list A. Recall from the shared categories on list B was significantly worse than from the nonshared categories in left-ATL group compared to right-ATL group, a PI effect. Left-ATL patients showed significant decreases in recall of the shared items in the short delay trail when compared to the fifth trail, a RI effect. The accelerated forgetting of the left-ATL was characterized by decreased recall of the recency portion but not the primacy portion, again suggesting that interference plays a role in delayed memory impairments in left-ATL. **Conclusions:** These findings demonstrated that left-ATL patients were more susceptible to PI and RI compared to right-ATL patients and that susceptibility to such interference plays a role in the verbal memory impairment found after left-ATL.

**A56****Dissociation of item and source memory in healthy subjects***Hampstead BM, Irani F, Rodak K, Meyers T, Platek S*

**Objective:** Previous research suggests that item and source recognition are dissociable processes. In an attempt to model potential difficulties observed in clinical populations, we designed an experimental task investigating these forms of memory in healthy undergraduates. We hypothesized that compared to full images, degraded images would form “weaker” memory traces which, when recognized, would be more difficult to attribute to the correct source. **Methods:** Eighteen healthy college undergraduates viewed two lists of items and, following a delay, determined whether they had seen a given stimulus and, if so, to which list it belonged. Stimuli were either full (F) or degraded (D) at study and test, resulting in a two letter combination that denotes their integrity at these times (FF, FD, DF, DD). **Results:** Recognition accuracy varied by stimulus type ( $F(2, 107) = 25.824, P < .001$ ), with accuracy for FF and novel images (both degraded and full) significantly better than FD, DF, and DD images, which did not differ significantly from each other. Subjects responded fastest for FF images and slowest for novel degraded images when making correct item judgments. Stimulus type tended to have an effect on source judgment accuracy ( $F(3, 70) = 2.532, P = .064$ ), with significant differences between FD and DD images. Response latency was equivalent for all stimuli during correct source judgments. **Conclusions:** Source judgment differences between FD and DD support our hypothesis and suggest that such judgments are related to the strength

of the initial memory trace. Future work will examine the effect of encoding strategy on these judgments.

#### **A57**

##### **Are depression and anxiety related to intelligence and memory performance?**

*Singh AN, Pella RD, Hill BD, Schneider J, Stewart H, Gouvier W*

**Objective:** The objective of this study was to examine the relationship between depression, anxiety and cognitive performance using multivariate statistical techniques in adults presenting for psychoeducational testing. **Method:** Participants were 130 individuals with a mean age of 22.5 years who were evaluated at a university psychological services clinic. There were 69 (53.1%) males and 61 (46.9%) females with an average of 13.73 years of education. One hundred and seven (82.3%) individuals were Caucasian, 14 (10.8%) were African American, 3 (2.3%) were Hispanic, 2 (1.5%) were Asian, and 1 (0.8%) was of other racial background. Variables measured included the WAIS III, WMS III, and PAI indexes. Participants were excluded if any of the PAI validity indexes were above standard cutoff scores. This study utilized Pearson partial correlations to initially examine the relationship between measures of anxiety and depression with scores on intelligence and memory indexes. Second, a multiple analysis of variance was conducted to determine the effect of clinically significant levels of anxiety on cognitive measures. Third, a multiple regression analysis was conducted to examine the relationship between anxiety and depression measures on the PAI and intellectual and memory functioning. **Results:** The results of this study failed to demonstrate a significant relationship between measures of anxiety and depression with intelligence and memory functioning. **Conclusion:** Current standard personality inventories may not be sufficiently sensitive measures of emotional distress to ascertain the specific nature of the relationship between psychopathology and cognitive performance.

#### **NEUROPSYCHOLOGICAL DOMAINS PART I: OTHER**

#### **A58**

##### **Detrimental effects of ecstasy use severity on facial emotional expression recognition**

*Verdejo-García AJ, Puente AE, Puente KL, Coín-Megías M, Rivas-Pérez C, Pérez-García M*

**Background:** Facial expression recognition is a crucial feature of emotional and social behavior. Previous studies have shown that substance dependent individuals (SDI) are impaired in their recognition of facial expressions portraying basic emotions. The aim of this study is to examine the influence of stimulants use severity and duration of abstinence on recognition of basic emotions in polysubstance users. **Methods:** Fifty-one polysubstance SDI were recruited as they joined inpatient addiction rehabilitation. Mean age was 30.34 (S.D. = 6.25), and mean years of education was 9.62 (S.D. = 2.71). Mean abstinence duration was 17.43 (S.D. = 21.85) weeks. The Interview for Research on Addictive Behaviors (IRAB), and the Matsumoto and Ekman Japanese and Caucasian Facial Expressions of Emotions (JACFEE) were administered to all participants. The IRAB assesses the severity (dosing, frequency, and duration) of the different drugs used in this sample. The JACFEE taxes recognition of facial expressions portraying seven basic emotions. **Results:** Regression analyses showed that the standardized index of severity

of ecstasy abuse was the best predictor of emotional recognition ( $F$  change = 4.302;  $P < .05$ ). Both variables were inversely correlated. Cocaine and amphetamine use severity, and duration of abstinence did not significantly predict performance on JACFEE. Post hoc independent analyses showed that ecstasy peak use was the best predictor of facial expression recognition. Conclusions: These results shows that ecstasy use severity differentially impacts emotional recognition in chronic users. Ecstasy's selective effects on 5HT depletion may be associated with the specific effects of ecstasy on emotion. These deficits on emotional recognition may have important effects on SDI's everyday social interactions.

### A59

#### **Do sensory and motor skills differentiate patients with CVAs from patients with TBIs?**

*Shunk A, Davis AS, Dean RS*

Objective: Individuals who have been diagnosed with either a cerebral vascular accident (CVA) or a traumatic brain injury (TBI) may experience similar difficulties with vestibular functioning, spatial orientation, coordination, cognitive functioning, and speech. These similarities may cause problems for neuropsychologists in making a differential diagnosis, especially when the TBI or CVA is mild. Data selection: The present study examined differences in the sensory–motor functioning of a group of 40 individuals with CVA (mean age = 53.1 years, S.D. = 15.8) and 40 individuals with TBI (mean age = 46.4 years, S.D. = 13.9). All participants were administered the Dean–Woodcock Sensory Motor Battery (DWSMB). Data synthesis: By analyzing the results from a MANOVA, the change in the combined dependent variable of the subtests for group participants was not significantly related to diagnosis, Wilks' Lambda = .463,  $F(35, 44) = 1.46$ ,  $P > .05$ . However, subsequent univariate tests indicated that individuals with TBIs performed better on one sensory and one motor task. Conclusions: The results indicated that the sample of individuals with either a CVA or TBI did not differ significantly on broad measures of sensory skills, cortical motor skills, or subcortical motor skills. It seems, at least in this sample, that individuals with CVA and TBI display similar sensory–motor functioning. This poster will discuss the results from this study and will discuss directions for future research.

### A60

#### **Sensory–motor cortical and subcortical differences between depressed and normal individuals**

*Marker KM, Davis AS, Dean RS*

Objective: Research has demonstrated that different affective states are characterized by lateralized hemispheric activation. Specifically, depression is theorized to primarily be a function of the right hemisphere as indicated by functional neuroimaging and neuropsychological data. Indeed, if depression is an organic marker of hemispheric impairment, or dysfunction, depressed individuals should demonstrate differences on sensory and motor tasks. Data selection: This study examined the cortical and subcortical sensory–motor functioning of 36 individuals diagnosed with a depressive disorder (mean age = 47.9 years, S.D. = 28.1) and 100 normal individuals (mean age = 40.7 years, S.D. = 13.9). The Dean–Woodcock Sensory–Motor Battery (DWSMB) was administered to all participants. Data synthesis: A MANOVA indicated

a significant performance difference between depressed and non-depressed subjects (Wilks' Lambda = .437,  $F = 3.68$ ,  $P > .001$ ). Subsequent univariate tests indicated that normal individuals did better on 35 variables of the DWSMB. Normal individuals performed significantly better on measures of sensory functioning, cortical motor skills, and subcortical motor skills. Conclusions: It seems as if individuals with a primary diagnosis of depression demonstrate a variety of cortical and subcortical sensory–motor weaknesses. The results argue for the inclusion of sensory–motor measures when assessing depressed individuals. This poster will discuss the findings and implications for practitioners and future researchers.

### A61

#### **Is depression linked to hemispheric asymmetry with sensory–motor tasks?**

*Marker KM, Davis AS, Dean RS*

Objective: Current research suggests that a depressed affect is primarily a function of the right hemisphere, as indicated by research on lateralized lesions, neuroimaging and neuropsychological data. If depression is indeed a function of asymmetrical hemispheric processing, depressed individuals may demonstrate lateralized deficits on sensory–motor tasks, with likely contralateral sensory and motor weaknesses. Method: This study investigated 34 individuals diagnosed with depression (mean age = 40.8 years, S.D. = 28.8) who were administered the Dean–Woodcock Sensory–Motor Battery (DWSMB). All participants were right handed and were diagnosed by a licensed neuropsychologist. Results: A series of paired samples  $t$ -tests was used to compare right versus left sensory–motor hemispheric functioning. Significant hemispheric differences were found on three subtests. Participants performed significantly better on a measure of astereognosis with their left hand ( $t = 4.01$ ,  $P < .001$ ). Similarly, participants did better identifying movement in their left visual field ( $t = 2.195$ ,  $P = .035$ ). Conversely, participants performed better on a measure of upper extremity motor functioning with their right hand ( $t = 2.033$ ,  $P = .05$ ). Conclusions: Findings were mixed regarding the hypothesis that depressed individuals would demonstrate laterality on sensory–motor subtests. However, since all participants were right handed, this may influenced their right-handed dominance on Grip Strength. This poster will discuss the findings of this study, as well as implications for practitioners and future researchers.

### A62

#### **Predicting cognitive processing abilities using construction tasks from a neurologically impaired sample**

*Stage KA, Davis AS, Dean RS*

Objective: Construction tasks are powerful measures for detecting deficits in neuropsychological functioning. Individuals with disease or damage to the brain often demonstrate significant impairment in construction tasks, and certain types of impairments are associated with damage in specific brain regions. In addition to measuring neuropsychological deficits, construction tasks are also associated with cognitive functioning. This study examined the associations between construction tasks and higher order cognitive processing. Method: This study used multiple regression analyses between scores on the Construction subtests from the Dean–Woodcock Sensory Motor Battery (DWSMB) and cognitive processing subtests from

the Woodcock–Johnson Tests of Cognitive Ability—Revised. A sample of 811 participants (430 males and 381 females; mean age = 35.95) with a wide variety of neurological problems participated in this study. Results: Regression analysis showed a moderate to large association ( $r^2$  ranged from .363 to .446) between Clock and Cross Construction and higher order cognitive processing tasks that measured Processing Speed, Visual Processing, and Fluid Reasoning. Conclusions: The results indicated that the construction tasks predicted a moderate to large amount of the variance in cognitive tasks measuring Processing Speed, Visual Processing, and Fluid Reasoning. It seems performance on the simple, yet powerful, Cross and Clock Construction tasks is linked to performance on higher order cognitive processing skills. This poster will discuss the relationship between construction tasks and cognition and discuss the implications of these results for practitioners and researchers.

### **A63**

#### **The effect of pain on neuropsychological test performance in patients with cervicogenic headache**

*Gale O*

Objective: To determine if pain has an effect on cognitive functioning in cervicogenic pain patients. Method: Three groups were recruited: cervicogenic headache ( $N=30$ ), somatic pain ( $N=27$ ), and a group of normal control ( $N=27$ ). Patients were recruited from a pain clinic where palliative nerve blocks were performed. Exclusion criteria were brain injury, and use of any medications except opioids. All pain patients were tested twice, while they experienced significant pain (Visual Analogue Scale score = 4–10), and second time when pain was reduced (VAS score = 0–3). The subjects were administered RBANS, a screening assessment tool with alternate forms, which provides indices of attention, immediate and delayed memory, visual–spatial skills, and language. A computerized attention test (IVA) was also administered. This test provides measures of omission and commission errors in both visual and auditory modality. Other tests included TOMM as a measure of effort, as well as HADS, a measure of anxiety and depression. Results: Both pain groups differed significantly from the normal control group. They were more anxious and depressed, and performed significantly worse on all the 12 measures of cognitive functioning ( $P < .01$ ). After the treatment, pain level was significantly diminished ( $P < .01$ ) but there was no change in the level of depression and anxiety. However, cognitive performance in both groups of patients improved significantly and closely approximated the performance of normal control group. Conclusion: Reduction in pain intensity improves cognitive functioning but does not affect the mood variables.

### **A64**

#### **Factor analysis of visuoperceptual-orthographic processing: Speed, Early Perception, Late–Post Perception, and Morphological Awareness**

*Mano QR, Osmon DC, Klein L*

Objective: This study examined the factorial structure of extant visuoperceptual-orthographic tasks taken from the experimental learning disability literature. Method: The factor structure was analyzed using data from a sample of 150 non-impaired adult college students ( $M=24$ ; 61% female, 39% male). All participants were subjected to a standardized presentation of



stimuli and procedures. The following tasks were adapted from prior research and put into computerized form: Letter Decision Time, Letter Inspection Time, Word Matching, Illusory Conjunction, Homophone Selection, Pseudohomophone Selection, and Word Jumble. These tasks were selected on the basis of measuring early-, late-, and post-perceptual processes. Reaction time and error rate averages for all tasks were collected. Results: A principal components factor analysis with Varimax rotation and Kaiser Normalization revealed a four-factor solution (Speed, Early Perception, Late–Post Perception, and Morphological Awareness), explaining 55.7% of the variance. Conclusions: Results support the existence of a multi-factorial orthographic construct using extant experimental visual perceptual orthographic tasks from the literature. The Speed factor, cutting across all experimental tasks, suggested a general processing demand underlying orthographic processing. The Early and Late–Post Perceptual factors, also cutting across all tasks, support the notion that early- and late/post-perceptual processes underlie orthographic processing. The Morphological factor could be interpreted as a construct representing perceptual decomposition of the word stem from prefix and suffix morphemes. Results add to the growing literature supporting the double-deficit hypothesis of dyslexia and have clinical implications for assessment of the orthographic aspects of dyslexia.

#### **A65**

##### **Neuropsychological patterns in simple and complex Tourette's syndrome**

*Mano QR, Osmon DC, Woods D, Smerz J, Kelderman J, Sun Y*

Objective: This study compared neuropsychological patterns of simple Tourette's syndrome (TS) versus complex TS. Method: Twenty-two participants (68% female, 32% male; ages 8–17 years old) were recruited through referrals to a Tic Disorders Specialty Clinic from pediatricians, psychiatrists, and neurologists. Diagnoses of TS, obsessive compulsive disorder (OCD), and/or attention-deficit/hyperactivity disorder (ADHD) were confirmed with the Diagnostic Interview Schedule for Children (DISC). Participants were placed in one of two groups: (1) TS diagnosis only (simple TS;  $n = 11$ ) or (2) TS and OCD and/or ADHD (complex TS;  $n = 11$ ). Multiple neuropsychological tests were administered that tap various neurocognitive domains: visual processing (NEPSY), psychomotor (Gordon), attention (CMS), executive functions (Stroop and Trails), and cognitive abilities and achievement (WJ-III). Results: A one-way fixed-effects multiple analysis of variance revealed a main effect for diagnosis [ $F(1, 20) = 20,657.593$ ,  $P = .005$ ]. Separate ANOVAs revealed significant differences on measures of visual processing [ $F(1, 20) = 14.651$ ,  $P = .001$ ] and executive functions [ $F(1, 20) = 13.433$ ,  $P = .001$ ], but not for a TS severity composite [ $F(1, 20) = 3.033$ ,  $P = .097$ ] that included the Yale Global Tic Severity Scale. All deficits were greater in the complex TS group. Conclusion: The complex TS group exhibited unique neuropsychological patterns (visual processing and executive functions) relative to simple TS. Results suggest that selective neuropsychological factors are impaired in TS patients but may be more related to co-morbidities than the TS disorder itself.

**A66****EOG smooth pursuit errors as a function of hostility***Mollet GA, Walters RP, Harrison DW, Holland AK*

**Objective:** Evidence suggests that frontal lobe dysfunction may affect frontal eye field (FEF) control of smooth pursuit movements (O'Driscoll et al., 1998). A majority of the work examining the FEFs and smooth pursuit movements has focused on populations with frontal lobe lesions and schizophrenia; however, hostility also affects frontal lobe function (Shapiro et al., 2000). Measurement of smooth pursuit movements may provide an additional method to examine the neuropsychology of hostility. The current experiment used electro-oculogram (EOG) to measure smooth pursuit movements in high and low hostiles. High hostiles were expected to commit more errors on smooth pursuit movements due to frontal lobe dysfunction. **Method:** Twelve right-handed men classified as high ( $N=6$ ) or low hostile ( $N=6$ ) completed the experiment. Participants were fitted with EOG electrodes and seated about 40 cm in front of a computer screen. Participants were then asked to track the horizontal movement of a red ball across the center of the screen. Participants made five cycles of smooth pursuit movements. **Results:** A four-factor mixed design ANOVA produced a significant group  $\times$  direction  $\times$  movement ( $F=15.45$ ,  $P<.0035$ ) interaction. Both groups committed more errors during lateral movements; however, high hostiles made significantly more errors during medial movements. **Conclusions:** The results indicate that high hostiles are impaired on eye movements toward midline and may indicate a decreased capacity of the FEF to regulate reflexive eye movements in hostility. Further, the experiment provides preliminary evidence that EOG can be used to examine frontal lobe regulation in emotional disorders.

**A67****Oral contraceptive use and cognitive functioning in young women***Mohn K, Spiers MV, Sakamoto M*

**Objective:** Empirical evidence suggests that changes in sex hormone levels are associated with changes in cognition. Few studies have explored the potential cognitive effects of oral contraceptive use, which reduce levels of circulating hormones up to 90%. The purpose of this study was to (1) examine the impact of oral contraceptives on cognitive functioning and (2) test theories of hormone–brain interaction. It was hypothesized that (1) women using oral contraceptives (OC) would outperform normally menstruating women on visual–spatial tasks and performances on these tasks were expected to be negatively correlated with estradiol (E) and progesterone (P) levels; (2) Non-OC women would outperform OC women on verbal tasks and performances on these measures would be positively correlated with E and P; (3) performance patterns would show E and P to have an “activating effect” specific to the left hemisphere. **Method:** Cognitive functioning was assessed in 16 women between the ages of 22 and 31 using a mixed design. Seven women were in the OC group and nine women were in the Non-OC group. Testing occurred during the menses and midluteal phases, with hormonal levels confirmed by saliva samples. **Results:** Non-OC women significantly outperformed OC women ( $P<.001$ ) on two visual–spatial tests. Positive relationships were demonstrated between E and P and verbal performances. Negative correlational trends were shown between E and P

and visuospatial performances. Conclusion: These findings suggest a dynamic relationship between hormone levels and cognitive functioning and give rise to further questions about the mechanisms by which these changes occur.

## A68

### **Daily stressors, coping, and depression in multiple sclerosis**

*Wagner ML, Arnett PA*

Objective: Depression is common in multiple sclerosis (MS); however, the mechanisms underlying its development are not fully understood. Negative life stress, in conjunction with maladaptive coping style, may put MS patients at risk for depression. In the present study, we examined the relationship between daily life stress (hassles), coping style, and a measure of depression which excluded neurovegetative items that overlap with MS disease symptoms. More specifically, we hypothesized that hassles would predict depression when low levels of active (adaptive) coping were used and that hassles would predict depression when high levels of avoidance (maladaptive) coping were used. Method: Ninety-seven community-based definite MS patients completed the Daily Hassles and Uplifts Scale, the COPE, and the combined evaluative and mood subscales of the Chicago Multiscale Depression Inventory. A limited subset of Hassles items was selected based upon the group mean for that item being at least 1 (Somewhat of a Hassle). Results: After controlling for age, education, and diagnosis duration, regression analyses revealed that coping style significantly moderated the relationship between hassles and depression ( $r^2$  change = .05,  $P < .05$ ); high levels of avoidance coping (but not low) were associated with higher levels of depression. Active coping predicted depression ( $sr = -.29$ ,  $P < .05$ ) but did not moderate the relationship between hassles and depression. Conclusions: Reliance on avoidance coping in response to stress may put MS patients at risk for depression, whereas active coping in general may provide a buffer against it.

## Poster Session B

### **AGING AND DEMENTIA: ALZHEIMER'S DISEASE**

## B1

### **Increased intra-subtest scatter on the Wechsler abbreviated scale of intelligence as a characteristic of mild cognitive impairment**

*Krishnan M, Sachs B, Leritz E, Seignourel P, Bauer R*

Objective: To extend previous findings that increased variability may indicate biobehavioral vulnerability to age-related decline, we sought to determine if intra-subtest scatter (ISS) was greater in individuals meeting diagnostic criteria for mild cognitive impairment (MCI) than in a comparison group of healthy elders. Method: Eighty-nine community-dwelling participants (72 healthy elders and 17 individuals with MCI) from North-Central Florida were administered a battery of neuropsychological tests. Participants had a mean age of 73.5 years, and 55% were female. *t*-tests were performed to compare performance between the MCI group and the healthy elders on WASI subtest scaled and ISS scores. Results: ISS for the MCI group was significantly higher on the Vocabulary subtest ( $t(22.57) = -2.27$ ,  $P < .05$ ), but not

Matrix Reasoning ( $t(18.76) = -1.62, P > .05$ ). The MCI group was also found to have lower WASI FSIQs ( $t(25.58) = 2.36, P < .05$ ), but similar NART scores (which may better measure pre-morbid capacity;  $t(25.57) = 1.57, P > .05$ ). Finally, a discriminant function analysis was conducted, using IQ scores and ISS scores as discriminators of impairment status. In comparison with a model including only the IQ scores, the model adding ISS scores did not improve classification. Conclusions: Individuals with mild cognitive impairment show increased response variability in the Vocabulary subtest of the WASI; this increased variability may partially explain apparent group differences in IQ. Heightened subtest scatter, however, failed to discriminate significantly between healthy elders and individuals with MCI in this sample.

## B2

### **Self and informant reports of executive function on the BRIEF-A in MCI and older adults with cognitive complaints**

*Roth RM, Rabin LA, Isquith PK, Nutter-Upham K, Flashman LA, Wishart HA, Santulli R, Saykin AJ*

Objective: Amnesic mild cognitive impairment (MCI) is characterized by impaired episodic memory, although mild executive dysfunction has been noted on neuropsychological tests. Recent research has described a group of healthy, nondepressed older adults with significant cognitive complaints (CC) normal performance on neuropsychological testing. These individuals show structural brain changes intermediate between those seen in MCI and healthy older adults without such complaints (HC). We evaluated executive functions in MCI and CC using the Behavior Rating Inventory of Executive Function—Adult version (BRIEF-A), a new self and informant report questionnaire. Methods: Participants were recruited from the Dartmouth Memory and Aging study and included 23 patients with amnesic MCI, 26 older adults with CC, and 27 HC. Participants and their informants completed the BRIEF-A. Results: Groups did not differ in age, education and gender. Group differences emerged on all BRIEF-A subscales for both self and informant reports, with greatest difficulty noted for working memory ( $\eta^2$ : self = 0.35; informant = 0.22;  $P < .001$ ).  $T$  scores on both forms showed a pattern of MCI > CC > HC, higher scores reflecting greater difficulty. In general,  $T$  scores were higher for the self than informant reports. Conclusions: Mild executive dysfunction was reported by both the amnesic MCI and CC groups, which was also observed by their informants albeit to a lesser degree. Findings indicate that the BRIEF-A is sensitive to executive problems in amnesic MCI and older adults with CC. Future research is needed to determine if executive complaints are predictive of conversion to MCI.

## B3

### **Limitations of the Mini-Mental State Exam (MMSE) in screening for mild cognitive impairment (MCI)**

*Ruffolo JS, Malloy PF, Ready R, Westervelt HJ, Whelihan W*

Objective: To evaluate the accuracy of the Mini-Mental State Examination (MMSE) in detecting mild cognitive impairment (MCI) and assess whether adjustments in MMSE cutoff score, through the use of normative data or more conservative cutoff scores, would improve sensi-

tivity. Methods: Rates of sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were assessed in groups of participants with MCI ( $n = 131$ ), dementia of the Alzheimer's type (DAT;  $n = 69$ ), or normally functioning elderly ( $n = 82$ ) in a memory clinic setting. MCI participants were broken down by subtypes as defined by Petersen et al. (2004) to examine differences between patients with or without memory impairment and single versus multiple cognitive domains impaired. Results: MMSE performed very poorly in identifying patients with MCI, except when a very conservative cutoff was used (i.e., 28/30). Using the standard 23/30 cutoff, only 8% of the MCI subjects were correctly identified. Cutoff scores adjusted for age and education did not substantially improve sensitivity rates. Specificity remained high regardless of cutoff adjustment. When broken down by Petersen MCI subtypes, the MMSE demonstrated slightly higher sensitivity and PPV rates for amnesic MCI groups, compared to those with nonamnesic MCI. Across all MCI subgroups, NPV rates tended to be low, particularly with the standard 23/30 cutoff. Conclusions: The MMSE appears to be of very limited utility as a screening instrument in patients with MCI or early dementia. To improve early detection, patients with cognitive complaints would likely benefit from referral to a more comprehensive neuropsychological evaluation.

#### **B4**

##### **Relative preservation of sequential memory compared to recognition memory in mild Alzheimer's disease**

*Hampstead BM, Gallo J, Platek S, Libon D*

Objective: Research suggests that sequential memory (i.e., memory for temporal order) is mediated by working memory. However, relatively little is known about sequential memory ability in mild Alzheimer's disease (AD). Using an experimental task, we hypothesized that sequential memory would be better preserved than recognition memory among participants with mild AD. Additionally, we predicted performance on the sequential and recognition memory components would correlate with traditional neuropsychological tests of working memory and recognition memory, respectively. Methods: A novel test was developed wherein participants were asked to sequence and then recognize series of letters. Participants with AD ( $n = 11$ ; MMSE = 23.89, S.D. = 2.52) and age-matched healthy controls ( $n = 9$ ; MMSE = 28.71, S.D. = 1.38) were administered our task and traditional neuropsychological tests of working memory and recognition memory. Results: Relative to controls, AD participants' sequential memory was significantly impaired (group:  $F(1, 18) = 26.681, P < .001$ ; span: ns; interaction: ns), as was recognition accuracy on our task ( $t(18) = 6.606, P < .001$ ). As predicted, AD participants' recognition accuracy was more impaired than their sequential memory ( $P < .001$ ). Correlations revealed that AD participants' sequencing performance was not significantly related to an index of working memory ( $r = -.372, ns$ ); however, our recognition accuracy was significantly related to a traditional measure of recognition accuracy ( $r = .709, P = .002$ ). Conclusions: These findings (1) suggest that sequential memory is preserved relative to recognition memory in mild AD and (2) warrant further examination of such abilities in this population.

**B5****Reliability and factor structure of the frontal assessment battery with questionable and mild dementia of the Alzheimer's type***Brooks BL, Weaver LE, Iverson GL*

**Objective:** The Frontal Assessment Battery (FAB; Dubois et al., 2000) is a six-item screening measure designed to assess frontal lobe dysfunction. The present study examines the psychometric properties of the FAB in an outpatient geriatric sample ( $N=83$ ) with and without early Alzheimer's dementia. **Method:** The FAB was given as part of a larger neuropsychological battery. Three groups were established using the Clinical Dementia Rating (CDR; Hughes et al., 1982) scale and included healthy older adults ( $n=28$ ; age = 71.0, S.D. = 7.0), questionable dementia ( $n=30$ ; age = 76.9, S.D. = 6.6), and mild dementia ( $n=26$ ; age = 79.8, S.D. = 6.8). **Results:** FAB scores (corrected for age) for the control group ( $M=14.4$ , S.D. = 2.6) were significantly higher ( $P=.002$ ) than the mild dementia group ( $M=12.0$ , S.D. = 2.5). However, the questionable dementia group ( $M=13.2$ , S.D. = 2.2) did not differ from either normal aging ( $P=.09$ ) or mild dementia ( $P=.07$ ). Internal consistency reliability for the FAB for the entire sample was low (Cronbach's alpha = .56) and the items loaded on two principal components; labeled motor and verbal. **Conclusions:** The FAB has potential as a brief screening measure of frontal lobe changes in questionable and mild dementia of the Alzheimer's type. This study contributes to an emerging literature on the psychometric properties and clinical utility of the FAB.

**B6****Validation the HeadMinder™ Cognitive Screening Test (CST)***Kaushik T, Schafer A, Lichtenberg P, Erlanger D*

**Objective:** Early detection of dementia relies heavily on primary care physicians. The HeadMinder™ Cognitive Screening Test (CST) is a 12-min computerized screening of reaction time, memory, and executive functions. The purpose of this study is to evaluate the construct validity of the CST. **Method:** Primary care patients ( $n=102$ ) over the age of 65 from a geriatric specialty clinic ranged in age from 57 to 97. In this double-blind study, treatment team diagnosed patients based on patient and family interview, MMSE, 1 h neuropsychological testing, and lab tests. HeadMinder diagnosed based solely on CST results. **Results:** Significant agreement between HeadMinder and the treatment team was obtained ( $\chi^2=45.84$ ,  $P<.001$ ). Sensitivity rate of the CST was 80%, specificity was 87%, positive predictive value was 88%, and negative predictive value was 79%. An ROC curve analysis was performed with AUC = .86, which compared well with the MMSE AUC of .76. The CST identified impairment, as measured by the MMSE, in a strictly linear manner for the entire population and for impaired persons as well. CST accurately identified persons as cognitively impaired whose mean MMSE scores were approximately 26, well above traditional MMSE cutoff scores associated with dementia. **Conclusion:** The CST holds considerable promise for detection of dementia in primary care. Future studies will expand the validation sample to include a diverse sample from multiple clinics and will include longitudinal data analysis.

**B7****Verbal memory retention and recognition in at-risk Alzheimer's individuals***Demertzis KH, Miller KH, Small GW*

**Objective:** Early stages of Alzheimer's disease (AD) are associated with verbal memory decline due to neuropathy in the medial temporal lobe. Furthermore, asymptomatic individuals at risk for AD demonstrate verbal memory impairment compared to normal controls. This paper evaluated verbal memory retention and recognition of newly learned information in low-risk (i.e., controls) versus at-risk (i.e., heterozygous or homozygous for APOE-4 allele) individuals for AD. **Method:** A sample of 289 individuals (119 men, 170 women, mean age of 64 years, mean education of 15 years) received genetic testing for classification as at-risk ( $n = 117$ ) or low risk ( $n = 172$ ). Immediate and delayed recall and recognition subtests of Logical Memory, Verbal Paired Associates, and the Bushke Selective Reminding test were administered to all participants. Retention scores were computed for all verbal memory tests. **Results:** Analyses indicated no significant group differences between at-risk and low-risk groups on verbal memory retention or recognition. However, homozygous APOE-4 compared to heterozygous APOE-4 and low-risk participants displayed significantly poorer verbal memory recognition ( $P = .003$ ), but not retention ( $P = .163$ ). **Conclusions:** At-risk individuals homozygous for the APOE-4 allele displayed significantly lower verbal memory recognition, but not retention, compared to heterozygous APOE-4 and low-risk individuals, even when controlling for age, gender, and education. Low recognition may indicate preclinical signs of AD possibly involving the medial temporal lobe, which may portend further neuropsychological decline. Implications for early identification of at-risk individuals are discussed.

**B8****Identifying preclinical Alzheimer's disease using neurobehavioral markers of MCI confirmed by CSF-Tau and AB42***Wagner MT, Smerz JM, Walker A*

**Objective:** A consecutive case series of 18 patients demonstrated the accuracy of the clinical diagnosis of mild cognitive impairment (MCI) amnesic type in the detection of preclinical AD. **Method:** Of 18 cases presenting with subtle memory loss underwent an extensive dementia work-up. Of the 18 cases, 2 were lost to follow up did not complete the work-up. One CSF tap was a technically inadequate sample. **Results:** Of the remaining 15 cases, 14 tested positive for AD with CSF tau/AB42 and several had positive PS-1. One case tested inconclusive for AD and is being followed. Eleven cases had amnesic MCI, two had frontal/temporal MCI and one had a primary progressive MCI, but all showed CSF markers positive for AD. For the amnesic MCI, the neurobehavioral profile consisted of deficits in immediate and delayed episodic memory in both verbal and visual domains, with various other areas of cognitive impairment observed (i.e., confrontational naming, orientation, executive functioning, visuospatial skills). **Conclusions:** This case series illustrated that careful diagnostics confirmed by biological markers will yield high sensitivity/specificity in identifying preclinical AD. The practical significance of this finding is that carefully applied clinical techniques can reliably identify potential subjects for research in the preclinical stage of AD.

**B9****Empirical evaluation of wandering among AD patients***Cox D, Coplin JM, Harrison DW*

**Objective:** The current research sought to introduce a method of empirically evaluating the rate, dispersion and pattern of wandering among AD patients that offers greater precision than current clinical observations. A secondary objective was to utilize this measure to gather some preliminary data on wandering behaviors that may have some utility for facility design. **Method:** Participants consisted of 10 male patients diagnosed with AD placed in a long-term psychiatric VA facility. The ward housing these patients was divided into 2 ft<sup>2</sup> grids and plotted on a map of the ward. Formulae for determining rate, dispersion, and randomness were devised based on the grid system. Sampling sessions over a 2-week period were observed and behavior was tallied and entered onto the grid. **Results:** Two patients that did not have a clinically observed diagnosis for wandering met criteria for wandering behaviors and one patient that had this diagnosis did not meet criteria. Quantitative analysis of the elements of wandering indicate that all patients demonstrated strong tendency to wander in a pattern toward points of egress. **Conclusions:** Data from this method of assessment suggests that wandering may be more accurately diagnosed and treated using the systematic grid technique. Specific wandering patterns illuminated in these findings may have implications in the design of treatment or living facilities.

**B10****Everyday judgment in AD: relation to ratings of executive function***Borgos MJ*

**Objective:** Judgment, an important aspect of executive functioning, is often compromised in individuals with Alzheimer's disease (AD). Knowledge about everyday judgment can inform clinical decision-making regarding diagnosis, functional and cognitive competence, and treatment. We examined performance of patients with mild AD on recently developed measures of judgment and other areas of perceived executive function. **Method:** Older adults from the Dartmouth Memory and Aging study, including patients with AD ( $n = 8$ ) and demographically matched healthy controls (HC;  $n = 18$ ), completed the Test of Practical Judgment (TOP-J), a recently developed test of judgment covering four content domains: safety, medical, social/ethical, and financial matters. Informants for each participant completed the Behavior Rating Inventory of Executive Function—Adult version (BRIEF-A), a new measure that assesses everyday executive functioning, summarized in a Behavioral Regulation Index (BRI) and a Metacognition Index (MI). **Results:** Patients with AD attained significantly lower scores than HCs on the TOP-J,  $P = .00$ . Informant ratings indicated substantially more difficulties on the MI for the AD group,  $P < .001$ , but not on the BRI. TOP-J performance was strongly correlated with the MI,  $r = -.72$ ,  $P < .01$ , but not with the BRI. **Conclusions:** Individuals with mild AD exhibited difficulty with practical judgment, reflecting problems with metacognitive aspects of executive function including working memory, planning, organization, and monitoring, but not behavioral regulation aspects including inhibitory and emotional control. The TOP-J and BRIEF-A appear to be useful measures for the comprehensive assessment of older adults with cognitive decline.



**B11****Using the Dean–Woodcock to differentially diagnose dementia and depression***Noggle CA, Dean RS, Finch WH*

**Objective:** Early diagnosis of dementia in the elderly is often complicated by its overlap with psychiatric disorders, such as depression (Hart et al., 1987). Currently, there are few neuropsychological measures that have been able to provide a clear discrimination between the cognitive deficits associated with depression and those associated with dementia in the elderly (McNeil, 1999). The present study looked at the ability of the Dean–Woodcock Neuropsychological Battery (D-WNB) to do exactly that. A previous study (Noggle, Dean, & Finch, 2005) looked at just the visual–auditory learning subtest and its ability to differentiate the two groups; however, this study incorporated all of the core subtests of the Woodcock–Johnson Tests of Cognitive Abilities (WJ-COG) as part of the D-WNB. **Methods:** Participants fell into one of three groups: (1) Depressed (DSM-IV-TR) ( $n=171$ ); (2) Demented (DSM-IV-TR; ICD-9) ( $n=52$ ); (3) Normal ( $n=78$ ). Patients were individually administered the WJ-COG as part of the D-WNB. **Results:** A MANOVA showed significant differences between the three groups' cognitive abilities ( $P<.001$ ) with the demented group performing worse than the depressed who performed worse than normals. Further data will be presented. **Conclusions:** Group differences on individual tasks indicate the D-WNB can differentiate between depressed and demented patients. Results will provide practitioners with information regarding the cognitive functioning of depressed and demented individuals using the D-WNB. Implications for practitioners and future research will be discussed.

**B12****ApoE e4 selectively affects memory and is not moderated by symptom duration or age in patients with Alzheimer's disease***Smerz JM, Wagner MT*

**Objective:** Although it is well established that the apolipoprotein E (ApoE) epsilon (e) 4 allele is associated with an increased risk of Alzheimer's disease (AD) and an earlier age of onset, research investigating the effect of ApoE e4 on cognitive functioning has been mixed. The current study investigates two potential reasons for inconsistencies: variability in cognitive domains measured, and moderating effects of symptom duration and age. **Method:** Participants included 127 outpatients presenting to a neurology department due to memory problems. All completed a neurological and neuropsychological evaluation and ApoE blood testing, and met criteria for probable AD based on NINCDS-ADRDA. Neuropsychological measures included subtests from the WMS-R; WAIS-R; Hooper Visual Organization Test; and naming and letter fluency from the CERAD. **Results:** ANOVAs revealed that those with e4 scored significantly worse only on the verbal and visuospatial memory measures than those without e4. Symptom duration and age did not moderate this relationship. **Conclusions:** The effect of ApoE status only on memory measures likely explains previous inconsistent results, and is consistent with neurophysiological evidence suggesting that ApoE e4 is associated with more tau formation in the hippocampus and decreased volume and metabolic activity in the medial temporal lobe. Despite suggestions by imaging research, age and symptom duration do not appear to

moderate the relationship between ApoE and cognitive functioning. Clinical implications and future research are discussed.

## **AGING AND DEMENTIA: HEALTHY AGING AND COGNITION**

### **B13**

#### **Working memory and aging: a new look at the alphanumeric sequencing task**

*Kraybill M, Suchy Y*

**Objective:** The Alphanumeric Sequencing (AS) task is one of the electronically administered tasks that comprise the Behavioral Dyscontrol Scale—Electronic Version (BDS-ev). The task is similar to Trail Making Test part B, except that it relies on button responses rather than a drawn trail, thus increasing burden on working memory. Buttons are located in two groupings either on the left or the right side of a response console, separated by 16 in. Thus, participants need to switch between letters and numbers, as well as periodically switching between the two sides of the console. The goal of this study was to examine whether incorporating spatial location as a variable that increases the difficulty of certain trials can be clinically useful. **Method:** Thirty-three participants (14 aged 40–50 years and 19 aged 60–70 years) were administered the AS task. The two groups were compared on the trials that required spatial switching versus the trials that did not. **Results:** The results showed that the older group made more errors on the trials that required spatial switching ( $t = -2.31, P = .029$ ), with no group differences found for the trials without a spatial switching component. **Conclusions:** The results provide tentative support for the utility of examining individual trials on the AS task. Further, they suggest that even a slight increase in the task complexity (i.e., the need to switch spatially) is sufficient to overload the working memory capacity of older adults.

### **B14**

#### **Awareness of memory function in a community dwelling elderly population**

*Atchison T*

**Objective:** Studies have focused on the ability of neurologically impaired elderly individuals to evaluate their memory (Kazniak et al., 1996; Starkstein et al., 1995). Little is known about the ability of normal elderly to evaluate their memory function. It is known that anosognosia influences patient independence (Clare et al., 2002; Kazniak et al., 1996; Koltai et al., 2001). The purpose of this study was to increase understanding of how two methods to measuring anosognosia operate in the community dwelling. **Method:** Participants were community dwelling: age (60+), living independently, and no report of neurological impairment. Participants were 3 males and 19 female, average age 76 (S.D. 9.5) and education 14 (S.D. 2.7). Assessment of memory function was determined using the Rivermead Behavioral Memory Test (RBMT) in conjunction with Linda Claire's (2002) Memory Awareness Rating Scale (MARS). These were followed by a short set of neuropsychological measures. The Anosognosia Questionnaire—Dementia (AQ-D) (Migliorelli et al., 1995) and a difference score on the MARS and the RBMT were the measures of awareness of memory function. **Results:** Variation in awareness scores was observed in each awareness measure. A significant but moderate correlation was found between MARS and actual RBMT scores. No significant correlation

was observed between the two measures of memory awareness. No significant correlation was observed between neuropsychological measures and memory awareness scores except ADQ difference and Trail Making A. Conclusion: The findings illustrate the difficulty of defining and measuring the concept, awareness of memory function.

### **B15**

#### **Older adults successfully use and benefit from a novel brain-plasticity-based training program**

*Connor BB, Appelman J, Hardy JA, Woods RA, Schilling KN, Cook BL, Brenner DF, Dewey JA, Goldman DM, Mahncke HW, Merzenich MM*

Objective: Existing treatments for age-related cognitive decline generally rely on pharmacological therapies or strategy learning. We developed a novel brain-plasticity-based training program to enhance memory and cognition in older adults. This training intensively exercises auditory and language systems with listening exercises designed to strengthen the representational salience of speech input, improve signal-to-noise ratios, and drive neuromodulatory systems that control learning and memory. This randomized controlled trial with 95 participants (mean age 80) assessed the ability of older adults to use and benefit from the training program. Method: The program is used for 60 min/day for approximately 40 h (8 weeks). Outcome measures included standardized neuropsychological tests performed pre- and post-training. Exercises were designed to prevent a training-to-task bias. Results: We demonstrated (1) most participants learn and progress through the training exercises; (2) a 5.5 standard score point improvement in RBANS total score in the intervention group,  $P < .01$ , and no significant change in either control group; (3) a 7.7 standard score point improvement in participants completing >75% of graded difficulty levels,  $P < .05$ . Neurocognitive improvement was driven by changes in immediate and delayed memory. Conclusions: Older adults are able to learn to use a brain-plasticity-based computer training program. This training generalized to improvements on neuropsychological measures of auditory memory and cognition, offering significant promise to older adults.

### **AGING AND DEMENTIA: OTHER**

### **B16**

#### **The accuracy of the CBRISC in comparison to the MMSE for a geriatric population**

*Bushnell M, Wechsler F, Amin K, Barry P*

Objective: The objective of this study was to determine which cognitive screening instrument is more sensitive and specific for detecting dementia in a geriatric population: The Computerized Barry Rehabilitation Inpatient Screening of Cognition (CBRISC) or the Mini Mental State Examination (MMSE). Method: One hundred and eighty-one geriatric participants aged 60–95 years old participated in the study. The clinical group consisted of 72 participants with dementia diagnoses solicited from adult day care programs and life care facilities. The control group consisted of 109 participants who were recruited from Parks and Recreation senior centers, senior living facilities, and other senior volunteers from the community who were living independently. Results: Analyses of the CBRISC using a receiver operating characteristic

(ROC) curve revealed an overall sensitivity of 96.6% and specificity of 96.1% using the equivalent of a cutting *T*-score of 99. The Mini Mental State Examination (MMSE) yielded only a sensitivity of 89.7% and specificity of 96.1% using the equivalent of a cutting *T*-score of 22 for the same control and clinical samples. Conclusion: In initial testing, the CBRISC has demonstrated excellent specificity and sensitivity with a population of geriatric individuals with dementia diagnoses and demonstrated superior performance when compared with the latest version of the MMSE.

### **B17**

#### **An examination of the MMSE and RBANS in detecting dementia in a geriatric inpatient population**

*Matson RJ, Baade LE, Soetaert DK*

**Objective:** This study examined patients in a geriatric psychiatric unit who passed the MMSE but scored 2 or more standard deviations (S.D.) below the mean on the Delayed Memory Index (DMI) of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). The MMSE three-word recall task was examined to determine if performance on this helped identify the cognitively impaired. **Methods:** Participants were 119 senior adults (mean age = 76.3, S.D. = 9.2; mean education = 12.2, S.D. = 2.4) hospitalized in a rural geriatric psychiatry unit and earning a MMSE score greater than 24 at admission. The RBANS was administered and patients scoring 2 or more S.D. below the mean on the DMI were compared to patients scoring less than 1 S.D. below the mean. **Results:** The RBANS DMI score was 2 or more S.D. below the mean for 33% of the sample. In the group of patients receiving a 0 on the MMSE three-word recall, 47% scored 2 or more S.D. below the mean on the RBANS compared to 25% in a group who recalled all three words, a difference that is significant at the .05 level. **Conclusions:** In a hospitalized geriatric population one-third of the patients passing the MMSE are cognitively impaired. Additional measures are needed to identify patients who score above the MMSE cutoff but have cognitive deficits. Though the three-word recall task can be used to improve MMSE sensitivity, one quarter of the inpatients who passed the three-word recall task were cognitively impaired.

### **B18**

#### **Retest characteristics of a computerized screener for dementia with older adults**

*Frassrand KC, Webbe FM, Peake T*

**Objective:** Previously we demonstrated concurrent validity of a web-based computerized screener with standard measures of cognitive status. The present study assessed retest characteristics of the computer screen for its intended use in detecting early cognitive changes in elderly subjects. **Method:** Thirty adults (11 men, 19 women; all Caucasian but one; education:  $M = 13.97$  years) age 65 and older ( $M = 76.77$ ) completed the Cognitive Community Screen—Virginia (CCS-V) and MMSE on two separate occasions within a 120-day period. The CCS-V contains seven subtests yielding two indices: learning capacity (LC) and motor speed (MS). The Computer Self Efficacy Scale (CSES) was administered prior to the initial test session. **Results:** Significant correlations were observed between MMSE1 and MMSE2, LC1 and LC2, and MS1 and MS2, with the strongest correlation between LC scores,  $r(30) = .775$ ,

$P = .000$ . Descriptive statistics indicated CCS-V subtests tracked almost identically at T1 and T2. Paired  $t$ -tests showed no significant differences between MMSE or CCS-V scores at T1 or T2. Overall CSES scores did not correlate with any CCS-V measures. Conclusions: Reliability of the CCS-V as a retest measure was evidenced by correlations between measures at times 1 and 2 and finding of no difference between means. No practice effect was noted in this elderly sample. Similar cognitive functioning patterns in MMSE and CCS-V performance replicated the convergent validity demonstrated previously. Lack of correlation between CSES and CCS-V scores suggested that CCS-V validity was not threatened by computer confidence levels.

## **B19**

### **The differential diagnosis of dementia**

*Braaten A*

**Objective:** Similarities in presentation of dementia of Alzheimer's type (DAT), vascular dementia (VaD), frontotemporal dementia (FTD), and major depressive disorder (MDD) pose differential diagnosis challenges. The current study identifies specific neuropsychological patterns of scores, for DAT, VaD, FTD, and MDD. **Method:** Archival data of 120 community-dwelling individuals were analyzed. Participants were administered a neuropsychological battery including tests of verbal fluency, expressive language, memory, and executive functioning. Using relevant criteria (NINCDS-ADRDA, NINDS-AIREN, Hackinski Ischemia Scale, DSM-IV-TR, Neary Consensus Criteria), participants were divided into four diagnostic groups: DAT, VaD, FTD, and MDD. **Results:** Significant effects were found in the following comparisons: DATs did less well on delayed memory than FTDs ( $d = -1.21$ ) and MDDs ( $d = -0.90$ ); DATs did less well on confrontation naming than FTDs ( $d = -1.21$ ), and MDDs ( $d = -0.90$ ); DATs did less well on semantic fluency than VaDs ( $d = -1.23$ ), but better than FTDs ( $d = 1.09$ ); VaDs did less well on phonemic fluency than FTDs ( $d = -1.31$ ) and MDDs ( $d = -1.07$ ); VaDs did less well on immediate recall than FTDs ( $d = -0.98$ ), and MDDs ( $d = -0.86$ ); FTDs did less well on executive functioning than DATs ( $d = -0.49$ ), VaDs ( $d = -0.91$ ), and MDDs ( $d = -1.16$ ); and MDDs did better on attention/concentration than VaDs ( $d = 1.17$ ). **Conclusion(s):** The results reveal specific neuropsychological comparative profiles for DAT, VaD, FTD, and MDD. The identification of these profiles will assist in the differential diagnosis of these disorders and aid in patient treatment.

## **B20**

### **Functional versus structural neuroimaging for early differential diagnosis of dementia**

*Baker JG, Conde AM, Abouzied M*

**Objective:** This systematic review addresses the expected advantages of functional versus structural neuroimaging for the early differential diagnosis of dementias. **Data selection:** A MEDLINE search from 1995 to 2005 includes studies with accuracy data (sensitivity, specificity, positive predictive value, negative predictive value) for functional imaging (positron emission tomography (PET), single photon emission tomography (SPECT), functional MRI (fMRI), and MRI spectroscopy (MRIs)), or structural imaging (MRI, CT) for the early differential diagnosis of Alzheimer's versus other dementia subtypes (vascular, fronto-temporal,

Lewy Body). Studies without a definitive clinical or histopathological outcome are excluded. Data synthesis: Potential studies are reviewed according to inclusion/exclusion criteria and accuracy data are extracted from the eligible studies. Average accuracy values are presented and summary diagnostic odds ratios and summary receiver operating characteristic curves are used to compare functional to structural imaging across studies. Conclusion: The clinical advantages and cost–benefit considerations of functional versus structural neuroimaging are discussed with implications for their use with neuropsychology assessment results to identify subtypes of dementia early and to initiate timely and specific treatment.

## **B21**

### **Differential deficits in visual–auditory learning of depressed and demented patients**

*Noggle CA, Dean RS, Finch WH*

Objective: Research has indicated cognitive declines occur in both Alzheimer’s disease and depression (Massman et al., 1992). Even though their clinical presentation can be similar, some research has demonstrated depressed patients can be distinguished from patients in the early stages of dementia. In their review of the literature, Lamberty and Bieliauskas (1993) found that depressed patients usually performed worse than normals yet they performed better than demented patients. These differences were particularly significant on measures of delayed recall. The present study looked to replicate these findings using the Visual–Auditory Learning subtest of the Woodcock–Johnson Tests of Cognitive Abilities, which constitutes one portion of a new neuropsychological system, the Dean–Woodcock. This subtest was chosen because of its reliance on long-term retrieval. Methods: Participants fell into one of three groups: (1) Depressed (DSM-IV-TR) ( $n = 171$ ); (2) Demented (DSM-IV-TR; ICD-9) ( $n = 52$ ); (3) Normal ( $n = 78$ ). Patients had all been individually administered the Woodcock–Johnson Tests of Cognitive Abilities as part of the D-WNB and did not differ significantly in age. Results: A multivariate analysis of variance indicated demented patients performed significantly worse ( $P < .001$ ) on the visual–auditory learning subtest of the WJ-COG than both depressed and normals. So too, depressed subjects were significantly lower than normals. Conclusions: This study showed that the Woodcock–Johnson Tests of Cognitive Abilities was of utility in differential diagnosis of depressed and demented patients.

## **B22**

### **A case of mixed dementia: frontotemporal and vascular**

*Sheehy LM, Haines ME*

Objective: To describe CY, a 49-year-old woman who presented with transcortical aphasia after a vascular event, but who also evidenced other significant cognitive deficits. Methods: Transcortical sensory (TCS) aphasia is characterized by normal articulation, no logorrhea, and preserved ability to repeat. Semantic paraphasias are common. There is usually a profound difficulty with auditory comprehension at the word level. TCS aphasia is not uncommon after a vascular event; however, the individual described here also exhibited signs of frontal lobe dysfunction, indicating an overlay of frontotemporal dementia (FTD). Results: CY demonstrated deficits in primary/secondary language skills consistent with a diagnosis of aphasia, most similar to a TCS aphasia. However, she also evidenced other cognitive and personality

changes that were more reflective of a frontal lobe dysfunction. Auditory comprehension was severely impaired, though she was able to follow simple directions and respond to simple autobiographical questions. Reading comprehension was characterized by profound alexia. With regard to expressive language, she exhibited a paucity of language output. Semantic paraphasic errors, occasional neologisms, and perseveration were noted in both oral and written responses. Signs of frontal lobe dysfunction exhibited were reduced insight, stimulus-bound behavior, perseveration, difficulty initiating, and disinhibition. Her family reported significant personality changes. Conclusions: CY had vascular lesions in the left parietal lobe as evidenced by the MRI, accounting for the TCS aphasia; she also had several vascular risk factors (hypertension, elevated homocysteine and Factor II). CY's history (personality change with frontal lobe signs) also argues for a concomitant diagnosis of FTD.

### **B23**

#### **Memory performance associated with obstructive sleep apnea in the elderly**

*Creamer S, Crowell TA, Jayne M, Mullan M*

**Objective:** Obstructive sleep apnea (OSA) affects about 4% of woman and 13% of men in the elderly. Although it is widely known that OSA is associated with impairment of cognitive functions in younger adults, this issue requires further examination in the elderly. This study investigated the cognitive performance of elderly subjects with OSA compared to those without OSA. **Method:** The subjects were 20 OSA and 25 healthy patients chosen from a larger sample of persons who had been referred to a memory clinic for evaluation. Groups were equivalent for age ( $m = 71.6$ ) and education ( $m = 14.2$ ), MMSE score ( $m = 28.5$ ) and Geriatric Depression Score ( $m = 6.6$ ). Neuropsychological tests included the Boston Naming Task, CERAD Word List (total learning trials 1–3, delayed free recall, and recognition discrimination index), CERAD Constructional Praxis, Controlled Oral Word Association (COWA), Animal Fluency, Trails A and B, WAIS-III Digit Span and Digit Symbol, and Judgment Line Orientation (JLO). **Results:** No significant difference was found for any cognitive domain other than memory (all  $P$ s  $> .05$ ). The OSA groups scored significantly worse than healthy groups on all memory measures: CERAD Total Learning ( $P = .015$ ), delayed free recall ( $P = .001$ ), and recognition ( $P = .021$ ). **Conclusions:** Despite intact cognitive functioning in most cognitive domains, older individuals suffering from OSA perform significantly worse on measures of learning, recall, and recognition.

## **NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART I: CERE-BROVASCULAR DISEASE**

### **B24**

#### **Effects of bright light on unilateral stroke: modified receptive speech deficits in left hemisphere stroke patients**

*Mollet GA, Holland AK, Harrison DW*

**Objective:** Unilateral stroke produces differential effects depending on the hemisphere affected. A left cerebral vascular accident (L-CVA) may lead to deficits in speech processing, while a right cerebral vascular accident (R-CVA) may result in emotional dysregulation. Research indi-

cates that changes in intensity of light exposure can improve cognitive functioning in patients with dementia (Graf et al., 2001) and in normal controls (Kelly et al., 1997). The current experiment examined the effects of light on a lateralized receptive speech (consonant–vowel dichotic listening) task in patients with L-CVA or R-CVA. It was hypothesized that bright light would improve performance in patients with L-CVAs, whose speech may be compromised. Method: Ten (men = 9) unilateral stroke patients (mean age = 60.9 years) were tested in bright light (2500 lx) and dim light (350 lx) conditions across three experimental dichotic listening conditions: no focus, left focus, and right focus. All conditions and settings were randomized between each participant. Results: Results indicated a right ear advantage (REA) for all subjects ( $F = 8.72, P < .01$ ) and an advantage for the R-CVA group ( $F = 5.40, P < .03$ ). Performance significantly increased in the bright light condition for all participants ( $F = 1.9, P < .02$ ). Further, L-CVAs in the bright light condition were indistinguishable from R-CVAs in the dim light condition when attention was focused to the right ear. Conclusions: The results provide preliminary evidence that bright light may improve speech reception and may be a potential therapeutic intervention for patients suffering from stroke.

## **B25**

### **Influence of smoking history on cognitive decline after orthopedic surgery**

*Kellison I, Price C, Dickey D, Shugarman I, Bowers D, Gearen P, Monk T*

Objective: The influence of patients' smoking history on cognitive outcome after surgery has yet to be examined. Based on the theories of subcortical vascular influences and cognitive functioning, we hypothesized that severity of smoking history would relate to declines in executive function after major surgery. Methods: We examined baseline and post-surgery (two-week and three-month) cognitive and smoking data for orthopedic surgery patients ( $N = 40$ ) and age- and disease-matched controls with osteoarthritis ( $N = 15$ ). We calculated composite scores for smoking severity (based on average lifetime cigarette packs) and years since quitting. Results: Surgery and Control groups were equivalent for smoking history (Surgery group = 65% smokers; Controls = 67% smokers); smoking onset (age: Surgery =  $17.50 \pm 7.93$ ; Controls =  $18.18 \pm 5.06$ ); age at cessation (Surgery =  $41.44 \pm 17.16$ ; Controls =  $49.00 \pm 15.10$ ); and number of lifetime packs (Surgery =  $3566.05 \pm 5061.56$ ; Controls =  $7,304.23 \pm 11,412.62$ ). Bivariate correlations revealed no relationship between smoking history variables and baseline executive functioning or memory and learning ability. There was a significant relationship between severity of smoking history variables and two-week decline on executive function measures for the surgery group only (executive function  $r = -.45, P = .005$ ; memory/learning composite  $r = -.04, P = .79$ ). No significance was found for three months post-surgery. Conclusion: Severity of smoking history, regardless of years since quitting, increases patients' vulnerability to acute cognitive decline after surgery. Post-operative cognitive decline may be associated with cerebrovascular vulnerability due to history of smoking severity.



**B26****Neuropsychological case study of a 6-year-old boy with frontal lobe atrophy***Zamorski SA, Kimchi KM, Raviv D*

**Objective:** Perinatal brain injury in full-term infants is uncommon, and typically secondary to hemorrhage, focal infarction and hypoxia–ischemia injury. This is a neuropsychological case study of a 6-year-old boy, born at term, who sustained hypoxic–ischemic injury. **Method:** Congenital heart defect and constriction by the umbilical cord resulted in anoxia and cerebral hemorrhage in the frontal lobes. This case is complicated by congenital visual defects. Follow-up neuroradiological studies documented frontal lobe atrophy; Aricept was prescribed to improve frontal lobe functioning. Neuropsychological evaluation was conducted. **Results:** Much structure and redirection was required throughout testing due to significant problems with inattention, impulsivity and emotional reactivity. He presented with restricted areas of interest, was highly perseverative, and exhibited severe difficulty with transitions and mood lability. His overall verbal reasoning abilities were at the upper end of the low average range. In contrast, his performance on a visual–spatial reasoning task was below average. Despite visual impairments, he demonstrated average knowledge of pre-academic concepts. Parental reports of overall adaptive functioning were significantly below average. **Conclusions:** This child has a history of a significant frontal lobe injury and presents with a sequelae of behavioral, cognitive, and adaptive functioning impairments. This case illustrates the long-standing brain impairments due to a severe ischemic frontal lobe injury in a full-term infant. Findings demonstrate the role frontal lobes play in inhibitory control and emotional regulation. Finally, the educational and therapeutic implications including educational placement, teaching strategies, and behavioral and environmental accommodations are discussed.

**B27****Hyperbaric oxygenation therapy and its effect on cerebral metabolism***DenBesten N, Collins M, Upadhyaya S, Neubauer R, Golden C*

**Objective:** Historically, the efficacy of Hyperbaric Oxygenation Therapy (HBOT) to treat neurological conditions has been questioned, although recently attempts to document the utility of HBOT to improve neurological functioning have been evident. Research by Neubauer and colleagues suggests that increasing cerebral metabolism in the brain regenerates dormant neural tissue, and therefore allows for recovery of impaired mental capacity that is lost as a result of injury. The present study will examine the effect of HBOT on cerebral metabolism levels in adult and pediatric samples. **Methods:** Forty-nine participants referred for HBOT and diagnosed with neurological impairment were included in the study. The analyses employed a baseline SPECT followed by HBOT exposures and a post-SPECT scan. The present study included: mean age, ethnic breakdown (e.g., most Caucasian), education, and gender percentage. **Results:** Statistical analyses consisted of a multiple regression analysis that examined differences in cerebral metabolism before and after HBOT. Overall, a combination of variables (time, age, gender, pre-level, total change) yielded a multiple correlation of  $r = .74$ , significant at .05 alpha level. Age and gender were not significant variables for the current sample, although partial correlations suggested that duration of testing might maximize the effectiveness of treatment. **Conclusions:** Results indicated that the final levels of cerebral metabolism were related to pre-

HBOT levels and positively to number of HBOT treatments. These results provide additional support for the utility of HBOT for improving neurologic functioning in neurologic patients.

**B28****Cognitive perceptual motor retraining of driving skills after bilateral CVA**

*Cook EC*

**Objective:** The presentation is of a physician, Dr P, who suffered bilateral CVAs, with resulting right hemiparesis and aphasia. One of Dr P's major goals was to resume driving; an activity that, to many, defines independence, although difficult to resume after a debilitating brain injury. This presentation describes the use of Cognitive–Perceptual–Motor Retraining (CPM) for recovery of driving skills. **Method:** Dr P suffered bilateral CVAs. An arteriogram showed left internal carotid break with embolic occlusion. **Results:** A neuropsychological evaluation indicated severe disability. General intellectual abilities were at the moderate range of impairment. Severe impairments were found in language, executive functions, and memory for visual designs. A CPM evaluation showed deficits in visual–spatial and tactile–kinesthetic functions, including attention, memory, and processing speeds in these domains. Dr P received CPM retraining where the initial focus was the reacquisition of motor coordination and basic visual–spatial and tactile–kinesthetic functions, and subsequently on more focused driving-related skills. **Conclusions:** Dr P showed sufficient improvement in driving-related skills to pass a pre-driving test. An on-road evaluation demonstrated reacquisition of basic driving skills. However, he had difficulty in responding appropriately in more complex traffic situations, and reinstatement of driving privileges was not recommended. Problems were related to executive dysfunction, specifically poor impulse control. This case showed the importance of remediation of executive functions as a necessary component of driving, while also demonstrating the efficacy of a focused treatment paradigm (CPM), that may lead to independence; or an improved quality of life.

**NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART I: PSYCHIATRIC ILLNESS****B29****Borderline personality disorder, impulsivity, and the orbitofrontal cortex**

*Berlin HA, Rolls ET, Iversen SD*

**Objective:** Orbitofrontal cortex (OFC) lesions produce disinhibited or socially inappropriate behavior and emotional irregularities. Characteristics of Borderline Personality Disorder (BPD) include impulsivity and affective instability. We investigated whether aspects of BPD, in particular impulsivity, are associated with OFC dysfunction. **Methods:** Measures of personality, emotion, impulsivity, time perception, sensitivity to reinforcers, and spatial working memory (SWM), were administered to BPD self-harmers ( $N=19$ ), OFC lesion ( $N=23$ ), non-OFC prefrontal cortex lesion control ( $N=20$ ), and normal control participants ( $N=39$ ). **Results:** OFC and BPD patients performed similarly in that they were more impulsive, reported more inappropriate behaviors, BPD characteristics, anger, and less happiness than both control groups. They were less open to experience and had a faster perception of time (underproduced time) than

normal controls. They performed differently on other tasks: BPD patients were less extraverted and conscientious and more neurotic and emotional than all other groups. OFC patients had deficits in reversing stimulus–reinforcer associations and a faster perception of time (overestimated time) than normal controls. Conclusions: OFC dysfunction may contribute to some of the core characteristics of BPD, in particular impulsivity. Other characteristics of BPD, such as high emotionality and personality irregularities, do not appear to be related to the type of dysfunction produced by OFC damage. The similarities and dissociations found between BPD and OFC patients may lead to a better understanding of the aetiology of BPD and the functions of the OFC. These findings could have significant implications for treatment.

### **B30**

#### **Stability of neuropsychological performance in anorexia nervosa**

*Mikos AE, McDowell BD, Moser DJ, Bayless JD, Bowers WA, Paulsen JS, Andersen AE*

**Objective:** We investigated the stability of neuropsychological performance and eating disorder (EDO) symptoms before, immediately after, and 2 years after inpatient treatment. We also examined relationships between neuropsychological and EDO measures. **Method:** Sixteen women who were admitted for inpatient treatment of anorexia nervosa participated in three evaluations: (1) at admission to the hospital, (2) at discharge, and (3) approximately 2 years after discharge. Neuropsychological, psychological, EDO, and physiological measures were taken. **Results:** (1) Stability of eating disorder symptoms over time. Body mass index (BMI) was significantly greater at discharge than at admission, and was significantly greater at follow-up than at either of the previous two times. Compared to admission, EAT scores were significantly decreased (indicating less endorsement of eating disorder symptoms) at discharge and at follow-up. (2) Stability of neuropsychological performance over time. RBANS total scores were significantly greater at follow-up than at admission. Examination of the 5 domain scores and 12 individual subtest scores revealed that there was significant improvement in the attention domain and the coding subtest. (3) Relationships between EDO symptoms and cognitive function at follow-up. There were no significant relationships. **Conclusions:** Participants displayed significant weight restoration and improvement in EDO symptoms during treatment and even further significant increases in BMI at follow-up. Gains in attention and psychomotor processing speed were achieved and maintained as long as 2 years after inpatient therapy. At follow-up, 69% of participants were in therapy and 88% were taking psychotropic medications. These factors may have contributed to the observed improvements.

### **B31**

#### **Neurocognitive performance in depression and automatic and effortful processing in a primary care setting**

*Franks SF*

**Objective:** Research on depression and neurocognitive functioning with patients in a primary care setting is rare. This study seeks to replicate and extend existing work on possible relationships between depression and neurocognitive performance of tasks involving varying degrees of processing (e.g., effortful vs. automatic) with this population. **Methods:** Participants included 58 patients, ages 24–79, referred to a primary care clinic for neuropsychological and

psychological testing. The Beck Depression Inventory (BDI) was used to separate moderately depressed patients from clinically non-depressed patients. Groups were matched on demographic variables of age, education, FSIQ, VIQ, and gender. Standard neuropsychological measures and a full WAIS-R were completed using standard procedures. Results: Independent sample *t*-tests found 10 neurocognitive measures statistically different ( $P < .05$ ) and 16 measures without statistical significant differences between the groups. Effect sizes ranged from medium to large (Cohen's  $d = 0.54$ – $1.28$ ). There was no significant difference between performances on measures of effortful and those of automatic processing. No age- or gender-related patterns of dysfunction were noted. Conclusion: Differences in neurocognitive performances between moderately depressed patients and clinically non-depressed patients were found, however, there was no difference in performances based on varying types of processing. Additional study is required before concluding moderately depressed patients have a specific pattern of performances on neuropsychological tests. Follow-up studies with repeated testing when clinically depressed patients are no longer depressed may provide additional information regarding the true effects of depression on neurocognitive performance.

### **B32**

#### **Executive dysfunction in depression—revisited**

*Sheehan C, Stack M, Nigl G, Lloyd A, Nixon E, Golden C*

Objective: A study by Shelley Channon (1996) examined the role depression plays in executive dysfunction as measured by the WCST among dysphoric adults. The purpose of the study was to replicate Channon's (1996) findings to see whether the results generalized to other executive tests. Methods: Participants were drawn from a referred population of adults without brain injury. The BDI was used to group participants by level of depression. All participants scored in the average range or above on the Vocabulary subtest of the WAIS-III. Forty-five participants were in the no depression group ( $BDI \leq 5$ ) and 45 were in the dysphoric group ( $BDI \geq 20$ ). Participants had an overall mean age of 34.50 years and a mean education level of 14.61 years. The sample consisted of 43% males and 76% Caucasians. The neuropsychological measures used in this study were the BDI, WAIS-III, WCST, Trails, and the Stroop. Results: Results of independent samples *t*-tests revealed significant differences between groups at the .05 level for the Stroop color–word test and Trails B. The no depression group performed better than dysphorics on Stroop-word,  $t(77) = 2.92$ ,  $P = .005$ , Stroop-color,  $t(77) = 2.53$ ,  $P = .013$ , and Trails B,  $t(87) = 2.51$ ,  $P = .014$ . Conclusions: Current findings suggest that both the speeded aspects of the Stroop color–word test and Trails B may be useful for identifying depression-related deficits. No differences were found however for executive measures such as the WCST, Stroop interference, and intellectual measures.

### **B33**

#### **Maintenance of reading and math skills among psychiatric outpatients**

*Harvey D, Korman B, DenBesten N, Durkin M, Golden C*

Objective: This study examined long-term maintenance of basic reading and arithmetic skills among psychiatric outpatients. It was hypothesized that reading achievement scores would hold better over time compared to arithmetic scores. Method: Participants were 76 psychiatric

outpatients divided into three groups based on time since completion of highest education level. All were administered the WRAT-3 and WAIS-III in a university mental health services setting. Fifty percent of participants were female and mean age was 35.11 ( $s = 12.54$ ), with mean FSIQ of 104.01 ( $s = 18.53$ ) and mean education of 14.52 years ( $s = 2.38$ ). Results: Two one-way ANCOVAs controlling for IQ were conducted at an alpha level of .25 (.05/2) to maintain the family-wise alpha level at .05. Levene's tests indicated the homogeneity of variance assumption was tenable (Levene's tests  $> .05$ ). Significant differences were found between adjusted group scores on WRAT-3 Arithmetic [ $F(2, 72) = 5.250$ ,  $MS_w = 87.244$ ,  $P = .007$ ] but not on WRAT-3 Reading [ $F(2, 72) = 0.925$ ,  $MS_w = 114.332$ ,  $P = .401$ ]. Bonferonni adjusted post hoc pairwise comparisons of group means indicated significantly lower scores for those with longest time since completion of education. Conclusions: Longer time since completion of education was associated with better maintenance of reading as compared to arithmetic skills, most likely due to more frequent practice of reading. A downward revision of math ability expectations for older psychiatric outpatients is recommended based on the findings.

### **B34**

#### **Neurocognitive phenotypes for individuals at risk for developing bipolar disorder**

*Frantom L, Allen DN, Knatz DT*

Objective: The purpose of this study was to determine whether there are neurocognitive endophenotypes in first-degree relatives of bipolar I probands. Bipolar disorder has been found to have a strong genetic component, and recent studies demonstrate significant cognitive impairment in executive function, verbal memory, and visuospatial abilities in affected individuals. Cognitive endophenotypes have also been proposed, but few studies have examined phenotypes in unaffected first-degree relatives of bipolar probands. Method: The current investigation examined cognitive function in both individuals with bipolar I disorder ( $N = 15$ ), their first-degree relatives ( $N = 15$ ), and a normal control group ( $N = 19$ ). Participants underwent a comprehensive neuropsychological evaluation of attention, executive function, verbal and visual memory, and visuospatial and motor abilities. Diagnoses were verified using the Structured Clinical Interview for DSM-IV, and symptoms were evaluated using the Hamilton Rating Scale for Depression and Young Mania Scale. Results: Analyses of variance demonstrated significant deficits ( $P < .05$ ) in the areas of executive function and visuospatial/visual memory tasks in individuals with bipolar I disorder as well as intermediate deficits in the first-degree relatives on tasks of visuospatial and perceptual–motor abilities. Conclusion: These preliminary results provide some evidence for visuospatial or right-hemisphere tasks as cognitive markers in unaffected relatives of bipolar probands. Cognitive endophenotypes may prove useful in diagnostic assessment and genetic linkage studies. Further research with larger samples is needed.

### **B35**

#### **NEO PI-R traits in adult ADHD subtypes**

*Samuel DB, Ranseen JD*

Objective: Significant controversy exists regarding the theoretical and clinical differences between ADHD subtypes. The current study sought to extend past research showing adult

ADHD diagnosis to correlate with five factor model (FFM) personality traits of neuroticism (high) and conscientiousness (low). More specifically, it sought to explain the less robust relationship between ADHD and the FFM trait of agreeableness as a difference between the two primary subtypes of ADHD. Method: Forty adults were assessed for ADHD at an outpatient facility and diagnosed as either combined ( $n = 14$ ) or inattentive ( $n = 26$ ) using strict DSM-IV criteria based on structured interview, self and informant reports (CAARS). The sample was 53% male, with a mean age of 29.9. No significant group IQ differences were evident (mean IQ = 105.6). Patients completed neuropsychological measures including the Connors' CPT-2, Wisconsin, and Trail Making; and an FFM measure. Results: Consistent with previous adult ADHD research, both combined and inattentive subtypes describe themselves as equally emotionally hypersensitive (high neuroticism) and lacking self-discipline (low conscientiousness). More importantly, the combined group's scores were significantly lower than the inattentive group's on the FFM Agreeableness scale,  $F(1, 39) = 4.71$ ,  $P = .037$ . Although a majority of subjects exhibited neuropsychological impairment on at least one measure, no differences between groups on neuropsychological measures was evident. Conclusions: It appears the relationship between low agreeableness and ADHD diagnosis may be a function of the symptoms of hyperactivity that may help differentiate the combined group from the inattentive subjects.

### **B36**

#### **Accelerated age-related decline of neurocognitive performance in deficit syndrome schizophrenia**

*Strauss GP, Allen DN, van Kammen DP*

Objective: The current study attempted to determine whether schizophrenia symptomatology differentially contributes to an accelerated age-related decline in neurocognitive ability. Research suggests that schizophrenia characterized by primary negative symptoms (i.e., deficit syndrome schizophrenia) may be associated with severe neurocognitive impairment. However, it has yet to be determined whether neurodegenerative processes contribute to the interaction between symptomatology and neuropsychological dysfunction. The current study attempts to clarify this relationship through a cross-sectional examination of neuropsychological performance in a group of individuals with schizophrenia. Method: Participants included 26 patients with schizophrenia (11 deficit syndrome; 15 non-deficit syndrome), and 17 healthy matched controls. Neuropsychological tests administered included the Wechsler Memory Scale (WMS), Wisconsin Card Sorting Test, Purdue Pegboard, and Trail Making Test. Deficit syndrome classification was determined using the Proxy for Deficit Syndrome method, which is derived using Brief Psychiatric Rating Scale data. Results: Linear regression revealed that neurocognitive performance declined more steeply for deficit syndrome patients than non-deficit patients or healthy controls. Decline was most significant for verbal memory and executive functioning (perseveration). Conclusion: Results suggest that schizophrenia patients with primary negative symptoms experience an accelerated age-related decline in cognitive function, which is more severe than that of non-deficit schizophrenia. This phenomenon may be specific to verbal memory and executive functioning, as it was not found in other neuropsychological measures. Findings have important implications for treatment planning in elderly

patients with schizophrenia, as results indicate that cognitive processes become more deficient with age.

**B37****Cognitive flexibility and the caudate nucleus***Zinn S*

**Objective:** Although Kaplan suggests that caudate lesions producing executive function deficits and those producing psychiatric symptoms occur in different areas, we report a case in which a small caudate lesion produced both a severe cognitive flexibility deficit and paranoia. It is hypothesized that both occurred because of the lesion's disruption of circuits crucial for resolving the salience of competing stimuli. **Method:** An 86-year-old college educated male who had been living independently presented for evaluation of sudden onset dysarthria and left-sided weakness. These symptoms resolved within 36 h but persistent cognitive impairment resulted in a neuropsychological evaluation during his hospitalization. MRI revealed a small lesion of the mid-body of the right caudate. Neuropsychological evaluation was repeated 1 year later after reports of paranoia raised concern of progressive dementia. **Results:** Acutely, the patient was disinhibited and logorrheic. Testing showed impaired working memory, cognitive flexibility, fluency, and construction. Memory testing revealed a slowed rate of learning, borderline long-term verbal memory impairment, and high rates of false positives on recognition. When reassessed 13 months later, he showed improvement of inhibition, fluency and learning, with memory and confrontational naming in the normal range. Cognitive flexibility and working memory remained severely impaired. **Conclusion:** Analysis of his problem solving process suggest that the patient had difficulty resolving competing solutions by discarding irrelevant information. He appeared unable to distinguish between degrees of salience to weight information in terms of context. It seems likely that his paranoia resulted from an inability to reach a reasonable interpretation of events.

**NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART I:  
TRAUMATIC BRAIN INJURY****B38****Are similar achievement deficits caused by different cognitive processing profiles for individuals with ADHD and TBI?***Shunk A, Davis AS, Dean RS, Woodcock R*

**Objective:** Individuals with attention deficit hyperactivity disorder (ADHD) and individuals with a traumatic brain injury (TBI) display similar achievement difficulties, including problems with reading, writing, math, attention skills, distractibility, and short-term memory. However, these similar academic problems are likely caused by differences in cognitive processing profiles due to differential areas of neurological impairment. **Method:** The present study used the Cattell–Horn–Carroll (CHC) and Gf–Gc theories to examine cognitive processing and achievement differences for a group of 100 individuals with ADHD (mean age = 22.14 years; S.D. = 7.42) and a group of 100 individuals with TBI (mean age = 22.23 years; S.D. = 6.91). All individuals received cognitive and achievement subtests from the

Woodcock–Johnson—Revised. Results: By analyzing the MANOVA, the change in the combined dependent variable of the subtests for group participants was significantly related to diagnosis, Wilks' Lambda = 0.329,  $F(51, 89) = 3.552$ ,  $P < .05$ . In regards to achievement, significant academic differences for performance on the Reading composite,  $P > .05$ ; the Writing composite,  $P > .05$ ; and the Math composite,  $P > .05$  were not present. However, subsequent univariate tests revealed a number of significant cognitive processing differences between the two samples, including tests of memory, visual processing and broad CHC indices. Conclusions: Individuals with TBI and ADHD were found to have similar achievement skills. However, clear and salient cognitive processing differences between the two groups seem to be accounting for these achievement differences. This poster will discuss these results and directions for future research.

### **B39**

#### **An examination of traumatic brain injury and posttraumatic stress disorder**

*Alford HL, Goldberg KB, Boyer B, Lazar M, Paharia I*

Objective: The current study attempts to address the controversy of the existence of PTSD in patients that have sustained a TBI. Major hypotheses included: (1) loss of consciousness (LOC), PTA and impaired declarative memory are protective for, but not mutually exclusive with, PTSD. (2) PTSD is not equivalent to PCS. Method: Participants were 43 individuals who were referred for outpatient neuropsychological assessment following TBI. Participants were included in the sample if they had completed the MMPI-2 PK scale and had a history of TBI. Exclusions were conducted statistically whenever participant data was missing for a variable of interest. PTSD was defined as a PK  $T \geq 65$ . Impaired memory defined as  $T \leq 40$  total score on trials 1–5 CVLT-II. Information regarding PCS, PTA, and LOC were obtained from medical records or clinical interview. Results: No significant relationship was found between PK and LOC. However, it was noted that 42% of the no LOC group, scored in the significant range on the PK scale, whereas 22% of participants with LOC, scored in the significant range on the PK scale. CVLT-II and PTA did not significant correlate with the PK scale. No significant relationship was found between PCS and the PK scale. Conclusions: LOC may be protective for, but not mutually exclusive with, PTSD. Findings do not support the argument that the symptoms of PTSD in patients with TBI are actually manifestations of PCS. LOC, combined with an absence of auxiliary mechanisms, may uniquely contribute to a clinical picture relatively absent of PTSD symptoms.

### **B40**

#### **Improvement of abstraction abilities following brain injury in children**

*Leany BD, Knatz DT, Allen D, Mayfield J*

Objective: Few studies have documented improvement in abstraction abilities associated with recovery of brain function following traumatic brain injury (TBI) in children. The current study addressed this issue using the Children's Category Test (CCT) to evaluate improvement of abstraction ability following brain injury in children and adolescents. Method: Twenty-five participants were administered the CCT on two occasions. Test–retest intervals ranged from 8 to 45 months (mean = 17.4, S.D. = 9.7). Participants were 9.5 years old (S.D. = 3.4) with Wech-



slers Full Scale IQs of 87.2 (S.D. = 10.7). Most participants had sustained TBI (92.0%). Results: ANOVA indicated significant improvement in CCT scores from the first to second assessment ( $F = 7.01$ , d.f. = 1,24,  $P < .05$ ). A significant positive correlation ( $r = .47$ ,  $P = .05$ ) was present between difference scores reflecting CCT improvement, and the elapsed time between evaluation one and two, indicating that as length of time between testing sessions increased, amount of improvement in test scores also increased. Conclusions: Results provide evidence supporting recovery of abstraction abilities following TBI. While it may be that practice effects account for the improvement in CCT scores, the finding of more improvement with longer test–retest intervals suggests that recovery of brain function was the primary mechanism responsible for improvement, as practice effects diminish as test–retest interval increases. Additionally, minimal practice effects have been reported for the CCT in other clinical groups over short test–retest intervals, further supporting recovery of brain function in the current study.

#### **B41**

##### **Pre- and post-injury parent ratings of executive function in pediatric TBI**

*Benjamin ML, Heaton SC, Fennell EB, Kimberg C, McCann S*

Objective: Executive dysfunction has been reported in pediatric traumatic brain injury (TBI), but traditional tests measures have not allowed for the examination of pre-injury functioning. The Behavior Rating Inventory of Executive Function (BRIEF) is a parent questionnaire for assessing everyday executive functioning. BRIEF ratings used to measure executive functioning retrospectively may enable clinicians to assess changes in executive functioning following pediatric TBI. This pilot study examines pre- and post-injury ratings of everyday executive functioning using individual scales of the BRIEF in a severe pediatric TBI sample within the first year of recovery. Methods: Parents of children aged 6–16 with severe TBI ( $N = 14$ ) and non-TBI orthopedic controls ( $N = 10$ ) completed retrospective (pre-injury) and current (post-injury) ratings using the BRIEF. Group differences were examined using change scores (post-injury minus pre-injury scores) for the following eight BRIEF scales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor. Results: Significant changes post-injury were found in severe TBI for the Working Memory scale ( $P = .006$ ), and changes were marginally significant for the Plan/Organize scale ( $P = .07$ ). Post-injury ratings suggest that the severe TBI group's Working Memory scores were clinically significant. Effect sizes calculations suggest that additional scales (e.g., Inhibit, Monitor) may demonstrate group differences in a larger sample. Conclusions: Results suggest that specific aspects of everyday executive functioning may be problematic in pediatric TBI and may represent a change from pre-injury functioning. Implications of this methodology will be discussed.

#### **B42**

##### **Recovery of memory function following traumatic brain injury in children**

*Park BS, Allen DN, Mayfield J, Knatz DT*

Objective: The current study utilized the Test of Memory and Learning (TOMAL) to assess recovery of memory and attention abilities in children following brain injury. Few investigations of this type have been accomplished with pediatric samples. Method: Twenty-three

children (15 males, 8 females; 5–17 years of age) suffering from traumatic brain injury (TBI) were administered the TOMAL on two occasions, with test–retest intervals from 10 to 28 months (mean = 16.7, S.D. = 5.8). Wechsler Full Scale IQ scores at initial evaluation were 83.36 (S.D. = 11.9). Results: Repeated measures ANOVA indicated significant improvement from assessment 1 to assessment 2 on the TOMAL Composite Memory Index (CMI;  $F = 13.80$ , d.f. = 1,22,  $P < .001$ ), but not on the Attention/Concentration Index (ACI,  $F = 1.78$ , d.f. = 1,22,  $P = .20$ ). Follow-up analyses of verbal and nonverbal memory abilities indicated significant improvement on TOMAL Verbal Memory Index (VMI,  $F = 14.59$ , d.f. = 1,22,  $P < .001$ ), but not on the Non-verbal Memory Index (NMI,  $F = 3.84$ , d.f. = 1,22,  $P < .10$ ). For verbal memory, a significant positive correlation ( $r = .36$ ,  $P = .05$ , one-tail) was present between VMI improvement and the time that had elapsed from evaluation 1 to 2. This indicates that improvement in verbal memory is positively associated with the number of months between the evaluations. Conclusion: Results indicate recovery of verbal memory function in children following TBI, although no such improvement occurs for nonverbal memory and attention abilities.

#### **B43**

##### **Cognitive improvement following SSRI treatment in patients with traumatic brain injury**

*Levin SL, Keating DJ, Gallo JL, Platek SM*

Objective: To determine if selective serotonin reuptake inhibitors (SSRIs) differentially improve cognitive functioning in patients with TBI. This research is based on a 2004 case study of a patient who showed improvement following the administration of Sertraline. Thus, we attempted to replicate this finding using a larger group of patients. Method: Three males and two females with TBIs incurred over 2 years ago and taking an SSRI for more than 6 months participated. Subjects were excluded for history of depression pre-injury requiring treatment with medication. One subject was unable to complete the performance section due to a tremor, therefore only verbal scores are reported. Assessments with a WAIS-II or a WASI were compared pre-SSRI (>11 months post-injury) and post-SSRI administration. The study was conducted in an outpatient rehabilitation facility at Bancroft NeuroHealth in New Jersey. Results: Most subjects showed improvement after SSRI administration as measured by the WASI. The subject on Zoloft improved the most, followed by the subject on Celexa, a subject on Prozac, and two subjects on Paxil. The subjects on Paxil showed either no improvement or declined on both verbal and performance measures. Statistical significance could not be determined due to the limitation in sample size, however three of five subjects showed clinically significant improvements. Conclusions: These results highlight the need for further study in this area. They also suggest that cognitive functioning is correlated with the amount of serotonin available in the brain, which might be best regulated with Zoloft. Possible explanations for study findings are discussed.

#### **B44**

##### **Memory for simple and complex material after pediatric TBI**

*Schroder MD, Heaton SC, Fennell EB, Rodriguez J*

Objective: Memory skills after pediatric traumatic brain injury (TBI) were examined. More specifically, the impact of injury severity and material complexity on memory performance

was explored. We hypothesized that the severe TBI group would perform worse than other groups on all tasks, but show greater impairment specifically on tasks involving more complex material. Method: The Children's Memory Scale was administered to a pediatric TBI sample from a teaching hospital. Memory tasks were divided according to material complexity as Simple (Dot Locations, Word Pairs) or Complex (Faces, Stories). Children aged 6–16 with mild TBI ( $n=9$ ), severe TBI ( $n=16$ ), and non-TBI controls ( $n=13$ ) were evaluated within one year of injury. Groups were comparable on age, gender, ethnicity, and IQ. Results: Contrary to hypotheses, the severe TBI group only performed worse than mild TBI and control groups on tasks classified as Simple ( $P < .001$ ). The three groups performed comparably well on tasks classified as Complex ( $P = .14$ ). Furthermore, within-group analyses revealed that mild TBI and control group performance did not differ as a function of material complexity ( $P_s > .35$ ), while the severe TBI group showed a clear weakness recalling material classified as Simple ( $P < .01$ ). Conclusions: Findings indicate that memory skills vary as a function of injury severity and material complexity. Although seemingly counter-intuitive, examination of the nature of the 'Complex' tasks revealed potential explanations. For instance, the 'Complex' material appears more related and meaningful, which may aid retrieval for children with severe TBI. Clinical implications are discussed.

#### **B45**

##### **Single photon emission computerized tomography and cognitive fatigue in patients with mild traumatic brain injury**

*Swan-Foster MA*

Objective: Activated and resting brain SPECT images of two patients with MTBI were compared to evaluate SPECT imaging sensitivity. The purpose is to demonstrate the phenomena of cognitive fatigue MTBI participants compared to normals via examination of neuropsychological test performance, SPECT results, and subjective ratings. Method: Brain SPECTs were completed on two MTBI participants recruited from a neurology practice. Participants were female age 30 and male age 37, both right handed, Caucasian, with 16 years of education. SPECT scanning was conducted at a nuclear medicine imaging facility. During resting brain SPECT participants were injected intravenously with a radioactive tracer and rested quietly. One week later, participants underwent the same procedures except instead of resting quietly they completed the PASAT. Self-report questionnaires completed were the FSS, NIS, and the Borg Mental Exertion Scale. Results: During PASAT, SPECT imaging in the female case revealed significant hyperperfusion in bilateral frontal, parietal regions, and in the thalamic nuclei. This is consistent with research comparing CFSs to normals where CFSs displayed more diffuse hyperperfusion in the left frontal, temporal, and thalamic regions (Schmaling et al., 2003). During PASAT, the male case SPECT results displayed significant hypoperfusion in anterior temporal lobes and posterior left occipital lobe, common areas of injury in TBI, in spite of a normal brain MRI and normal PASAT performance. Conclusions: SPECT is a sensitive measure of cognitive fatigue in MTBI patients given the correlating subjective measures of cognitive fatigue, mental exertion, and cognitive inefficiency yet discrepant normal performance on PASAT and normal results on brain scans.

**B46****Neuropsychological subtypes predict functional outcome in pediatric brain injury***Strauss GP, Mayfield J, Allen DN*

**Objective:** The current study attempted to determine whether Neuropsychological profiles are associated with distinct behavioral impairments in pediatric brain injury. **Method:** Participants included 101 children with moderate to severe brain injury. The sample was 12.3 (S.D. = 3.4) years old, 58.4% male, and had Wechsler Full Scale IQ scores of 84.5 (S.D. = 13.3). Cluster analysis using Ward's method and squared Euclidean distance was used to divide the sample into distinct clusters. Neuropsychological measures in the analysis included the Grooved Pegboard Test, Test of Memory and Learning (TOMAL), and Continuous Performance Test (CPT). External validation was accomplished using the parent and teacher ratings on the Behavioral Assessment System for Children (BASC), as well as a number of relevant demographic and clinical variables. **Results:** Cluster analysis suggested that a three cluster solution was optimal. Discriminant function analysis indicated that these groups were adequately separated in discriminant function space. When the three groups were compared on the BASC, children characterized by a primary motor impairment were uniquely rated as having behavioral problems in the areas of conduct, attention, learning, externalization, and adaptive skills. Children with relatively intact verbal, but poor visual memory were rated as having better social and academic functioning. Group differences were not attributed to age, coma severity, or time of recovery following insult. **Conclusion:** The current results have important implications for treatment and rehabilitation, as they suggest that patterns of neuropsychological impairment are differentially associated with behavioral deficits and strengths.

**B47****Teacher and parent attentional ratings are unrelated to neuropsychological measures of attention in pediatric brain injury***Park BS, Strauss GP, Mayfield J, Caron J, Allen DN*

**Objective:** The current study examined the relationship between behavioral ratings of attention and neuropsychological tests of attention to determine the extent to which assessment tools measure a similar construct. **Methods:** Participants included 88 children with moderate to severe brain injury who were affected by the following conditions: TBI ( $n = 76$ ), anoxia ( $n = 1$ ), AVM/stroke ( $n = 5$ ), tumor ( $n = 3$ ), and seizure ( $n = 3$ ). The sample was 11.6 (S.D. = 2.92) years old. 43.2% female, and had Wechsler Full Scale IQ score of 85.1 (S.D. = 13.23). Participants received objective measures of focused (WISC-III, TOMAL) and sustained attention (CPT), as well as behavioral ratings of attention from the BASC Parent and Teacher Attention subscales. **Results:** Pediatric brain injury was characterized by deficits in focused and sustained attention. However, severity of impairment on neuropsychological tests was not significantly correlated with parental and teacher ratings of attention problems on the BASC. **Conclusion:** In pediatric brain injury, behavioral ratings of attention were unrelated to neuropsychological test results, suggesting that there is a marked discrepancy between these two types of attention evaluation. The lack of correspondence may indicate that observers are unable to rate the construct of attention as commonly conceptualized by cognitive psychologists and neuropsychologists or,

alternatively, that neuropsychological tests lack the ecological validity to predict the types of real-world behavioral disturbances that result from attention impairment.

#### **B48**

##### **Effects of visual symptoms on computerized cognitive assessment of concussed athletes**

*Tinker J, Kaminaris C, Schneider J, Zillmer E*

**Objective:** To compare the cognitive profiles of concussed athletes reporting visual symptoms with those reporting no visual symptoms on a computerized concussion assessment tool. Given the inherent visual demands of computerized cognitive assessment, it is hypothesized that individuals reporting visual symptoms post-concussively will demonstrate greater cognitive declines relative to baseline on computerized assessment. **Method:** Participants were 27 collegiate varsity and club athletes who sustained a concussion during the 2002–2003 season. The mean age of participants was 19.8 years (range 18–23 years) and 52% were male. Athletes were assessed using the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) computerized assessment program at baseline (prior to initiation of season) and within 48 h of concussive incident. The ImPACT's composite scores for Verbal Memory, Visual Memory, Processing Speed, and Reaction Time were examined. **Results:** A mixed between–within MANOVA revealed a decline in cognitive performance between baseline and post-concussion testing,  $F(1, 24) = 4.77, P = .005$ , and an interaction between assessment time and visual problem report,  $F(1, 24) = 2.48, P = .02$ . Post hoc univariate analyses revealed differences in Visual Memory, Processing Speed, and Reaction Time composites. **Conclusion:** The results support the well-documented concept that athletes experience declines in cognitive test performance post-concussively. Importantly however, results also support the contention that those reporting visual symptoms demonstrate greater degrees of decline within discrete cognitive domains on computerized assessment.

#### **B49**

##### **Counterconditioning of affective dyscontrol by administration of red-hot candies**

*Schutz LE*

**Objective:** Counterconditioning, the treatment of choice for post-traumatic affective dyscontrol when medication is not a viable option, can often be implemented most efficiently by using familiar, mundane stimuli. That principle is demonstrated by this case of very severe TBI (coma duration of six weeks, multifocal contusions to left temporal and right parietal cortex) from a DUI motorcycle accident. **Method:** Subject was discharged to outpatient cognitive rehabilitation just as post-traumatic amnesia was resolving, at three months post onset. Therapy was administered to the couple for nine months, and he continues in follow-up group to the present day. Neuropsychological testing, administered at five months, showed profound receptive aphasia, broad-perspective perceptual disorder, and bimodal recent memory impairment with moderate–severe executive syndrome. Situationally inappropriate episodes of protracted angry display, with loud voice and enraged facial features, began in the following month. One such episode terminated his speech therapy. Strong rapport allowed negotiation of a counterconditioning paradigm: they agreed that the wife would administer red-hot candies at the outset of the next episode. **Results:** The first treatment interrupted and terminated the episode, and

the final episode occurred before the box of candies was empty. Conclusion: Because of strong rapport, this patient was able to gain full control of affective discontrol by administration of a potent, appetitive, familiar counterconditioning stimulus.

### **B50**

#### **Pull the thorn from her paw and she will follow you anywhere: a neurorehabilitation fable**

*Schutz LE*

Objective: The most challenging and important step in postacute cognitive rehabilitation is establishment of the therapeutic alliance. When treatment begins, the typical low-insight trainee rejects the therapist's true agenda out of hand. The therapy contract must be formed on a basis apart from remediating neurocognitive deficits. Method: Admitted to the holistic program 2 months after emerging from a 30-day anoxic coma, this school librarian suffered such acute buttocks pain secondary to femoral artery damage that she could not attend therapies or tolerate testing. Medications, hot and cold packs, bed rest, and stretching exercises were tried without benefit. The neuropsychologist administered a pain protocol for alexithymia: Close regulation of sit-down impact, timer-driven weight shifting, relaxation exercises, and enforced session time limits. Results: Pain abated by the second day and was well controlled within a week. Thereafter, the patient placed confidence and trust in the neuropsychologist's findings and recommendations. She became a model patient, mastering the compensation strategies for all of her major cognitive deficits (memory, executive function, problem solving, processing speed, insight, and social perception). She was able to return to work, home management, and parenting two adolescent children with fully satisfactory results. She remains employed, married, and diligent in using her therapy protocols at 12 years post onset, and still credits her cooperation to the rescue from her pain disorder.

## **NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART I: OTHER**

### **B51**

#### **Verbal and visual memory in TBI, learning disorders, and psychiatric controls**

*Garcia J, Foley J, Hernandez K, Lloyd A, Golden C*

Objective: This study seeks to explore the relationship between verbal and visual memory impairment found in a pediatric population of children with TBI, Mathematics Disorder, Reading Disorder and Psychiatric Controls. Methods: All participants were administered the WRAML as part of a larger neuropsychological battery. Groups consisted of 20 children with Mathematics Disorder, 31 children with Reading Disorder, 51 patients with history of TBI and 30 children with Generalized Anxiety Disorder. All were between 5 and 16 years of age and males outnumbered females 3:2. Results: A series of one-way ANOVAs were performed. A statistically significant difference was found between the groups on the WRAML Verbal Memory Index  $F(3, 138) = 4.796, P < .003$ . Post hoc comparisons revealed that the mean score for the TBI group was significantly lower than both the Anxiety group and the Reading Disorder group. A significant difference was also found between groups on the WRAML Visual Memory Index  $F(3, 138) = 6.311, P < .000$ . Post hoc comparisons revealed that the

mean scores for both the Mathematics Disorder group ( $M=87.10$ ,  $S.D.=15.82$ ) and the TBI group ( $M=84.98$ ,  $S.D.=4.34$ ) were significantly lower than the mean score for the Reading Disorder group ( $M=97.80$ ,  $S.D.=14.55$ ). Conclusion: Results of this study lend further support to previous findings, which suggest impairment of both visual and verbal learning in TBI populations even when compared to LD populations. Furthermore, impairments in visual memory were found in those with Mathematics Disorder.

## **B52**

### **Coping, social support, and depression in multiple sclerosis**

*Polen DM, Arnett PA*

Objective: Individuals with multiple sclerosis (MS) consistently show high rates of depression. Although two potentially modifiable psychosocial attributes—coping style and social support—have been repeatedly linked to depression, no study has yet compared the relative ability of each to predict depression when both are considered together. Such a relative comparison is important in identifying which domain may be most important to target in preventing and treating depression. The present study compared how well active coping (AcCOPE), avoidant coping (AvCOPE), number of social supports (SSQ-N), and satisfaction with social supports (SSQ-S) predicted depression in MS. Methods: Coping was assessed with the COPE, social support was assessed with the Social Support Questionnaire (SSQ), and depression was assessed with the combined Chicago Multiscale Depression Inventory (CMDI) Mood and Evaluative scales, in 101 definite MS patients. Results: Correlational analyses revealed that the CMDI correlated significantly with AcCOPE ( $r=-.26$ ,  $P<.05$ ), SSQ-N ( $r=-.37$ ,  $P<.001$ ), and SSQ-S ( $r=-.34$ ,  $P=.001$ ). Stepwise linear regression indicated that (after removing variance for age, sex, and intelligence at Step 1), that SSQ-S and AcCOPE predicted significant variance in the CMDI ( $r^2=.14$ ,  $P=.000$  and  $r^2=.05$ ,  $P<.05$ , respectively). Conclusion: Our results suggest that satisfaction with social support, more than coping, is related to depression in MS patients. Furthermore, quality of social support, more than quantity, may be a more useful measure of social support for this population, though both support measures were significantly associated with depression.

## **B53**

### **Dysarthria predicts poorer performance on cognitive tasks requiring a speeded oral response in an MS population**

*Smith MM, Arnett PA*

Objective: Slowed oral motor speed, or dysarthria, is a common symptom of multiple sclerosis (MS). Processing speed and motor speed deficits may contribute to functional changes in speech. The present study examines the effect of dysarthria on performance on cognitive tests requiring a speeded oral response. Method: Ninety-five MS patients were administered cognitive tests requiring a speeded oral response, including the COWA, Visual Elevator (VE), and the SDMT-Oral Form. The Shipley Institute of Living Scale was also administered as a general intelligence estimate. Prior to testing, examiners rated the participants' level of dysarthria on a 4-point scale anchored with descriptors. These ratings were dichotomized into "normal speech" and "dysarthria" for the purpose of this study. Z-scores were created for the cognitive

tests and entered as dependent variables. Results: Regression analyses revealed that participants' dysarthria classifications significantly predicted performance on two of the cognitive measures, even after controlling for general intelligence: SDMT  $r^2$  change = .10,  $P < .001$ ; VE  $r^2$  change = .06,  $P < .01$ . Performance on the COWA was not significantly predicted by the dysarthria ratings. Conclusion: Although participants' general intellectual abilities predicted the bulk of the variance in performance on the cognitive tasks, greater dysarthria was still associated with worse performance on some speeded tasks even after controlling for these general abilities. Future research could examine whether the poorer performance of MS patients compared with controls on higher level cognitive tasks that require rapid oral responses is due, at least in part, to patients' slowed speech.

#### **B54**

##### **Doctor, am I depressed? Distinguishing depression from MS symptomatology**

*Strober L, Arnett P*

Objective: To identify depression in multiple sclerosis (MS) using the subscales of depression measures. Method: Thirty-five depressed MS (BDI-II score  $> 14$ ) and 63 non-depressed MS patients were recruited through a local MS chapter, in addition to 26 healthy controls. Participants were administered the Chicago Multiscale Depression Inventory (Mood, Evaluative, and Vegetative scales) and a modified version of the BDI-I (Cognitive–Affective and Somatic scales). Results: Depressed MS patients reported more cognitive–affective and somatic complaints on the BDI-I than non-depressed MS and controls ( $P_s < .05$ ). Non-depressed MS were also significantly higher than controls on these subscales ( $P_s < .05$ ). On the CMDI, depressed MS patients were significantly higher than non-depressed MS and controls on all subscales ( $P_s < .05$ ). However, when comparing non-depressed MS and controls, there were no significant differences on mood and evaluative scales, but MS patients were higher on the vegetative scale ( $P = .002$ ). Finally, the best predictors of depression were loss of interest, sadness, less satisfaction, irritability, and suicidal ideation, accounting for 55% of the variance ( $P < .001$ ) in the difference between depressed and non-depressed MS patients. Conclusions: Depressed and non-depressed MS patients endorsed more vegetative symptoms than controls. Additionally, the mood and evaluative subscales of the CMDI were significantly different between controls and depressed (but not non-depressed) MS, suggesting that the CMDI subscales were specific to detecting depression in MS when used separately. Further, on the BDI-I, the affective items were better predictors of depression in MS.

#### **B55**

##### **Quality of life in pediatric patients with multiple sclerosis and related demyelinating diseases**

*Fersh ME, MacAllister WS, Milazzo M, Christodoulou C, Krupp LB*

Objective: Quality of life (QOL) has been studied extensively in adult multiple sclerosis (MS), but to date little is known about QOL in pediatric MS. The purpose of this investigation is to assess QOL in pediatric MS and related demyelinating illnesses and to determine the relations between QOL and clinical variables. Methods: Twenty patients who visited the



National Pediatric MS Center at Stony Brook University Hospital were enrolled. Patients were diagnosed with MS (12%), recurrent optic neuritis (20%), clinically isolated syndrome (15%), acute disseminated encephalomyelitis (10%) or other (5%). Patients and parents completed the PedsQL 4.0 Generic Core Scales; this survey evaluates physical, emotional, and social functioning, and school performance. Dependent sample *t*-tests assessed congruence between patient report and parent proxy. Pearson correlations were used to assess relations between QOL and clinical factors such as neurological dysfunction (as measured by Expanded Disability Status Scale [EDSS]) and disease duration. Results: Patient and parent report did not differ significantly ( $P = .299$ ). Significant Pearson correlations were seen between EDSS score and the child's report of QOL, ranging from  $-.531$  to  $-.771$ . The relations between other clinical factors and QOL were not significant. School functioning was typically rated as the domain of poorest functioning. Conclusions: Parents of children with MS and related demyelinating diseases overall have a realistic appraisal of their child's QOL. Physical disability is the factor most likely to reduce QOL with school performance being the most affected.

## **B56**

### **Neurocognitive functioning of the frontotemporal region in pedophilic and non-pedophilic child molesters**

*Eastvold A, Suchy Y, Whittaker W, Strassberg D*

Objective: Research suggests that pedophiles may be characterized by brain abnormalities, particularly in the left frontal and bilateral temporal regions. The aim of this study is to further examine neurocognitive functioning among pedophilic (PED) and non-pedophilic (NPED) child molesters relative to controls (CTL), in order to gain a greater understanding of the etiology and phenomenology of pedophilia. Method: Participants (PED = 26, NPED = 26, CTL = 24) completed tests of verbal and nonverbal fluency, and verbal and nonverbal recognition memory, in order to assess the integrity of left and right frontal and temporal regions. Pedophilic status was confirmed by penile plethysmograph. All sex offenders were residents of an inpatient treatment program; controls were community volunteers. Groups were similar in age and education level. Results: Mixed Factor Repeated Measures ANOVA, using Caudality (frontal vs. temporal) and Laterality (left vs. right) as within-subjects factors and Group as the between-subjects factor revealed significant interactions between Group and Caudality,  $F(2) = 4.131$ ,  $P < .05$  and Group and Laterality,  $F(2) = 3.551$ ,  $P < .05$ , with PEDs and NPEDs performing more poorly than CTLs on frontal and right-hemisphere measures. There was also a three-way interaction between Group, Caudality, and Laterality,  $F(2) = 3.409$ ,  $P < .05$ . Post hoc comparisons revealed significant differences between CTLs and both PEDs and NPEDs on nonverbal fluency. No significant differences were found between offender groups. Conclusions: Consistent with previous research, sex offenders demonstrate poorer performance on frontal/executive tasks relative to controls. Contrary to previous findings, these results suggest a more prominent right frontal involvement.

**B57****Neuropsychological impairments of females diagnosed with Sjögren's syndrome***Jennings T, Goldberg K, Prout M, Maitz E, Vivino F, Hobbs B*

**Objective:** The purpose of this study was to replicate literature findings of primary Sjögren's syndrome (pSS) using the revised American European criteria of SS. Cognitive deficits and psychological symptoms of depression, anxiety, and somatization were expected to occur within the pSS sample. **Method:** Thirteen female pSS outpatients was compared to 10 women not diagnosed with pSS. Attention and concentration, verbal and performance IQ, verbal and visual memory, executive functioning, and psychological impairment were assessed. **Results:** The score for verbal IQ was lower than performance IQ (WASI) for the pSS group ( $P = .004$ ). While there were no group differences for visual memory tasks (VRI and II), the pSS group remembered fewer words (CVLT-II). The pSS group recalled fewer words over trials ( $P = .0001$ ), over time, or with cue. On the executive functioning task (WSCT), the pSS group achieved and maintained cognitive set as well as the control group, but they did show difficulties in changing cognitive set ( $P = .41$ ). In terms of psychological variables, somatic complaints were reported more so in the pSS group, but there were no significant differences between the groups on depression and anxiety. Additionally, the pSS group reported that they perceived distressful cognitive impairment ( $P = .01$ ). **Conclusions:** VIQ and executive functioning differences were replicated from previous literature, although there has not been much literature using the CVLT-II for this population.

**B58****Neuropsychological profile of a young woman with Susac's syndrome: a case study***West R, Schrock BJ*

**Objective:** Susac's syndrome is an extremely rare autoimmune disorder consisting of a triad of symptoms including retinal arteriolar occlusions, sensorineural hearing loss and multifocal brain lesions, usually along the corpus collosum. Research suggests that the course is unknown and may spontaneously remit after 2 years. Imaging may lead to a misdiagnosis of multiple sclerosis or acute disseminated encephalomyelitis. Existing research is sparse and has mainly focused on ophthalmologic and audiology symptomatology, and little is known about the neuropsychological sequelae. This study presents the results of a 32-year-old Caucasian female who was diagnosed with Susac's syndrome approximately 10 months prior to the evaluation. **Method:** Onset of symptoms was reportedly insidious with gradual progression. Symptoms included migraine headaches, right eye retinal arteriolar occlusion and bilateral hearing loss, more on the left side compared to the right, as well as decline in motor functions and balance. Imaging revealed diffuse white matter lesions in the left frontal and right parietal lobes, left basal ganglia lesions and lesions in the corpus collosum. A comprehensive neuropsychological evaluation was completed. **Results:** Neuropsychological profile is suggestive of deficits in left-sided motor functions, visual scanning, visual-spatial functions, visual memory, and perceptual organization, processing speed, sustained attention and shifting mental set. **Conclusions:** The present case study may be the first comprehensive neuropsychological evaluation documented. Although this is a rare disorder it is important to understand the neuropsychological presentation as

this disorder may often be misdiagnosed and therefore under diagnosed within the population.

### **Poster Session C**

#### **PROFESSIONAL ISSUES: EFFORT AND MOTIVATION**

##### **C1**

##### **A survey of neuropsychologists' beliefs and practices with respect to the assessment of effort**

*Sharland MJ, Gfeller JD, Justice L, Ross M, Hughes H*

**Objective:** Research (Mittenberg et al., 2001; Slick et al., 2004), has investigated neuropsychologists' beliefs with respect to assessing effort and malingering. The current study further examined this topic among professional members of the National Academy of Neuropsychology. **Method:** Randomly selected NAN professional members ( $n=653$ ) were mailed a survey that examined their beliefs and practices with respect to assessing effort. Preliminary results from 148 (22%) returned surveys were examined. Seventy percent of respondents were male (mean age = 51 years), with 17 years in practice. **Results:** Results indicated that 58% of respondents frequently included measures of effort when conducting a neuropsychological evaluation. Eighty-eight percent routinely encouraged participants to provide good effort. While 23% of respondents often or always provide a warning that psychological tests may be sensitive to poor effort, 51% of respondents rarely or never provide a warning. The most frequently used measures of effort were the Test of Memory Malingering (TOMM), Rey 15-item test, MMPI-2 FBS, and MMPI-2 F–K ratio. However, the TOMM, Validity Indicator Profile, Victoria Symptom Validity Test, and Word Memory Test were rated most accurate for detecting suboptimal effort. **Conclusions:** Findings indicate that while the majority of neuropsychologists routinely assess for effort when conducting evaluations, approximately one-third do not. Neuropsychologists had disparate opinions regarding whether examinees should be warned that measures of effort were a component of the assessment. While the TOMM was rated as the most utilized and accurate measure of effort, differences existed between ratings of accuracy and utilization for some indicators.

##### **C2**

##### **The validity of using effort tests in a mentally retarded population**

*Victor T, Boone K*

**Objective:** There are many external incentives for feigning intellectual or cognitive deficits on psychological tests. In the case of mental retardation, the stakes are high, as successful feigning is literally now a matter of life or death since the 2002 Supreme Court decision in *Atkins v. Virginia* which ruled that the execution of persons with mental retardation (MR) is unconstitutional. Unfortunately, there is little established validity for using our current effort indicators with persons who are MR, as this special clinical population is typically not found in validation samples. The main objective of this investigation was to examine the predictive accuracy of commonly used effort tests in a clinical sample of identified MR patients. **Method:** A total of 16 individuals diagnosed with MR based on the obtainment of a WAIS-III Full Scale

IQ of <70 and significant functional impairment, with no identified incentive to feign (i.e., they were not involved in litigation or currently seeking disability) were administered a battery of neuropsychological tests that included several commonly used indicators of effort. Results: Specificity, or the proportion of honest responders who were correctly classified, was quite low ranging from 0 to 62%. The only exception to this was with the Finger Tapping Test, which had a specificity of 83%. Conclusions: The use of commonly used effort indicators is not valid in a MR population, as it leads to unacceptable rates of false positive error. These results need to be further explored and replicated in a larger sample.

### C3

#### **Use of the Test of Memory Malinger (TOMM) in individuals with FSIQ < 70**

*Kennedy CH, Shaver G, Weinborn M, Manley J, Broshek DK, Marcopulos BA*

Objective: The Test of Memory Malinger (TOMM) is a standardized procedure for evaluations of symptom validity and memory malinger, is relatively insensitive to genuine memory impairment, and has been validated for use in multiple populations. Data regarding the validity of the TOMM in intellectually impaired individuals, however, remains sparse. Method: This study looked at the use of the TOMM in individuals with FSIQs less than 70. Subjects were 60 individuals hospitalized at two state psychiatric hospitals (mean age = 38, S.D. = 10.9, mean FSIQ = 62.2, S.D. = 5.1; 68% male). Twenty-nine carried a diagnosis of mental retardation (26 mild, 3 moderate) and other mental health disorder, two were diagnosed with mental retardation only (1 mild, 1 moderate), and 29 exhibited low intellectual functioning secondary to persistent mental health disorder. Results: Six participants failed the TOMM per the cut-off score specified in the manual (i.e., <45 on Trial 2 and Retention Trial). Pearson's  $r$  revealed a positive correlation between FSIQ and TOMM, Trial 2 ( $r = .553$ ,  $P < .01$ ). Of the four individuals with moderate mental retardation two were unable to meet the cutoff on any trial, and two were able to meet the cutoff only on the third trial. Chi-square revealed no significant difference between the mentally retarded/mentally ill group and the persistent mental disorder group. Conclusions: Findings suggest that the TOMM is appropriate for use in individuals with intellectual functioning in the mildly deficient range. The TOMM's appropriateness for individuals functioning within the moderate range is questionable and requires further exploration.

### C4

#### **Test of Memory Malinger (TOMM) performance in persons with right hemisphere lesions**

*Sewick B, Raymond M*

Objective: The TOMM (Tombaugh, 1996) requires visual processing. Persons with right hemisphere lesions often present with visual-perceptual impairments. In this study, we examined TOMM performance in a group of persons with CT or MRI evidence of right hemisphere lesions. Method: Participants were 22 persons with history of traumatic brain injury ( $n = 11$ ) and cerebrovascular accident ( $n = 11$ ) with right hemisphere lesions (e.g., hemorrhage, contusion, infarct). None were involved in litigation and all were caucasian and right hand dominant. Demographic characteristics were as follows: mean age = 52.04 years (S.D. = 20.80, range

17–85 years), mean education = 12.45 years (S.D. = 2.36, range 6–17 years), gender = 15 females and 7 males. Average time since onset was 8.86 weeks (S.D. 12.94, range 1–64 weeks). Twenty had significant acquired visual impairments. Twelve had blurred vision, seven had left visual field neglect and three had diplopia. Results: Average scores on the TOMM were 45.90 (S.D. = 3.97, range = 37–50) for Trial 1, 49.18 (S.D. = 1.76, range 43–50) for Trial 2, and 49.04 (S.D. = 1.81, range 42–50) for Retention. Only one person performed below the recommended cut-off of 44/45 on Trial 2 and Retention. Conclusions: Despite a high percentage of neurologically based visual perceptual impairments (91%), 95% of this sample performed above the recommended cut-off level on the TOMM.

## C5

### **TOMM Trial 1 as a screening measure for insufficient effort**

*Kleiner JS, O'Bryant SE, Engel LR, Vasterling JJ, Black FW*

Objective: To evaluate the utility of Trial 1 of the Test of Memory Malingering (TOMM) as a screening measure of insufficient effort. Method: Archival data were drawn from 329 (227 men; 107 women) patients who were referred for evaluation in a medical center outpatient neuropsychology clinic. Sensitivity and specificity estimates were calculated for a range of TOMM Trial 1 cut scores (i.e., 25–50) using diagnostic decisions made based on the criteria outlined by Slick, Sherman, and Iverson (1999) as the “gold standard.” Diagnostic accuracy estimates of positive and negative predictive value were calculated for base rates from 10% to 50%. Results: Sensitivity spanned from 0.264 (cut-score of 27 or below) to 1.000 (cut-score of 49 and 50), and specificity spanned from 0.333 (cut-score of 50) to 1.000 (cut-score of 25 or 26). Positive predictive value ranged from 0.140 to 1.000 and negative predictive value ranged from 0.580 to 1.000 (depending on the cut-score and base rate used). Conclusions: TOMM Trial 1 demonstrated high levels of diagnostic accuracy and is a viable option for screening of insufficient effort. Estimates of diagnostic accuracy are presented for a range of cut scores and base rates, which will allow examiners to consider the probability of false positive (Type 1) and false negative (Type 2) error rates and weigh them accordingly.

## C6

### **Performance on the TOMM as a function of reported anxiety and depression levels in a psychiatric sample**

*Finlay CG, O'Bryant SE, O'Jile JR*

Objective: Increasingly, neuropsychological assessments are incorporating effort tests to assess the extent to which individuals malingering during neuropsychological assessments. Numerous studies have shown effort tests, such as the Test of Memory Malingering (TOMM), to be resistant to numerous medical and psychiatric conditions in community samples. This investigation is to further assess such claims by testing whether performance on the TOMM is resistant to the effects of depressive and anxious symptoms in a psychiatric sample. Method: Patients ( $N=69$ ), referred to a primary care center for neuropsychological evaluation for assessment of possible neurocognitive deficits, were reviewed. As part of their assessment, patients completed the Beck Depression Inventory (BDI), the State-Trait Anxiety Inventory (State and Trait scales), and the TOMM. Correlational analyses and  $t$ -tests comparing low and high depres-

sion and anxiety scores were administered to assess for differences in performance on the TOMM. Results: BDI, State, and Trait anxiety scales were significantly and negatively correlated with performance on Trial 1 of the TOMM,  $r = -.30$ ,  $-.25$ , and  $-.37$ , respectively,  $P < .05$ , but not Trials 2 or 3. When cutoff scores were applied, only performance on Trial 1 of the TOMM was significantly lower for patients endorsing symptoms of high state anxiety, relative to those endorsing symptoms of low state anxiety,  $t(66) = 2.02$ ,  $P < .05$ . Conclusion: Results suggest performance on the first trial of the TOMM is sensitive to negative affective states in a psychiatric sample. Clinical considerations for administering effort tests as part of a neuropsychological battery will be discussed.

### C7

#### **Neuropsychiatric inpatients with dementia perform well on the TOMM**

*Iverson GL, Brooks BL, Zakrzewski MJ*

Objective: When patients perform poorly on the Test of Memory Malingering (TOMM), clinicians must decide whether this reflects poor effort or a false positive result. The purpose of this study was to extend the literature on the specificity of the TOMM by examining performance in a sample of inpatients with serious neuropsychiatric problems, most of whom have dementia. Method: The TOMM was given to inpatients at a provincial psychiatric hospital ( $N = 28$ ) as part of their neuropsychological evaluations. Results: The average age of the sample was 42.7 (S.D. = 13.2), average education was 10.4 (S.D. = 2.5), and median length of stay at the time of assessment was 62 days (range 6 days to 9.7 years). In this 28-patient sample, 21 had frank dementia or serious cognitive impairment, 27 were deemed unable to safely operate a vehicle, 24 were unable to live independently, and 20 were deemed unable to live independently even if they were psychiatrically stable. Average scores on the TOMM Trials 1, 2, and Retention were 42.9 (S.D. = 7.9), 46.5 (S.D. = 6.6), and 46.1 (S.D. = 7.1), respectively. Only six inpatients scored below the cutoff on Trials 2 or Retention, and five had dementia or severe cognitive impairment, could not drive, and were incapable of living independently. Conclusion: The majority of neuropsychiatric inpatients were able to achieve adequate performance on the TOMM. The literature now clearly indicates that low scores in non-litigating patients (without dementia) are extremely rare.

### C8

#### **Neuropsychological test performance of TBI litigants performing inconsistently on tests of negative response bias**

*Gavett BE, Fisher JM, McCaffrey RJ*

Objective: Inconsistent performance on measures of negative response bias (NRB) provides challenges to the interpretation of overall neuropsychological test results. This study compares overall neuropsychological test performance amongst three groups: consistent poor performance, consistent good performance, and inconsistent performance. Method: One hundred and twenty-eight patients from an archival database were included in the study. Patients received a neuropsychological evaluation secondary to litigation involving mild traumatic brain injury. One hundred and twenty-six patients were administered one to four tests of NRB, including the TOMM, VSVT, WMT, and Rey-15. Patients failing 100% of these tests were assigned to

the consistent poor performance group (CP). Patients failing 0% of these tests were assigned to the consistent good performance group (CG). Remaining patients were assigned to the inconsistent performance group (I). Groups were compared on 18 neuropsychological metrics, including summary scores from the WAIS-III, HRNB, and MAS. Results: Significance was reached on 15 DVs. Follow-up tests revealed a consistent difference between the CP and CG groups. For seven variables, there was a significant difference between the I group and the CG group; one DV showed a difference between the I group and the CP group. Conclusions: Inconsistent performance on tests of NRB contributed significantly to group differences for 9 of the 15 significant DVs. From these results, it appears that inconsistent performance on tests of NRB is associated with an overall neuropsychological profile similar to that seen with consistent poor performance.

### **C9**

#### **Dissociation between neuropsychological and psychiatric forms of malingering**

*Ruocco AC, Swirsky-Sacchetti T, Raines D, Chute DL, Platek SM, Mandel S, Zillmer EA*

Objective: Malingering in neuropsychological and psychiatric domains is common in neuropsychological settings. However, little is known about the extent to which malingering in one domain crosses over into the other. Method: One hundred and thirteen patient files of persons referred for neuropsychological evaluation who completed the Test of Memory Malingering (Tombaugh, 1996) and Millon Clinical Multiaxial Inventory-III (Millon, Davis, & Millon, 1997) were selected for inclusion in the study. Results: TOMM and MCMI-III malingering indices were uncorrelated and principal components factor analysis revealed two distinct components for neuropsychological and psychiatric malingering. While only 3.6% of the sample malingered in both domains, the most severe neuropsychological malingerers tended to score more highly on MCMI-III symptom exaggeration indices. Persons not malingering psychiatrically reported higher levels of histrionic, narcissistic, and compulsive personality traits, while those who malingered only neuropsychologically reported lower levels of drug use. Conclusion: The results support a dissociation between neuropsychological and psychiatric forms of malingering within a neuropsychological setting.

### **C10**

#### **Assessment of effort in brain injured patients using the Finger Tapping Test**

*Patton C, Black F*

Objective: An emerging number of studies are available supporting the use of the Finger Tapping Test to assess dissimulation in clinical cases. The present study provides comparison group data for both effortful and dissimulating patients on the Finger Tapping Test. Method: Participants were patients examined at Tulane University Health Sciences Center ( $N=418$ ). Members were assigned to either the effortful ( $n=320$ ) or dissimulating ( $n=98$ ) group based on each individuals' Test of Memory Malingering (TOMM) scores. Patients falling below cutoffs on Trial 2 or the Retention Trial of the TOMM were classified as dissimulators. Results: Groups did not differ on age, handedness, or gender. Diagnostic accuracy rates using the dominant hand average raw Finger Tapping scores were 70.9% for the effortful patients and 55.1% for the dissimulators. Nondominant hand raw Finger Tapping scores accurately classified 68.8% of

effortful patients and 53.1% of dissimulators. When each patient's dominant and nondominant average Finger Tapping raw scores were combined, specificity was 70.0% and 57.1% for the effortful and dissimulating groups, respectively. TOMM Trial 2 and Retention Trial scores were significantly correlated with Finger Tapping raw scores in both groups. Conclusions: The current study found that the Finger Tapping Test is clinically useful for assessing dissimulation and effort. Based on the current data, raw dominant hand scores below 40.2 taps or combined raw scores below 76.3 indicate possible dissimulation. Additional cutoffs will be discussed, as will sensitivity and specificity.

### **C11**

#### **The FBS and videotape surveillance of malingerers**

*Woltersdorf M*

Objective: Most malingering studies unfortunately only involve simulators or known groups based on other malingering measures; the latter being rather circular in approach. Method: This study had access to video surveillance tapes from private investigators of patients sent for second opinions for various types of physical and emotional harm claims. These patients had been previously evaluated by other providers who opined that the patients were genuine and actually harmed; these providers did not have access to the tapes. When evaluated by this office, some received a full HRB because of a TBI claim and some received less due to an emotional harm or pain claim and then received an MMPI-II with other selective tests. Results: The patient's presentation on the tapes and in this examiner's office were striking to the point of absurdity; there was no doubt they were all malingerers. For one example, one patient had to be carried in on a stretcher yet on the tape he was water skiing a week earlier. Conclusions: The F-family of MMPI-II validity scales were only helpful in the emotional harm claims but not in the pain or TBI claims; only the FBS worked. On the emotional harm claims, the FBS also helped sort out whether or not a "cry for help" was present. In the emotional harm claims the higher FBS cut score was used as recommended by the literature to prevent false positives in a potential psychiatric case. Discussion about pattern analysis and future study is offered.

### **C12**

#### **Validation of FBS across a clinical and forensic midwest population**

*Woltersdorf M*

Objective: Lawyers for plaintiffs often insinuate that the FBS is used against their clients in a discriminatory fashion since "everyone knows it was created by and for defense experts alone." It made me consider what I would find if I randomly computed the FBS for those medical patients who had no attorney, were referred by an MD, had no clear secondary gain in their case, and had no psychiatric history. Method: I limited the population to 2004 and randomly selected clinical cases who fit the above limitations. From the year 2004, we had 150 medical cases without reason to assume forensic import or psychiatric background. FBS was computed for these 150 patients. The total forensic cases for 2004 were also selected with the same criteria. This resulted in 45 forensic cases for whom an FBS had already been computed. Results: Of the 150 non-forensic cases, none had an FBS raw score over 19. For the remaining 45 forensic cases, 30 (66%) had FBS scores above 20 and all but one had more



than two additional indicators of malingering on the remainder of the data collected (such as RDS, Total tapping, positive SVT, etc.). The patient without other indicators was a chronic pain patient who only received the MMPI-II. Conclusion: The above analysis shows that the FBS is not indiscriminate. Within the forensic population it seems sensitive to malingering where it is most likely to occur. Where low rates of malingering are expected, the FBS seems specific as well.

### C13

#### **Validation of the MMPI-2 FBS scale in clinical malingerers and nonlitigating patients**

*Martinez G, Mittenberg W, Gass CS, Quintar B*

**Objective:** The validity of the MMPI Fake Bad Scale has been demonstrated, but continues to be a matter of current debate. This study validated the scale in probable clinical malingerers and nonlitigant patients. **Method:** The MMPI-2 was administered to 44 litigating or compensation seeking individuals that claimed cognitive impairment and scored in the probable malingering range on the TOMM, Portland Digit Recognition Test, or Word Memory Test. The MMPI-2 was also administered to 64 non-litigating patients hospitalized for treatment of head trauma. Groups were compared on the FBS and standard MMPI-2 validity scales. **Results:** Malingerers averaged significantly higher FBS raw scores (25.3,  $s = 6.7$ ) than patients (15.8,  $s = 4.7$ ), and higher  $F$  (77.6 vs. 60.7) and  $Fb$  (81.2 vs. 59.8) scale  $T$ -scores. FBS scores correlated significantly with  $F$  ( $r = .37$ ) and  $Fb$  ( $r = .58$ ) in malingerers but not patients. Hypochondria, Depression, Hysteria, and Psychasthenia were highly correlated with FBS scores ( $r_s > .7$ ). No relationship between the scale and gender, age, or education was observed in either group. Stepwise discriminant function analysis showed that an FBS cutoff score above 20 accurately classified 82.8% of patients and 72.7% of probable malingerers. Other validity scales did not add significantly to diagnostic accuracy. An FBS cutoff greater than 28 correctly identified 100% of patients and 34% of malingerers. **Conclusions:** The FBS scale is useful for characterizing malingered cognitive impairment. Diagnostic accuracy can be improved by consideration of specificity, sensitivity, and base rates.

### C14

#### **Examining the relationship between the reconstructed scales and the fake bad in a personal injury population**

*Downing SK, Denney RL, Tempelmeyer T, Halfaker DA, Houston CM*

**Objective:** This study investigated the relationship between the Fake Bad Scale (FBS) (Lees-Haley, English, & Glenn, 1991) and the Reconstructed Scales (RC Scales), which have recently been introduced by Tellegen, Ben-Porath, McNulty, Arbisi, Graham, and Kaemmer (2003), in the context of a personal injury litigant population. **Data selection:** This archival data study included 76 Caucasian personal injury litigants that completed a neuropsychological evaluation, including the MMPI-2, in an outpatient private practice. The sample includes 46 males and 30 females with a mean age of 41. Pearson product-moment correlations and stepwise multiple linear regression were used to evaluate the relationship between the FBS and the RC scales. **Results:** Although RCd, RC1, RC2, RC6, RC7, and RC8 were positively correlated with the FBS, the only statistically significant correlations with the FBS exist with RC2 and

the combination of RC2 and RC1. RC2 (low positive emotions) accounts for 32% of the variance in FBS, while RC1 (somatic complaints) and RC2 combined account for 41% of the variance. Using Lees-Haley's cutoff scores (1992), 69.7% of those participants with *T*-scores of 70 or greater on RC2 also had elevated FBS scores. In addition, 69.2% of participants who received a 65 or greater on RC1 in combination with an RC2 *T*-score of 70 or greater, also had elevated FBS scores. Conclusions: The resulting significant relationships may indicate that, within the context of personal injury populations, RC1 and RC2 appear to be susceptible to exaggerated/feigned somatic complaints as measured by the FBS. Additional research is required for validation.

### **C15**

#### **Reliability of the Lees-Haley Fake Bad Scale in a population of personal injury litigants**

*Triebel KL, Denney RL*

**Objective:** The Fake Bad Scale (FBS; Lees-Haley, English, & Glenn, 1991) of the MMPI-2 has been shown to be a useful measure of somatic malingering, but few studies have reported the reliability of the scale. The present investigators examined the internal consistency reliability of the FBS with a group of civil forensic outpatients. **Method:** Archival data was collected for 72 Caucasian outpatients (43 males and 29 females) who were 18 years or older, presenting for an evaluation of brain impairment caused by an alleged head injury. All of the participants were actively pursuing personal injury litigation at the time of the evaluation. Participants' had a mean age of 40.49 years (S.D. = 11.98) and ranged from 18 to 61. Years of education ranged from 7 to 18 years, with a mean of 12.01 (S.D. = 2.01). The most common injury reported was mild head injury ( $n = 68$ ), while a few ( $n = 4$ ) claimed a history of stroke, chronic substance abuse, hypoxia, or electrical injury. **Results:** An alpha coefficient of .76 was obtained for the FBS. Internal consistency reliability estimates for the FBS were, in general, adequate, ranging from 0.67 to 0.84 at the 95% confidence interval. **Conclusions:** The current study results suggest that the FBS has moderate levels of internal consistency.

### **C16**

#### **Base rates of malingered neurocognitive dysfunction among criminals**

*Ardolf B, Denney RL, Houston CM*

**Objective:** The base rate (BR) of malingered neurocognitive dysfunction (MND) among criminal forensic defendants referred for neuropsychological assessment is important because we cannot understand malingering test accuracy without good estimates of MND BRs in this population. This study identifies the BR of MND using established criteria set forth by Slick et al. (1999). **Method:** One hundred and five male criminal defendants, serially referred for neuropsychological evaluation, were reviewed for MND. Individuals were administered a variety of neurocognitive measures as part of a complete examination. Mean age was 40, years of education were 10.5, and FSIQ was 80.9. **Results:** 29.52% ( $n = 31$ ) fell into the probable malingering category. 20.95% ( $n = 22$ ) fell into the definite malingering category. The resulting 49.52% ( $n = 52$ ) fell into the valid group. **Conclusions:** These results suggest the BR for MND is much higher for neuropsychological issues in the criminal setting than the civil setting. Previous estimates of NRB and MND in the criminal neuropsychology setting have been

much lower (~20%; Mittenberg et al., 2002). The resulting BR estimate of 50.5% appears reasonable given the Slick, Sherman, and Iverson (1999) diagnostic criteria for malingering neurocognitive dysfunction (MND) as interpreted by Larrabee (2003). Future research should include an evaluation of the utility of the classification system itself in accurately classifying MND. Forensic evaluators cannot ignore the possibility of MND in this setting.

### **C17**

#### **The CVLT-II forced choice recognition trial as a measure of effort in a TBI population**

*Teegarden LA*

**Objective:** To determine if the California Verbal Learning Test-II (CVLT-II) Forced Choice Recognition (FCR) is a sensitive measure as compared to the Word Memory Test (WMT) in assessing motivation in individuals participating in neuropsychological evaluation. **Method:** A sample of 93 mild to moderate traumatic brain injured patients were administered a comprehensive neuropsychological battery including measures of attention, memory, learning, visuospatial functioning, executive functioning, and effort. The WMT was used as the “gold standard” by which the FCR was compared. **Results:** Of those that failed the WMT (defined as Type III, IV and V;  $n = 9$ ), eight subjects also failed the CVLT-II FCR (defined as <88% on the %Total Accuracy Raw). The CVLT-II FCR demonstrated low sensitivity (0.47) but high specificity (0.97). Analysis of positive and negative predictive values took into account base rates of symptom exaggeration (20%). The CVLT-II FCR achieved a positive predictive value (PPV) of 0.80 and a negative predictive value of (NPV) of 0.88. **Conclusions:** The findings suggested that the CVLT-II FCR demonstrated adequate convergence with the WMT. However, the CVLT-II FCR was not as sensitive as the WMT at classifying individuals with poor motivation. Additional findings and future implications for considering base rates in neuropsychology will be discussed.

### **C18**

#### **Sensitivity and specificity of COWAT indicators to malingered neurocognitive dysfunction in traumatic brain injury**

*Thompson L, Curtis KL, Bianchini KJ, Greve KW*

**Objective:** The present study uses well-defined traumatic brain injury (TBI) and non-TBI samples to examine the Specificity and Sensitivity to malingered neurocognitive dysfunction (MND) of four Controlled Oral Word Association Test (COWAT) variables. **Method:** TBI ( $n = 297$ ) were assigned to one of four groups: No Incentive, Incentive Only, Suspect, and Malingering. A clinical sample (e.g., CVA, memory-disorder, psychiatric disorder) of 487 patients without incentive was also included to examine performance of these four COWAT variables. The COWAT indicators considered were: FAS Total Words Correct (raw), FAS *T*-score, Animals Total Words Correct (raw), and Animals *T*-score. **Results:** Tables show cumulative percentages for each COWAT score level within each well-defined malingering group. Within the overall TBI sample, Specificities of 95–96% (5–4% false positive error rate) resulted in Sensitivities to MND ranging from 6% (Animals Total Words Correct raw) to 19% (FAS *T*-score). Different patterns were observed in mild versus moderate/severe. In the Mild TBI group, 95% Specificity corresponded with Sensitivities ranging from 21% (FAS Total

Words Correct raw) to 28% (Animals Total Words Correct raw). In the moderate/severe TBI group, Sensitivity ranged from 0% to 9% at 95% Specificity. Conclusion(s): The present study demonstrates good Sensitivity to well-defined MND in Mild TBI patients in the context of excellent Specificity. However, it appears that Sensitivity is adversely affected by objectively documented neuropathology (e.g., moderate/severe TBI).

### C19

#### **Sensitivity and Specificity of Trail Making Test indicators to malingered neurocognitive dysfunction in traumatic brain injury**

*Brasseux R, Curtis KL, Springer S, Bianchini KJ, Greve KW*

Objective: The present study uses well-defined traumatic brain injury (TBI) and non-TBI samples to examine the Specificity and Sensitivity to malingered neurocognitive dysfunction (MND) of eight Trail Making Test (TMT) variables. Method: TBI ( $n = 292$ ) were assigned to one of four groups: No Incentive, Incentive Only, Suspect, and Malingering. A clinical sample (e.g., CVA, memory-disorder, psychiatric disorder) of 454 patients without incentive was also included to examine performance of these eight TMT variables: TMT A and B raw time and  $T$ -score, TMT A and B errors, TMT B/A, TMT B–A. Results: Tables show cumulative percentages for each TMT score level within each well-defined malingering group. Within the overall TBI sample, Specificities of 93–98% (7–2% false positive error rate) resulted in Sensitivities to MND ranging from 5% (TMT A errors) to 19% (TMT B raw scores). Different patterns resulted within mild versus moderate/severe. In the mild TBI group, Specificities of 93–98% corresponded with Sensitivities ranging from 7% (TMT A errors) to 56% (TMT B raw scores). However, in the moderate/severe group, TMT indicators were not effective at detecting malingering. Conclusion(s): The present study demonstrates good Sensitivity to well-defined MND in Mild TBI in the context of excellent Specificity. However, it appears that Sensitivity is adversely affected by objectively documented neuropathology (e.g., moderate/severe TBI).

### C20

#### **Sensitivity and specificity of WAIS indicators to malingered neurocognitive dysfunction in traumatic brain injury**

*Curtis KL, Heinly MT, Bianchini KJ, Greve KW*

Objective: The present study uses well-defined traumatic brain injury (TBI) and non-TBI samples to examine the Specificity and Sensitivity to malingered neurocognitive dysfunction (MND) of nine Wechsler Adult Intelligence Scale—3rd Edition (WAIS-3) variables. Method: TBI patients ( $n = 235$ ) were assigned to one of four groups: No Incentive, Incentive Only, Suspect, and Malingering. A clinical sample (e.g., CVA, memory-disorder) of 133 patients without incentive was also included to examine performance of these nine WAIS-3 variables. The WAIS-3 indicators considered were: the Mittenberg formula, Vocabulary minus Digit Span, FSIQ, VIQ, PIQ, Verbal Comprehension Index (VCI), Perceptual Organization Index (POI), Working Memory Index (WMI), and Processing Speed Index (PSI). Results: Tables show cumulative percentages for each WAIS-3 score level within each well-defined malingering group. Within the overall TBI sample, Specificities of 94–97% (6–3% false positive error rate) resulted in Sensitivities to MND ranging from 5% (Vocabulary minus Digit Span)

to 40% or higher (FSIQ, VIQ, VCI). In general, IQ scores related to verbal tasks exhibited good Sensitivity regardless of injury severity. Scores related to performance subtests demonstrated higher Sensitivity rates for the mild injury severity group. Conclusion: The present study demonstrates good Sensitivity to well-defined MND in TBI in the context of excellent Specificity. These results provide valuable data supporting the use of WAIS-3 variables in the detection and diagnosis of malingering in TBI.

## C21

### **Assessment of effort in baseline MTBI neuropsychological testing**

*Bailey CM, Arnett PA*

**Objective:** The current study examined the impact of effort on baseline mild traumatic brain injury (MTBI) performance using the computerized assessment of response bias (CARB) mean response time (MRT) as a measure of effort. **Methods:** Fifty-six collegiate athletes (39 male, 17 female) were administered baseline neuropsychological batteries as a part of the Penn State Concussion Program. Tests included: the BVMT-R, HVLTR, SDMT, Comprehensive Trail Making Test, Vigil/W CPT, Stroop, PSU Cancellation Test, and the Digit Span Test (DST). Average *z*-scores for both the non-timed memory performance (MP; BVMT-R, HVLTR, DST, and SDMT memory) and the overall performance (OP) were created. Hierarchical regressions were then conducted to determine the amount of variance in MP and OP that was accounted for by the MRT after removing the effects of visual–motor speed and other significantly related variables. **Results:** As was expected, the MRT and CARB average percent correct *z*-scores were correlated ( $r(55) = .44, P < .01$ ), suggesting that slower response time on the CARB was associated with less effort. Also, MRT accounted for a significant proportion of the variance of MP ( $r^2$  change = .10,  $P < .05$ ) when entered alone, and OP ( $r^2$  change = .13,  $P < .01$ ) after removing both sex ( $r^2$  change = .09,  $P < .05$ ) and visual–motor speed ( $r^2$  change = .01,  $P > .10$ ). **Conclusions:** These results suggest that effort, as measured by MRT, has a moderate association with neuropsychological performance at baseline and highlights the need for identification of athletes that may not be putting forth optimal effort.

## C22

### **Green's MACT helps identify internal predictors of effort in the social security disability exam**

*Chafetz M, Abrahams J*

**Objective:** Green's MACT was designed as a brief memory screen with built-in effort measures. The MACT closely approximates the Word Memory Test in sensitivity. It has higher specificity because it has been shown that MACT subtests are objectively easier than WMT subtests in several groups (e.g., dementia). In Louisiana, the typical psychological consultative examination (PCE) for Social Security Disability (SSD) involves a mental status examination and a Wechsler Scale. The SSD office requires a warning that failure to do one's best may result in an unfavorable decision on the claim. Formal testing of effort using Green's MACT was undertaken in order to identify internal indicators of poor effort within the PCE. **Method:** An indicator scale including simple arithmetic items, simple sequences, improbable responses, Ganser-like answers, personal information, and internal WAIS-III predictors was developed. Regression

analyses were used to identify predictors. Results: In 47 cases (time of abstract), totals from this scale correlated highly with Immediate Recognition ( $r = -.75, P < .001$ ), Delayed Recognition ( $r = -.82, P < .001$ ), and moderately with Consistency ( $r = -.5, P < .001$ ). The failure rate for IR (57.4%), DR (61.7%), and Consistency (61.7%) was somewhat high and likely due to increased malingering rule-out referrals to the first author now that the local SSD office has begun to appreciate effort testing. Conclusions: Multiple predictors are useful when combined into a scale for predicting effort as identified by Green's MACT. The implications of these data in the SSD framework are discussed.

### **C23**

#### **Cognitive and self-report credibility among claimants for social security disability benefits**

*Hammond J*

Objective: To identify base-rates and patterns of symptom invalidity for cognition and self-report among applicants for Social Security Disability benefits. It was hypothesized that combining cognitive and self-report measures would identify a greater number of suspect cases than either measure alone. Method: Participants were 200 claimants consecutively referred to the author's private practice. Presenting complaints and diagnostic impressions spanned across the DSM-IV. Mean age was 42.43 (10.47). Average level of education was 11.13 (2.68). Sixty percent of the sample were female. All participants completed a psychiatric diagnostic interview, and assessment of mental status including memory (Cognistat), counting, oral trail making, and serial sevens. Two hundred participants completed the Dot Counting Test (DCT). One hundred subjects completed a stand-alone version of the NIM from the PAI. Results: Thirty-two percent of the sample had DCT *E*-scores greater than 18. Thirty-eight percent of participants had invalid NIM scores ( $>12$ ). Caution regarding self-report was identified for 66% of the sample. Fifty-four percent of the sample had valid data based on conservative thresholds. Twenty-two percent of the group had noncredible self-report but credible cognitive effort, nine percent had noncredible cognitive effort but credible self-report, and 15% had both noncredible self-report and cognitive effort. DCT *E*-scores were significantly correlated with performance on all cognitive variables. Conclusions: Clinicians should use symptom validity measures of cognitive effort and self-report when working with this population, and even brief or transparent measures have great utility.

### **C24**

#### **Characteristics of performance on the Validity Indicator Profile (VIP) by neuropsychology examinees**

*Frederick R, Sarfaty S*

Objective: Two changes in categorization scheme of the Validity Indicator Profile (VIP) were published in 2003 to make the nature of inconsistent performance more intuitively obvious. The first change was to rename inconsistent performances from "Careless" to "Inconsistent," mitigating potential misattribution for notable inconsistency. The second change eliminated classification based on subtle, but powerful, analyses of internal consistency of responses to more obvious and intuitive departures from consistent responding on VIP performance curves.

In the validation sample, 80% of 61 TBI non-litigants were classified as “Compliant,” and 16% were classified as “Inconsistent.” This study reports rates of VIP classification for 263 adults undergoing neuropsychological examination. Data selection: Neuropsychological examinees comprised consecutive evaluations in an outpatient private practice. Out of 211 potentially litigated or compensated examinations, 84 were civil legal cases, 75 were IME, 42 were worker’s compensation cases, 6 were criminal legal cases, and 4 were disability determinations; 52 examinations were neither potentially litigated nor compensated. Data synthesis: VIP classification is either “Compliant” (strong effort to perform well), “Inconsistent” (compromised effort to perform well), “Irrelevant” (token effort to perform poorly), or “Suppression” (strong effort to perform poorly). Among cases not potentially litigated or compensated, 73% were classified as Compliant, 19% were Inconsistent, 6% Irrelevant, and 2% Suppression. Among potentially litigated cases, 32% were classified as Compliant, 45% Inconsistent, 20% Irrelevant, and 2% Suppression. Measures of inconsistent responding were significantly different between these two groups. Conclusions: The VIP effectively quantifies the compromised effort that is associated with performances in neuropsychological evaluations that are potentially compensated or litigated.

## C25

### **Development of a response bias scale for the MMPI-2**

*Gervais RO*

Objective: To derive a Response Bias Scale (RBS) for the MMPI-2 using empirical methods. Method: This archival study examined Word Memory Test (WMT; Green, 2003; Green, Allen, & Astner, 1996), Computerized Assessment of Response Bias (CARB; Allen, Conder, Green, & Cox, 1997), and MMPI-2 raw data from 1212 consecutive non-head injury disability claimants and counseling clients seen in a private practice setting. Logistic and multiple regression analyses were used with the MMPI-2 items as independent variables and pass/fail WMT and/or CARB as a grouping criterion to select MMPI-2 items that predicted group membership. Results: Regression analyses identified 41 MMPI-2 items that classified claimants as pass/fail WMT and/or CARB with 76% overall accuracy in the total sample, and with 81% accuracy in the chronic pain disability subgroup. The 41-item scale (RBS) was moderately correlated with the mean of the three WMT effort measures ( $r = -.50$ ,  $P < .0005$ ). The scale was highly accurate in identifying SVT failure in the total sample and in subgroups with specificity between 93% and 97%, and positive predictive power ranging from 77% to 93% at a cutoff of 22. Positive predictive power was 100% at a score greater or equal to 27. Conclusions: Preliminary analyses of the RBS suggest that it is a potentially useful measure of response bias in the cognitive, emotional and physical symptom dimensions. Further cross-validation with different clinical samples is in progress.

## C26

### **Word Memory Test (WMT) performance and MMPI-2 validity scales and indices**

*Gervais RO, Wygant DB, Ben-Porath YS*

Objective: Numerous validity scales and indices for detecting biased responding and feigned/exaggerated symptoms have been developed for the MMPI/MMPI-2. The present

study examined the relationship between performance on the Word Memory Test (WMT; Green, 2003; Green, Allen, & Astner, 1996), an objective measure of response bias, and scores on the MMPI-2 F scales, F–K, Meyers Validity Index (Meyers et al., 2002), Md scale (Steffan et al., 2003) and other indices designed to detect symptom exaggeration/biased responding. Method: This archival study used MMPI-2 and WMT data from 1212 consecutive non-head injury disability-related referrals to the first author's private practice. Chronic pain (39%) and anxiety-related disorders (23%) were the primary diagnoses. We excluded patients who did not complete the WMT, had CNS > 30, or scored VRIN/TRIN > 80. This resulted in a final sample of 775 cases (51% male). The sample was divided into WMT pass (70%) or fail (30%) groups. Results: The fail WMT group scored significantly higher than the pass WMT group on all MMPI-2 scales and indices ( $P = .01-.0005$ ). ANOVA results indicated significant increases in MMPI-2 scores across decreasing WMT score ranges ( $P < .0005$ ). Conclusion: Poor performance on the WMT was associated with increasing scores on MMPI-2 validity scales and indices. This provides external validation and support for interpretation of the MMPI-2 validity indices and scales as indicators of biased responding/symptom exaggeration. Sensitivity and specificity of these scales relative to the WMT is discussed.

## C27

### **Correlation between Word Memory Test (WMT) performance and the MMPI-2 Restructured Clinical (RC) scales**

*Wygant DB, Gervais RO, Ben-Porath YS*

Objective: To explore the correlation between Word Memory Test (WMT; Green et al., 2004) performance and the MMPI-2 Restructured Clinical (RC; Tellegen et al., 2003) scales. Method: Archival data from 1212 consecutive non-head injury disability and counseling referrals to the second author's private practice were examined. Patients were excluded if they did not complete the WMT ( $n = 133$ ), left more than 30 MMPI-2 responses blank ( $n = 273$ ), or had VRIN/TRIN T scores above 80 ( $n = 31$ ). The final sample included 775 patients (392 men, 383 women). WMT performance was grouped into three levels based on the mean of Immediate Recall, Delayed Recall, and Consistency-Level 1: >90% ( $n = 507$ ), Level 2: 80–89% ( $n = 129$ ), Level 3: <79% ( $n = 139$ ). ANOVA was used to examine differences on RC scales across three levels and effect sizes were calculated between levels 1 and 3. Results: ANOVA results indicate significant differences on RC scales across WMT levels—RCdem, RC1som, RC2lpe, RC7dne, RC8abx ( $P < .002$ ); RC3cyn, RC4asb ( $P = .028$ ). No significant differences were found on RC6per and RC9hpm. Effect sizes were highest for RC1som, RC2lpe, RCdem, and RC8abx. Conclusions: WMT performance was correlated with higher scores on some RC scales. Correlations were strongest on scales measuring somatic complaints, anhedonia, and demoralization. These data indicate two possibilities: poor WMT performance is associated with some symptom over-reporting on the MMPI-2; or psychopathology, as measured by the RC scales impairs WMT performance. Ways to tease out these non-mutually-exclusive possibilities are discussed.



**C28****The Memory and Concentration Test (MACT): data from a clinical sample demonstrating a range of neurological and psychiatric disorders***Teichner G, Waid L, Buddin W*

**Objective:** This study presents clinical data for Green's Memory and Concentration Test (MACT). The MACT is a new test that may be useful in the detection of cognitive malinger and poor testing effort. **Method:** Subjects were 260 patients (children, adolescents, adults). The sample was comprised of both clinical (i.e., neurological and psychiatric disorders) and forensic (e.g., IME, litigation) referred patients. All subjects were administered the MACT as part of a larger test battery. The MACT is similar to Green's Word Memory Test (WMT) as a comparable method is employed. Subjects are asked to learn a list of 10, instead of 20 (i.e., required by WMT), simple word pairs. Primary effort measures (i.e., Immediate Recognition (IR), Delayed Recognition (DR), and Consistency (CNS)) mirror those of WMT. Pass and fail guidelines were employed as per test guidelines. **Results:** Results indicated that 39 subjects (15% of the sample) failed MACT. Subjects failing MACT were 21 forensic referrals who demonstrated insufficient testing effort, and 18 clinical cases. Results demonstrated that 93% of sample passed MACT when these 21 forensic cases were excluded from analyses. Passing rates of this subgroup ( $N=239$ ) for the primary MACT effort measures were as follows: IR, 98.7%; DR, 93.7%; CNS, 92.9%. **Conclusions:** This study provides independently collected data supporting the utility of the Memory and Concentration Test (MACT) in assessing cognitive malinger and testing effort.

**C29****Cognitive complaints in relation to test performance and emotional status in a neuropsychological referral sample***Gass CS, Ardern H, Howell S, Dowd A, Levy S, MacKenzie K*

**Objective:** Evaluate the relationship between cognitive complaint severity, neuropsychological test performance, and emotional status. **Method:** Self-appraisal of cognitive difficulties was measured in a sample of 266 consecutive VA outpatient referrals who completed the 39-item Cognitive Difficulties Scale (CDS; McNair & Kahn, 1983) prior to neuropsychological test battery administration. Most referrals were made by Primary Care, Neurology, and Psychiatry. Age- and education-corrected scores on the 20 widely used tests were factor analyzed (PCA, varimax), yielding four factors: Information Processing Speed, Memory, General Knowledge, and Graphomotor Skill. Patients were divided into three groups based on complaint severity: Low (CDS = 0–56,  $n = 86$ ), Moderate (57–90,  $n = 90$ ), and Severe (91–149,  $n = 90$ ). One-way ANOVAs were used to assess mean differences between the three groups on the four factor scores and on a priori selected scores on the MMPI-2 (scales F, Anxiety, and Depression). **Results:** The three groups did not significantly differ in their mean scores on the four neuropsychological factors (all  $P$ s > .10). However, mean scores on all three MMPI-2 scales were substantially different (all  $F$ s > 30,  $P$ s < .0001). For example, mean scores on Depression were 52T (Low CDS scorers), 62T (Moderate CDS scorers), and 72T (Severe CDS scorers), with a robust PPM correlation,  $r = .57$ ,  $P < .0001$ . **Conclusion:** The extent of self-appraised cognitive difficulties is much more likely to reflect emotional status than actual cognitive ability. Sub-

jective reports, including a denial of problems, are poor predictors of performance. Emotional status predicts the extent of reported problems with cognitive inefficiency.

### **C30**

#### **Performance on cognitive “effort” measures in ESL and non-ESL patients**

*Wen J, Boone K*

Cognitive “effort” measures are given in conjunction with neuropsychological testing to ensure that patients are motivated to perform their best. Objective: Studies have shown that age, education, and gender do not impact performance on effort tests (Boone et al., 2002a, 2002b, 2002c; Boone et al., 2005), but to date, virtually no information is available regarding whether cultural and language factors impact test performance. Specifically, it is unknown as to how individuals who speak English as a second language perform on effort indicators, and whether cut-offs need to be adjusted so that these individuals are not inappropriately designated as malingering when in fact they are performing with their best efforts. Method: Multiple *T*-tests were performed between the ESL and non-ESL group on the Dot Counting Test (Boone, Lu, & Hertzberg, 2002b), Rey 15-item Test plus recognition trial (Boone et al., 2002c), Rey–Osterrieth effort equation (Lu et al., 2003), Rey Word Recognition Test (Nitch et al, in press), Rey-O/RAVLT discriminant function (Sherman et al., 2002), RAVLT recognition trial (Boone et al., 2005), Warrington Recognition Memory Test—Words (Iverson & Franzen, 1994), and the Digit Span (Babikian et al., in press). Results: No statistical difference was found on six effort indices, including age and education. However, a significant group difference was found on the Digit Span;  $T(2.440)$ ,  $P < .05$ . Conclusion: Our study found no group differences on six out of seven effort indices, which supports that published cut-off scores for poor effort could be used in various ethnic populations.

### **C31**

#### **Relationship between poor effort and baseline performance on ImPACT**

*Sucharski NM, Schatz P*

Objective: To examine the relationship between poor effort, as measured by performance on the Word Memory Test, and baseline performance on ImPACT. Methods: Twenty-five undergraduate volunteers completed the immediate and delayed recall subscales of the WMT, as well as baseline testing on ImPACT. Results: Pearson’s correlations revealed a significant relationship between WMT scores (percent correct) and ImPACT processing speed composite score ( $r = .58$ ;  $P = .003$ ). Ten participants who failed the WMT (below 95% correct) had significantly faster ImPACT processing speed composite scores [ $F(1, 23) = 5.03$ ;  $P = .035$ ], as compared to 15 participants who completed the WMT at 95–100% correct. One-way ANOVAs revealed no significant between-groups differences on the other four ImPACT composite scores, including Impulse Control. Conclusions: Individuals performing with sub-optimal effort appear to process ImPACT stimuli faster than individuals completing the test with full effort. While this might suggest individuals providing sub-optimal effort are choosing any answer as quickly as possible, this is not reflected by poor performance on the other four composite scores. These results suggest that effort testing should be included in baseline concussion assessment, as decision time/processing speed is compromised by poor effort. In those cases where individu-

als provide sub-optimal effort, performance on baseline testing should be carefully scrutinized with particular emphasis on accuracy and speed of responses. Further research is required to determine the response patterns of individuals providing sub-optimal effort on specific neuropsychological test measures, especially those measuring response time on a computer.

## **PROFESSIONAL ISSUES: ETHICS**

### **C32**

#### **Patient and family perceptions of the neuropsychological evaluation: how are we doing?**

*Westervelt H, Brown LB, Tremont G, Stern RA*

**Objective:** To assess perceptions of the neuropsychological evaluation, patients and significant others presenting to an academic medical center neuropsychology service were surveyed over a two year period. **Method:** All patients ( $N = 346$ ) attending a neuropsychological exam and feedback session were sent a confidential survey one month following their feedback session. Significant others attending the feedback session were also surveyed ( $N = 216$ ). Participants rated their level of satisfaction on a 4-point rating scale regarding aspects of the exam/interview and feedback session. Respondents were also asked indicate whether they had followed/intended to follow each recommendation made, and how helpful the recommendation was. **Results:** Thirty-nine percent of the patient surveys ( $n = 134$ ) and 37% of the significant other surveys ( $n = 80$ ) were returned. Overall, both patients and significant others reported being mostly or very much satisfied with the interview, testing, and feedback sessions. Degree of satisfaction with the interview/testing session was not affected by the level of training of the examiner (i.e., practicum student, intern, postdoctoral fellow, or staff member). Responders were generally receptive to the recommendations made, though they were more inclined to have followed recommendations regarding patient safety by the time of the survey (53.3%) than those related to coping or support (30.9%). Some barriers to following recommendations were identified. **Conclusions:** Patients and significant others generally view the neuropsychological evaluation as a positive experience. Some insights into responses to recommendations were gained, though further work with careful exploration into barriers to compliance is needed.

## **PROFESSIONAL ISSUES: FORENSIC PRACTICE**

### **C33**

#### **Identification of malingered head injury with WAIS-3 vocabulary and digit span**

*Mittenberg W, Roberts DM, Patton C, Legler W*

**Objective:** Prior research documents that exaggeration is common in compensable head trauma, and can be identified by intelligence test performance pattern. This study derived a WAIS-3 Vocabulary-Digit Span discriminant function to identify malingering by comparing clinical malingerers and head trauma patients. **Method:** Fifty-nine malingering litigants were identified by scores on the TOMM, PDRT, WMT, or VSVT that were lower than obtained by any TBI patients in validation studies. Fifty-nine nonlitigants were matched to litigants on WAIS-3 FSIQ (85.53 vs. 85.54). Nonlitigants had a median GCS of 9 and 18 h post-injury coma. Litigants had a median GCS of 15 and median coma less than 1 h. Litigants and nonlitigants obtained

FSIQ's that were lower than demographically estimated premorbid IQ ( $M = 19$  and  $12$  points) at 30 months versus 9 months post-injury. Vocabulary and Digit Span scores were entered in a stepwise discriminant analysis to determine if groups could be accurately identified. Results: Seventy-five percent of TBI and 76% of malingers were correctly classified. Discrimination was unrelated to coma length, GCS, CT results, or obtained FSIQ in either group. Discriminant score was significantly correlated with TOMM ( $r > .47$ ) and VSVT ( $r > .44$ ) scores in malingers. Crossvalidation in independent groups of 68 nonlitigating TBI and 108 normals instructed to malinge impairment produced 71% and 77% diagnostic accuracy rates, respectively. Conclusions: Vocabulary and Digit Span performance pattern continues to be useful in identifying malingered head injury. This study was supported by the NAN Clinical Research Grant and an NSU President's Grant.

### C34

#### **A symptom validity test using incidental recognition for WAIS-3 similarities items**

*Mittenberg W, Ziemann SF, Stanczak SR, Roberts DM*

Objective: Incidental recall of information used during a problem solving task is relatively insensitive to reduced motivation due to depression, and recognition tasks are relatively unaffected by memory impairment. This study validated a new test designed to identify intentional memory difficulties using incidental recognition for Similarities word pairs. Method: Recognition items were created by pairing Similarities words with incorrect semantically or phonemically related alternatives. The 38-item forced choice test required recognition of the Similarities items immediately after the subtest (e.g., orange or juice?) and again following Block Design (e.g., apple or orange?). The test was administered to 56 nonlitigants with TBI ( $n = 24$ ), dementia ( $n = 18$ ), CVA ( $n = 7$ ), and other disorders. Patients had significant immediate memory impairment on the HVLTR or Logical Memory (mean = 35T) and reduced FSIQ (mean = 89). Thirty-four individuals instructed to malinge cognitive impairment for financial compensation, and four litigants that failed the TOMM also completed incidental recognition. Results: Patients accurately recognized an average of 89% immediate, 92% of delayed, and 90% of total items. Malingers were significantly less accurate, with 62% immediate, 58% delayed, and 60% total items correct. A cutoff of 75% correct accurately identified 87% of the validation sample and all four litigants. Scores that were lower than those obtained by any patient with neurological disorder were obtained by 47% of malingers on delayed or total recognition. Three of four litigants scored more poorly than any patients. Conclusions: Incidental recognition of Similarities items may identify exaggerated memory difficulty. Copies of this brief test will be provided.

### C35

#### **Social facilitation effect of examiner attention or inattention to computer administered neuropsychological tests: first sign that symptom validity tests may be affected**

*Yantz CL, McCaffrey RJ*

Objective: This study was designed to determine if an examiner's attention or inattention to computerized tests has similar impairing effects as third-party observers have on memory. Method: Seventy-two undergraduates were administered computerized versions of the Test

of Memory Malinger (TOMM), the Word Memory Test (WMT), and the Wisconsin Card Sorting Test (WCST). The examiner observed performances of 37 students and administered the tests to the remaining 34 participants while in the room, but inattentive to their performance. It was expected that students' symptom validity test (SVT) performances (WMT and TOMM variables) would not be affected by observation status, while their WCST performance would be when groups are compared with independent samples *t*-tests. Results: The TOMM total errors were significantly lower in the observed group compared to the unobserved/inattentive group ( $t=2.90$ ,  $P=.005$ ). There were no group differences on WMT or WCST variables. Conclusions: This first examination of observation effects on SVTs found that normal undergraduates' performance on the TOMM was lowered by the examiner's inattention to test performance though the examiner remained in the room. This corresponds with the strengthening of dominant responding theory of social facilitation, which suggests that easy tasks are improved while hard tasks are impaired by an observer's presence. These results extend the idea that observation, even by test administrators, can influence test performance. These impacts may be magnified in litigating samples, with their more variable SVT performances. Implications of these findings in forensic and criminal assessment will be discussed.

### **C36**

#### **Third-party observer effect confirmed on tests of executive functioning**

*Horwitz JE, McCaffrey RJ*

Objective: This study examined the effects of a third-party observer on tests of executive functioning. We hypothesized that the presence of a third-party observer would negatively affect performance on these types of tasks, as has been shown on tests of memory and other neuropsychological tasks. Method: Fifty-three undergraduate students were administered phonemic and categorical verbal fluency tests (using the letters FAS and an animal category), Trail Making Tests Parts A and B, and the Tactual Performance Test. A trained assessor who was blind to the hypothesis conducted the testing. The third-party observer, whose purpose in the testing room was not revealed to either the assessor or the subjects, was present for 28 of the testing sessions while the remaining 25 were conducted with no third-party observer present. Results: Gender, age, and years of education did not differ significantly between the two groups. Subjects tested in the presence of the third-party observer performed more poorly on categorical fluency and on the localization subtest of the Tactual Performance Test. There were no significant differences on any of the remaining variables. Conclusions: Performance on some tests of executive functioning was negatively affected by the presence of a third-party observer. The findings from this study lend further support to the notion that the validity of neuropsychological test results obtained while a third-party observer is present may be significantly compromised.

### **C37**

#### **Neuropsychological correlates to treatment progress in substance abuse offenders**

*Ratanadilok K, Festinger DS, Patapis N, Goldberg K, Marczyk GR*

Objective: Neuropsychological impairments have been demonstrated in substance abusing populations (Whitlow et al., 2004). Certain neuropsychological deficits might contribute to

poor treatment outcomes. The present study examined the correlation of neuropsychological functioning (intellectual functioning, executive functioning and memory) with treatment outcomes in a substance abuse population (urinalyses at 8-week follow-up). Method: The participants were 24 adults (6 females, 18 males), nonviolent substance abusers actively involved in Newcastle County, Delaware, drug treatment court. Clients already participating in the Improving the Ethics of Consent in Drug Abuse Research study agreed to participate in this study. Neuropsychological measures included the WASI (VIQ, PIQ and Full Scale IQ), WCST (Preservation Errors and Number of Categories Completed), Trails B, COWAT, and the WMS-III: Logical Memory I and II (Percent Retention and 1st Recall Total Score). Demographic data were also studied. Results: The participants' mean age was 25; 83% had 12 years of education or higher. Pearson correlation analyses reveal that the neuropsychological variables that significantly correlate with positive urine samples are WASI VIQ ( $r = -.656, P = .001$ ) and WASI Full IQ ( $r = -.619, P = .001$ ). Years of education also significantly correlate with the number of positive urine results ( $r = -.463, P = .023$ ). Conclusion: These results suggest that VIQ, Full Scale IQ, and years of education are negatively related to positive urine results. These variables may be important factors to consider in treatment planning for this population. Funding: National Institute on Drug Abuse: Grant #R01-DA-13096 and #R01-DA-016730.

### C38

#### **The use of descriptive labels in reporting neuropsychological test scores: forensic implications**

*Guilmette TJ, Hagan LD, Giuliano AJ*

Objective: To determine the use of specific descriptive or classification labels (e.g., superior, average, normal, impaired, etc.) among ABPP/AACN board-certified neuropsychologists in reporting test scores in neuropsychological reports. Method: One-half of the board-certified neuropsychologists listed in the 2004 membership directory of the American Academy of Clinical Neuropsychology ( $n = 232$ ) were mailed surveys asking them how frequently they used descriptive labels in forensic and non-forensic neuropsychological reports. In addition to demographic information, participants were also asked to assign a classification or descriptive label to 12 different standard scores (SS), which ranged from 50 to 130, of a memory test based on a brief case scenario. Surveys were returned by 110 (47%) of the neuropsychologists. The mean number of years since receiving their doctoral degrees was 19.6 years (S.D. = 7.0). Results: Classification/descriptive labels were used greater than half the time by 94% of our participants in non-forensic neuropsychological reports and by 82% of our respondents in forensic reports. The mean number of different classification labels assigned by our participants to each of the 12 standard scores was 14.1 and ranged from 6 (for SS = 130 and 95) to 24 (for SS = 50). Conclusions: There is a lack of uniformity among neuropsychologists in assigning consistent classification or descriptive labels to specific standard scores. This is a potential source of confusion in forensic evaluations and is likely detrimental to our credibility. Possible consequences and suggestions for remediation of this issue are discussed.

**PROFESSIONAL ISSUES: TEST DEVELOPMENT AND METHODS****C39****Optimal sample sizes for normative studies in pediatric neuropsychology: a quantitative analysis of confidence intervals***Bridges AJ, Holler KA*

**Objective:** The purpose of this investigation was to determine how confidence intervals (CIs) for pediatric neuropsychological norms vary as a function of sample size, and to determine optimal sample sizes for normative studies. **Data selection:** First, the authors calculated 95% CIs for a set of published pediatric norms for four commonly used neuropsychological instruments (Boston Naming Test, Rey Auditory–Verbal Learning Test, Rey–Osterrieth Complex Figure Task, and Hooper Visual Organization Test). Second, 95% CIs were calculated for the same norms, but varying sample size (from  $n=5$  to  $n=500$ ). Results of the changes in CIs as a function of sample size were graphed. **Data synthesis:** Results of the first analysis suggest that many pediatric norms have unacceptably wide CIs. Results of the second set of analyses suggest that normative studies ought optimally to use 50 participants per group, resulting in a CI that spans approximately 1/2 standard deviation. Smaller sample sizes lead to increased CIs, and the clinician is in greater danger of over-pathologizing results. Alternately, the cost per reduction in CI ratio is deemed unjustifiable for sample sizes greater than 75. **Conclusions:** Normative studies should aim to include 50–75 subjects per group. Norms tables should include CIs for ease of interpretation. At a minimum, published tables of norms should include sample sizes, so clinicians may calculate CIs. Finally, although sample size is one important variable neuropsychologists ought to use when evaluating the usefulness of norms, other essential variables (e.g., exclusionary criteria, sample characteristics, representativeness) must be considered.

**C40****Test of verbal conceptualization and fluency: age effects***Reynolds C, Horton AM*

**Objective:** Age effects on a newly developed test of human executive functioning, the Test of Verbal Conceptualization and Fluency (TVCF) are examined. **Method:** Neuropsychological procedures that served as models for the TVCF subtests include card sorting tasks, category and letter retrieval tasks and “trailmaking” tasks. Age effects on the TVCF were examined by calculating the intercorrelation of the TVCF subtests at the ages of 16, 20 and 30. Age effects on the TVCF were also examined by calculating the means and standard deviations for the Classification, Category Fluency and Letter Naming subtests of the TVCF at 12 age intervals from 8 to 89 years (Trail C data previously reported, Reynolds, 2003). **Results:** At age 16, Category Fluency and Letter Naming subtests correlation was statistically significant at the .0005 level. At age 20, the Category Fluency and Letter Naming subtests scores correlation was statistically significant at the .0001 level. Trails C was significantly correlated with all of the other TVCF subtests. In addition, the age 30 correlation matrix showed the strongest correlation between the Category Fluency and Letter Naming subtest scores was significant at the .0001 level. Trails C was also correlated with all subtests. **Conclusions:** The intercorrelation

matrices at three different ages suggest greater associations among TVCF subtests scores were apparent after age 16. Data also suggest the natural curve of performance on the TVCF turns down at age 30 and continues to worsen with declines occurring after age 60.

#### **C41**

##### **Test of Verbal Conceptualization and Fluency: review of conceptualization of executive functioning**

*Horton AM, Reynolds C*

**Objective:** The Test of Verbal Conceptualization and Fluency (TVCF) is a new test designed to assess executive functioning. Executive functioning is a multifaceted neurocognitive construct that is presumed to be supported by a widely distributed neural network in the human brain. **Method:** The TVCF is based on the modification of a number of selected previous employed and well researched neuropsychological tests but does not postulate specific localization of any particular brain area. Similarly, the TVCF does not attempt to sample the entire potential range of possible executive functions, which is potentially limitless but has rather carefully selected and modified a finite number of well researched traditional clinical neuropsychological procedures with the intent of better conceptualizing and objectifying this important area of neurocognitive and adaptive behavioral functioning. The selected neuropsychological tasks that served as models for the TVCF include card sorting tasks, category and letter retrieval tasks, and “trailmaking” tasks. **Results:** The various tasks of the TVCF are entirely consistent with contemporary conceptualizations of executive function in particular as well as most conceptual neurocognitive models. A considerable amount of evidence has accumulated linking the neuropsychological tasks that underlie the TVCF subtests to disruptions of the decision-making brain systems. **Conclusions:** While the TVCF does not purport to assess every possible theoretical aspect of executive functioning, but rather selectively samples multiple clinically important aspects of the executive control system, the tasks of the TVCF receive strong theoretical support from contemporary models of brain systems and from decades of clinical neuropsychological research on highly similar assessment tasks.

#### **C42**

##### **Florida Affect Battery: expansion of young adult normative data**

*Havellana BK, Uomoto JM*

**Objective:** The Florida Affect Battery (FAB) assesses emotional facial encoding (EFE) and emotional prosody encoding (EPE). Normalized on individuals with neurological disorders, scarce normative data exists on this measure particularly for young adults between 18 and 30 years of age, a cohort particularly susceptible to neurological insults such as spinal cord and traumatic brain injuries. This study sought to obtain normative data on the FAB, expand upon currently available normative data based upon 53 participants in this age group, and to analyze the FAB’s effectiveness in differentiating between those with and without neurological impairment. **Method:** Utilizing a quasi-experimental design the FAB was administered to 108 university students between 18 and 30 years of age. **Results:** Participants with neurological disorders made significantly more EFE errors ( $M = 87.11$ ;  $S.D. = 8.35$ ) compared to normative participants ( $M = 91.23$ ;  $S.D. = 7.09$ ,  $F(2, 105) = 4.50$ ,  $P < .01$ ). Compared to normative partic-



ipants ( $M=95.41$ ;  $S.D.=4.14$ ) those with a history of neurological disorders made more EPE errors ( $M=94.18$ ;  $S.D.=5.14$ ) although the difference between groups was not statistically significant  $F(2, 104)=1.51$ , ns. Conclusions: Normative data indicates that young adults with a history of neurological disorder exhibit impaired EFE in comparison to those without such history. However, this does not appear to be true for this cohort in terms of EPE. Further normative research is necessary to determine the efficacy of the FAB in identifying impaired EPE in young adults with neurological disorders.

### C43

#### **Development and examination of a new cognitive screening examination**

*Wynkoop TF*

Objective: Examine the psychometric characteristics of the Mini Cognitive Screening Exam (MCSE). Method: The MCSE is a brief, yet broad cognitive screening instrument. Its 80 points include screens for orientation, attention, mentation, language, construction, remote memory, new learning and recall (verbal and visual), and executive functions in about 15 min. It is as portable (one page front and back) and about as easy to administer as the MMSE, but more variable in difficulty (i.e., to increase its sensitivity to early dementia and/or to cognitive change), to help mental health and medical professionals to decide when patients should be referred for more thorough neuropsychological evaluation. The MCSE was administered to 108 patients referred for neuropsychological evaluation to rule out dementia. Average age was 75.7 (7.7), with an average of 11.5 (2.4) years of education, an average Barona FSIQ of 102.7 (7.7), and an average MMSE score of 23.4 (5.8, range 0–30). Results: The average MCSE total score was 54.4 (14.8, range 4–79), and correlated well with the MMSE ( $r=.88$ ,  $P=.0001$ ). Like the MMSE, the MCSE total score correlated with years of education ( $r=.20$ ,  $P=.038$ ), but not IQ ( $r=.10$ ,  $P=.321$ ) nor age ( $r=-.18$ ,  $P=.066$ ). Reliabilities for MCSE domains, as currently organized, ranged from modest to good (and improve with conceptual and statistical rearrangement). Conclusions: The MCSE can become a useful and convenient screening tool for neuropsychologists, with the requisite research and revision.

### C44

#### **Development and validation of the neurobehavioural symptom inventory**

*Alfano DP*

Objective: The evaluation of neurobehavioural symptoms represents a major issue in clinical neuropsychology. The objective of this study was to develop and validate a new measure of neurobehavioural symptoms for use in the assessment of mild traumatic brain injury (MTBI). Method: An initial pool of 28 items, based on DSM-IV Research Criteria for Postconcussional Disorder and Mild Neurocognitive Disorder, were developed and administered to 107 individuals medically diagnosed with MTBI according to the criteria of the American Congress of Rehabilitation Medicine. Results: Principal components analysis of the 28 items revealed five conceptually coherent and non-overlapping factors that together accounted for 58.4% of the total variance. The 23 items retained in the factor solution were named the Neurobehavioural Symptom Inventory (NSI). The five factors comprising the NSI were labelled: Cognitive (coefficient of internal reliability = .89), Emotional (.87), Somatic I (.69), Somatic II (.67), and

Sensory (.49). Validation of the NSI was done using demographically matched samples of 30 individuals with MTBI (separate from the above sample) and 18 non-clinical controls. The group with MTBI scored significantly higher than the control group on the first four factors of the NSI. Discriminant function analysis revealed an overall rate of correct classification of 83.3% of the 48 individuals (86.7% of the individuals with MTBI and 77.8% of the control group). Conclusion: These findings demonstrate adequate psychometric properties and high discriminative validity of the NSI. Future research will examine the relationship between the NSI and objective measures of neuropsychological functioning in MTBI.

#### **C45**

##### **The validity, reliability, and utility of the Dean–Woodcock emotional status examination** *Dean RS*

Objective: A recent structured emotional status examination based on DSM IV diagnostic criteria is the Dean–Woodcock Emotional Status Examination (D-WESE). The D-WESE is an instrument that enables the clinician to gain a comprehensive picture of the patient's psychiatric symptoms. The D-WESE assesses both the presence and severity of psychiatric symptoms pertinent in neuropsychological evaluation. The present study examined the reliability, validity, and utility of the D-WESE. Method: The patients ( $n = 207$ ) had been referred for neuropsychological evaluation. Patients were individually administered the D-WESE. Patients also responded to the Minnesota Multiphasic Personality Inventory (MMPI). These measures were compared using Pearson's  $r$  and a multiple regression analysis following a factor analysis of the D-WESE. Results: Analysis of the D-WESE indicated an 11-factor solution emerged. The alpha coefficient for the D-WESE was found to be .94. A Pearson  $r$  correlation was conducted between the 11 factors of the D-WESE and the 10 clinical scales of the MMPI. Results indicated each D-WESE factor were significantly correlated to the MMPI clinical scales, indicating shared variability. The factors of the D-WESE, using a multiple regression, accounted for 16–70% of the variance for the MMPI predictor scales. Thus, moderate degree of overlap exists between the D-WESE factors and the MMPI. Conclusion: Overall, the D-WESE appears to be a reliable and valid instrument that can assist in and diagnosis of psychopathology.

#### **C46**

##### **Predicting neurological with the Dean–Woodcock Sensory Motor Battery** *Noggel CA, Dean RS, Davis A*

Objective: Neuropsychological assessments contribute unique information regarding the functional strengths and weaknesses of patients necessary for the diagnosis of disorders and useful for accurate prognoses and rehabilitation planning that brain imaging cannot provide. A major component of these neuropsychological batteries, that has been at the core of early explorations of brain functioning and is, to this day, an important part of neurological and neuropsychological examinations, is the assessment of sensory–motor functioning. Sensory–motor assessments provide information about the patient's neurological functioning and many pathognomic signs. The present study assessed the ability of Dean–Woodcock Sensory Motor Battery (D-WSMB), part of a new neuropsychological measure, the Dean–Woodcock Neuropsychological Battery (D-WNB), to identify brain dysfunction. Method: Participants ( $n = 500$ ) included 250 individ-

uals that had been referred for neuropsychological evaluations and 250 “normal” volunteers that denied being diagnosed or treated for neurologic, psychiatric, or orthopedic disorders. Results: Statistical analyses indicated the D-WSMB was able to correctly identify 92.8% of the cases, identifying 94.4% of the normal population and 91.2% of the neurologically impaired subjects. An additional discriminant analysis was conducted to establish the accuracy of the D-WSMB to identify individual diagnoses within neurologically impaired and normal subjects whereby the following cases were correctly identified: 44.9% cardio-vascular accidents, 66.7% multiple sclerosis, 40% seizures, 42% traumatic brain injuries, 62.7% dementia, and 54.5% Parkinson’s disease. Conclusions: Findings indicate the D-WSMB is useful in identifying neurological damage and specific diagnoses in a relatively quick assessment.

#### **C47**

##### **Development of a new visuospatial memory test**

*DiLandro C, Tanaka T, Thompson L*

Objective: The purpose of this project was to establish the reliability and validity of a new visuospatial memory with alternate forms, the Delayed Visual Memory Test (DVMT). Methods: One hundred and three men and women between the ages of 30 and 85 were recruited from the community for a nonclinical sample. Participants were administered a neuropsychological battery that consisted of: the four forms of the DVMT, Dementia Rating Scale, California Verbal Learning Test, Visual Reproduction I and II subtest, National American Adult Reading Test, Trail Making Test, Verbal Fluency Test, and California Older Adult Stroop Test in one testing session. A correlational research design was chosen to examine the relationship between the DVMT and other measures to establish reliability and validity. The four forms were correlated with each other to establish alternate form reliability and with other measures within the battery to obtain convergent and discriminant validity. Results: The obtained Chronbach’s alphas were over .85. Alternate form reliability coefficients ranged from .584 to .737 ( $P < .001$ ). Convergent validity correlations with VR I and II range from .463 to .598 ( $P < .001$ ). Discriminant validity correlations with verbal memory measures ranged from .201 to .494 ( $P < .05$ ). Age was the only demographic variable that influenced performance. Conclusions: Alternate form reliability was not established; however, the forms were found have strong internal consistency. Adequate convergent and discriminant validity was established. Future research should aim at administering the four forms of the DVMT at different time points to further assess parallel form reliability and test–retest reliability.

#### **C48**

##### **Timed Gait Test: normative data and preliminary clinical validity**

*Parsons TD, Price RW, Sidtis JJ, Braaten A, Inman TH, Robertson WT, Hall CD, Robertson KR*

Objective: Gait disturbance is common feature of neurological illnesses with accompanying cognitive abnormalities. However, a simple, well-normed procedure for measuring gait velocity has not been established. The Timed Gait Test is a standardized procedure assessing motor dysfunction of the lower extremities and gait abnormalities associated with AIDS dementia complex (ADC), a syndrome of cognitive and motor impairment complicating HIV infection,

usually in its late phase. With the present study, we provide normative data to aid Timed Gait interpretations. Method: Normative data was derived from 1549 subjects, including: a sample of 189 HIV-seronegative (HIV–) subjects; HIV-seropositive (HIV+) but systemically and neurologically asymptomatic subjects; test results from 808 neurologically abnormal subjects classified according to ADC stage. Results: Timed Gait was found to be a useful screening and assessment tool for evaluating ADC and correlated with clinical ADC staging as well as more extensive structured neurological and neuropsychological evaluations. Total neurological scores were significantly correlated with Timed Gait ( $r = .66$ , 43.56% of variance). The mean  $z$ -score across neuropsychological tests was significantly correlated with Timed Gait score ( $r = -.48$ , 23.04% of variance). Conclusion: These normative data should prove useful in both recognition of ADC and in following subjects over time for natural history and treatment responses. This study now provides a normative base for Timed Gait Test in the age range of most HIV subjects. It also establishes Timed Gait scores across ADC stages, documenting slower performance with each increase in stage.

#### **C49**

##### **Empirical comparison of the Heaton et al. 1991 and 2004 comprehensive norms**

*Mooney SR, Lindbergh KH, Jackson WT*

Objective: The purpose of this study was to examine the substantive changes of neuropsychological data that is norm-referenced in the Heaton et al. (2004) professional manual vis-à-vis Heaton et al. (1991) in a heterogeneous psychiatric population. Methods: Participants were 30 African American (16 males and 14 females) and 35 Caucasian (20 males and 15 females) patients with an average age of 44.4 (S.D. = 13.2) and 43.8 (S.D. = 11.8), respectively. Participants were referred for a neuropsychological evaluation, including measures of fine motor coordination, grip strength, visuomotor speed, and mental flexibility. Results: Omnibus  $\chi^2$ -tests indicated that there were several significant divergences in the observed  $t$ -scores (from expected) from Heaton et al. (2004) vis-à-vis Heaton et al. (1991) on the Groove Peg Dominant Hand (PEG DH;  $P < .001$ ) and bilateral Hand Dynamometer (GRIP DH and NDH; both  $P < .004$ ) but not Trail Making Test Part A or B for the total sample. Post hoc  $\chi^2$ -tests, by ethnicity, would indicate that there was a significant divergence in the  $t$ -scores (i.e., observed from expected) on the PEG DH and GRIP DH for African American but not Caucasians. In contrast, there was a significant divergence in the  $t$ -scores on Grip NDH for Caucasians but not African Americans. Conclusions: Significant differences in obtained  $t$ -scores from Heaton et al. (2004) compared to the Heaton et al. (1991) edition are found when ethnicity is taken into account, at least for the Grooved Peg Board and Hand Dynamometer. Further replication is needed.

#### **C50**

##### **Interrater reliability of the Meyers and Meyers scoring system for the copy trial of Rey Complex Figure Test**

*Hoskins LL, DeRoest J, Nelson A, Polance C, Carothers T, Daniel M, Brockwood K*

Objective: Establish interrater reliability of the Meyers and Meyers (MM) (1995) scoring system for the Rey Complex Figure Test (RCFT) copy trial. Method: The study involved three

phases: Phase 1: Four scorers trained in the MM scoring system scored the RCFT copy trial for 30 adults seen for cognitive evaluation in our urban university training clinic. Each copy was scored by two independent scorers. Phase 2: To improve scoring reliability for the MM system, criteria for ambiguous scoring items were further operationalized. Five scorers were trained in this elaborated MM scoring system. After training, all five scorers scored the same 10 RCFTs. Phase 3: Using the elaborated scoring system established in Phase 2, each rater scored additional RCFTs. Each of the possible pairs of scorers (5 scorers = 10 total pairs) scored 13 RCFTs in common. Forty total RCFTs were scored by all scorers. Results: Phase 1: Interrater reliability ranged from .633 to .875 using the MM scoring system. Phase 2: Interrater reliability ranged from .758 to .947 for pairs of scorers using an elaborated MM scoring system. Phase 3: In cross-validation, interrater reliability ranged from .823 to .999 for pairs of scorers using the elaborated MM scoring system. Conclusions: Although the MM scoring system contains more specific criteria for the traditional 18-item RCFT scoring, some criteria are not well defined resulting in subjectivity and less than desirable interrater reliability. Establishing objective definitions for these subjective criteria, improves reliability to very high levels.

### **C51**

#### **Internet-based assessment in schools for mild traumatic brain injury screening in rural Australia**

*Donnelly JF*

The current project assessed the psychometric properties of the Headminder Concussion Resolution Index, an internet-based screening battery designed to detect changes in mental processing speed on a range of visual tasks. The effects of age and gender in children from 9 to 16, test–retest reliability, practice effects, and regression to the mean across time were examined. In addition, the logistical difficulties involved in group testing in school computer labs were assessed and resolved. Several cases for whom baseline data was available were re-assessed post-injury, and group effects between those with and without an mTBI history were examined. Anecdotal evidence on the school policies regarding referral for assessment, and local medical philosophies regarding the importance of mTBI assessment and the use of neuropsychological services was also assessed. The first normative data for young children using the Headminder battery were generated. Findings indicate that internet-based assessment in schools may be a viable alternative for children involved in high risk sports such as rugby and equestrian activities, especially for rural communities where neuropsychological services are severely limited. The importance of having premorbid baseline data, and the inclusion of clinical neuropsychological oversight was evident. Attention to reporting procedures, even in the better private schools, and education of the rural medical practitioners were essential components of the program.

### **C52**

#### **Evaluating the construct validity of a dementia screening battery: A follow-up study**

*Ferro JM, Webbe FM, Peake TH*

Objective: The purpose was to evaluate the predictive power of a dementia screening battery following the incorporation of a serial word learning task. Method: Data were obtained

from the records of 85 clients seen at the East Central Florida Memory Clinic. Participation was based on the following criteria: (1) being an active client of the ECFMC; (2) a signed consent for treatment form; and (3) having been evaluated at the Clinic after January 2003. The measures included a self-report questionnaire, MMSE, 6-item Grocery List recall, Letter/envelope preparation task, Clock drawing, 10-item Serial Word List, and the Hamilton Depression Scale. Feedback was provided to referring physicians and final diagnoses were obtained following subsequent evaluation by primary care physicians or neurologists. Results: A hierarchical regression, whereby Grocery List Task was entered first and SWL-best score was entered second, indicated that the combined output of the Grocery List Task and SWL-best score made significant contributions to the prediction of a dementia diagnosis. Together they accounted for 28.4% of the variance; 2.6% more than the combined predictive power of Grocery List and MMSE. Conclusion: SWL-best score was shown to be a powerful predictor of dementia; contributing more to the overall predictive power when combined with the Grocery List than the MMSE. These findings support using SWL-best scores as an abbreviated screening measure, as well as helping differential diagnosis when a clinician is presented with an ambiguous MMSE.

### C53

#### **Development of the Behavior Rating Inventory of Executive Function—Adult version**

*Roth RM, Isquith PK, Gioia GA, Widows M*

Objective: Ratings of individuals' executive function in the everyday environment provides useful clinical information, enhancing ecological validity. We describe the development and standardization of the Behavior Rating Inventory of Executive Function—Adult version (BRIEF-A). Methods: The initial item pool included 146 items tapping everyday executive behaviors. Two samples, aged 18–90, completed the BRIEF-A: initial adult self-report (ASR,  $n=313$ ) and informant report (AIR,  $n=289$ ) and final standardization samples matched to US Census data (ASR,  $N=1050$ ) and (AIR,  $N=1200$ ). Item-scale fit was assessed by 10 experts. Iterative item-total and factor analyses informed final scale composition. Results: The development process yielded parallel 75-item ASR and AIR forms with nine non-overlapping clinical scales: Inhibit, Shift, Emotional Control, Self Monitor, Initiate, Working Memory, Plan/Organize, Task Monitor, and Organization of Materials. Three validity scales reflect unusually negative, inconsistent, and infrequent responses. Expert agreement of item-scale membership ranged from 0.58 to 0.98. Alpha coefficients ranged from the high .70s to mid .90s. Inter-rater agreement between ASR and AIR was high ( $r=.60$ ). Principal factor analyses supported a two-factor solution resulting in Behavioral Regulation and Metacognition Indexes. Conclusions: The BRIEF-A is a new adult self and informant report instrument with appropriate evidence of reliability and construct validity for evaluating adults' executive functioning in the everyday, real-world context. Such ecologically oriented assessment is an increasingly important component of a comprehensive neuropsychological evaluation.

**C54****Estimating WAIS-III IQ with the BEST-3 approach***Schneider JJ, Brennan A, Hill B, Stewart HA, Singh A, Garcie H, Pella R, Gouvier WD*

Objective: The BEST-3 approach was designed to predict IQ scores using a combination of WAIS-R subtest performance and demographic information. Regression equations are calculated using the Vocabulary, Information, and Picture Completion subtests, with the highest score serving as the IQ estimate. The BEST-3 approach was found to correlate .84 with WAIS-R FSIQ, with a standard error of estimate (Sest) of 8.64 for the Vocabulary subtest, 9.10 for the Information subtest, and 9.57 for the Picture Completion subtest. The ability of this approach to estimate WAIS-III FSIQ is examined. Method: Undergraduate psychology students ( $n = 123$ , mean age = 21.09) and a clinical comparison group ( $n = 38$ , mean age = 21.16) were administered the WAIS-III. The BEST-3 estimate was compared to WAIS-III FSIQ. Results: Correlations between WAIS-III FSIQ and the BEST-3 estimate were .70 for the student group and .80 for the clinical group. In the student group, Sest were 10.55 for Vocabulary, 7.87 for Information, and 9.62 for Picture Completion. For the clinical group, Sest were 6.47 for Vocabulary, 6.30 for Information, and 5.88 for Picture Completion. Residual scores showed that the BEST-3 approach tended to overestimate actual IQ scores, particularly in the clinical group. Conclusion: Overall, the BEST-3 approach appears to provide a fairly accurate estimate of WAIS-III FSIQ. The consistent overestimation of scores found here might be due to the homogenous nature of the sample used.

**C55****Test score range in a comprehensive neuropsychological battery***Fishman E*

Objective: Lezak (1995) advised “the basic element of test score analysis is a significant discrepancy between any two or more scores.” Schretlen et al. [2003; JINS, 9, 864–870] found in a sample of 197 normal adults (mean age = 55.1, mean education = 13.9), an average 3.4 (S.D. = 0.8) Z-score range from high to low performance across tests on a comprehensive neuropsychological test battery (32 measurements from 15 tests), with 65% of subjects showing a Z-score range of 3 or greater. Method: The current study extended this same methodology to a sample of 117 consecutive referrals to a general hospital adult neuropsychology service (mean age = 52.5, mean education = 13.2). Results: This analysis showed an average 3.6 (S.D. = 1.2) Z-score range on a comprehensive neuropsychological test battery (40 measurements from 17 tests), with 65% of this sample also showing a Z-score range of 3 or greater. Conclusions: The remarkable similarity between these characteristics of “normal” and “clinical” samples should serve as another caution to neuropsychologists not to blindly over-interpret simple test score range on a comprehensive battery as indicative of brain injury/illness. Application of this method to other clinical samples/settings is encouraged.

**C56****Alternate versions of a story memory test: preliminary older adult normative data***Nicosia J, Price C, Lasaga L, Kellison I, Selke G, Newcomer J*

In addition to more popularly used tests of list learning for declarative memory (e.g., Hopkins Verbal Learning Test), story memory tasks are increasingly used for detecting prodromal dementia (Petersen et al., 1999). Objective: To provide preliminary older adult (age > 60) normative data on four alternate versions of a new unpublished story memory task (SMT), modeled after the WMS-R LM I&II. Method: A total of 53 ‘normal’ older adults (age  $M \pm S.D. = 70.81 \pm 5.82$ ; MMSE  $M \pm S.D. = 29.33 \pm 0.58$ ) completed one of four SMT versions (Version A,  $n = 10$ ; Version B,  $n = 15$ , Version C,  $n = 14$ , Version D,  $n = 14$ ;  $\chi^2(3) = 0.774$ , ns). The SMT was administered randomly as part of a larger neuropsychological protocol that included the Hopkins Verbal Learning Test (HVLT; Brandt, 1991). Each SMT version produces four summary scores: verbatim free recall, paraphrase recall, contamination errors, and confabulation errors. Results: Verbatim, paraphrase, and error type scores were produced equally across SMT versions and immediate/delay conditions (e.g., verbatim,  $F(3, 49) = 0.92$ , ns). For all versions, greater verbatim scores were associated with greater paraphrase output ( $r = .52$ ,  $P < .001$ ) and a trend for reduced error scores ( $P = .09$ ). SMT verbatim scores related moderately with the HVLT (e.g.,  $r = .424$ ,  $P < .002$ ). Conclusions: The SMT appears to be a valid measure for assessing immediate and delay verbal memory ability. The theoretical constructs associated with each scoring method will be discussed. Preliminary normative data by version will be provided.

**PROFESSIONAL ISSUES: CULTURAL DIVERSITY AND GENDER****C57****The relationship between culture and cognitive processes***Salazar G, Bure-Reyes A, Kiselnikov A*

Objective: The purpose of this study was to examine in detail the relationship between culture and performance on neuropsychological tests. The authors believe that the number of years spent in the host country (U.S.) have an impact on the way a person processes information. This is especially true of timed tasks, as Hispanics generally do not value time in the fashion that Americans do. It is believed that the more time in the U.S. a person spends, the better they will perform on the tasks. Method: Eighty Hispanics from a free health care clinic in Wilmington, NC were administered the Beta-III nonverbal intelligence test, the reading section of the WRAT-3 achievement test, and an abbreviated version of the AMAS-ZABB multidimensional acculturation scale. These scores were then subjected to a preliminary correlation analysis. Results: The results of the correlational analysis support the hypothesis that length of time in the U.S. has a positive effect on test performance. Conclusions: These results are preliminary and correlational. Thus, causation should not be inferred and further analysis such as factor analysis will be completed.



**C58****Cross-cultural intellectual assessment in children with TBI***Foley J, Chester S, Garcia J, Harris K, Collins M, Golden C*

**Objective:** Recent adult evidence suggests that nonverbal measures may show cultural inequalities commensurate with those found on verbal measures. The present study extends previous research by including children with/without history of TBI to the examination of culturally relevant assessment discrepancies. **Methods:** Participants included four neuropsychiatric-referred groups, with variations in race (i.e., Caucasian/African American) and history of TBI ( $N = 106$ ). The mean age for the sample was 9.90 years ( $S.D. = 3.12$ ), 78% were male, 65.1% were Caucasian, and 85.8% were right-hand-dominant. The study used two-way ANOVAs with TBI and Race as factors and VCI, POI, PSI, and FDI as dependent variables. **Results:** Results showed statistically significant differences between the Caucasian and African American groups scores on VCI [ $F(1, 102) = 9.152, P = .003$ ]. No significant differences were found between the two groups on the Perceptual Organization Index  $F(1, 102) = 3.264, P = .074$ , the Freedom from Distractibility Index  $F(1, 102) = .820, P = .376$ , or on the Processing Speed Index  $F(1, 102) = .095, P = .759$ . No interaction effects were found between race and TBI status. There were significant effects for TBI alone as well. **Conclusions:** Results from this pediatric sample differed significantly from findings with adult populations. In this population, there were only small effects due to culture in only the VCI measure. The relevance of findings, as well as the potential impact of SES, developmental differences, level of TBI severity, and cultural artifact upon findings, will be discussed.

**C59****Normative data for the d2 Test of Attention: an examination of age, gender, and cross-cultural indices***Ross RM, Dsurney J, Zillmer EA, Bates K, Altabe M*

**Objective:** The d2 Test of Attention (d2 Test; Brickenkamp & Zillmer, 1998) is an internationally used instrument to assess both selective and sustained attention, visual scanning, response inhibition, and speed of information processing in a variety of clinical settings. The d2 Test has shown to be a reliable and valid measure of attention based on German and preliminary United States normative samples. The purpose of the present study was to provide normative data obtained from a stratified sample of 225 healthy adults between 20 and 60 years of age that is representative of the U.S. population. In addition, age, gender, and cross-cultural influences were examined. **Data selection:** Adults were assessed in a standardized manner with the d2 Test. Subjects were excluded if they reported a history of attention deficit hyperactivity disorder, reading disability, or significant visual acuity problems. The sample included Caucasian, African American, Hispanic, and Asian participants. **Data synthesis:** Seven d2 Test variables were examined including: total number of items processed (TN), errors of omission (E1), errors of commission (E2), percentage of errors (E%), fluctuation rate (FR), and overall performance measures including total number of items processed—errors (TN-E), and concentration performance (CP). No significant gender differences were found among the seven variables of the d2 Test. As predicted, a decline in performance among elderly adults was evident on TN-E. **Conclusions:** The findings demonstrate that the d2 Test continues to be a

powerful assessment of selective attention with the updated norms based on a representative U.S. sample.

### **C60**

#### **Norms for Draw-A-Person (DAP) test for Chinese-speaking children**

*Hsieh S, Reed LC*

**Objective:** The Draw-A-Person (DAP) test has been used for 79 years as a non-verbal estimate of intellectual ability of children. Most norms are based on children born in the U.S. Comparisons of Caucasian, African American and Spanish speaking children have found no significant differences (Naglieri, 1988) but Asian samples are lacking. This study's objective was to develop a normative sample of Chinese children and to compare to existing U.S. norms. **Method:** Children living in northern China were studied. Graduate students from Peking University recruited from local communities and schools. Subject pool consisted of 224 Mandarin-speaking children, ranging from 6 to 12 years old; boys and girls were equally represented. Consistent with current cultural norms of the People's Republic of China, nearly all children (219) identified as right-handed and the majority (176) had no siblings. Each subject was individually tested in home or school. Instructions were translated into Mandarin. Drawings were scored and evaluated using the Naglieri DAP:Quantitative Scoring System to derive an estimate of intellectual ability. **Results:** Because of the small sample, a modified statistical approach was used to ensure consistency and reliability of norms. While these norms for Chinese children are slightly different from those observed for American children, the overall differences were small considering the standard deviations of the original scores in both data sets. **Conclusion:** While clinicians are encouraged to use the norms from this research for Chinese American children, Naglieri's DAP norms are sufficiently close to our findings so they may be substituted if needed.

### **C61**

#### **Language status, acculturation, and performance of Mexican Americans on Trail Making Test**

*Saldivar A*

**Objective:** This study examined relations among acculturation, language fluency, education, age, and abstract reasoning abilities and how these variables influenced performance on automatized language tasks of counting 1–20 and reciting the alphabet in English and Spanish. It also investigated how these same variables plus performance on counting and alphabet tasks influenced performance on the Trail Making Test (TMT), Parts A and B. **Method:** The study included 70 healthy Mexican American participants (26 Spanish-speakers, 23 Bilinguals, 21 English-speakers), ages 18–49, with 0–18 years of education. Measures used were the Neuropsychological Symptoms Checklist, Cognistat, the Bilingual Syntax Measure II, the Acculturation Rating Scale for Mexican Americans-II, Raven's Standard Progressive Matrices, The Wechsler Memory Scale-III Mental Control Subtest, and TMT Parts A and B. Data were analyzed using multiple hierarchical regressions. **Results:** The study found that language fluency was a significant contributor to reciting the alphabet and counting in Spanish while acculturation was a strong predictor of counting in Spanish, reciting the alphabet in both lan-

guages, and speed of TMT, Part B. The ability to recite the alphabet in English also significantly affected performance on TMT, Part B. Conclusion: Execution of TMT, Parts A and B, was primarily influenced by abstract reasoning abilities, language fluency, acculturation, and the ability to recite the alphabet in English.

## C62

### **Neuropsychological assessment and discrepancy between reading and education levels in Mexican Americans**

*Romero HR, Capetillo DV*

Objective: Recent research suggests that discrepancies between reading level and education level account for cross-cultural differences in neuropsychological test performance. However, investigation of such discrepancies in the Latino community is limited. The current study investigated discrepancies between education and reading levels among Mexican Americans. Investigators hypothesized that participants who passed a fourth grade level reading assessment would report completion of a primary school education. Method: Participants were 59 community dwelling Mexican American adults who participated in a Mexican American acculturation study. Participants were recruited from local restaurants and churches in Washington State. Average age of participants was 34 (S.D. = 9.12, range = 19–61). Participants were placed in two groups based on whether they reported completion of primary school (through 6th grade) or not. Thirty-six participants completed primary school and 23 did not complete primary school. The Developmental Reading Assessment (DRA) was used to measure whether participants were able to read at a fourth grade level. Results: Results indicated that reading level of those who completed primary school differed significantly from those who did not complete primary school (Fisher's exact test:  $P < .05$ ). Only 5% of the participants who did not complete primary school failed the DRA while 39% passed. Of the participants who completed primary school, 27% failed the DRA while 39% passed. Conclusions: Results demonstrate that self-reported education level is a poor estimation of reading level. The current study has implications for neuropsychological assessments which are normed only on educational level and generalizes previous findings to the Latino community.

## C63

### **Spanish and English language versions of the HVLT-R are comparable in detecting effects of HIV infection**

*Suarez P, Cherner M, Lazzareto D, Artiola L, Grant I, Heaton R*

Objective: To compare the Spanish and English language versions of the Hopkins Verbal Learning Test—Revised (HVLT-R). Performance on raw total immediate recall score was compared in HIV+ and HIV– study participants who were native speakers Spanish or English speakers and were administered the test in their native language. Method: Form 1 of the HVLT-R was translated and adapted for Spanish language administration taking care to arrive at a list of words that would be interpreted neutrally by Spanish speakers from different countries. Forty-six Spanish speaking HIV+ subjects were compared to a demographically matched group of 46 Spanish speaking healthy HIV– controls. Separately, 45 English-speaking HIV+ subjects were matched to a group of 45 English-speaking normal controls. All four groups

had comparable demographic composition. HIV+ groups were comparable with regard to current degree of immunosuppression (CD4 count). HIV effect sizes were computed for each language separately. Results: A  $2 \times 2$  ANOVA revealed a main effect of HIV status and no effect of language or significant interaction. Among Spanish speakers, the mean (S.D.) for HIV+ subjects was 24.15 (5.17) versus 26.63 (3.72) for HIV- ( $t(90) = -2.64, P = .005$ ). The effect size for Spanish speakers was moderate ( $d = 0.55$ ). Among English speakers, the mean (S.D.) for HIV+ subjects was 25.04 (5.32) versus 27.71 (4.13) for HIV-. The effect size for English speakers was also moderate (0.56) ( $t(88) = -2.65, P < .005$ ). Conclusions: This study suggests comparability of the Spanish language and English language versions of the HVLTR and helps to fill a gap in instruments available to assess Spanish speakers.

#### **C64**

##### **Metalinguistic awareness and verbal fluency in Spanish–English bilingual and Spanish monolingual children**

*Rosselli M, Matute E, Ramirez M, Elizabeth R, Jones I, Molina P, Arcila L*

The effect of learning a second language on cognitive measures has been controversial. Research has shown that bilingual children score better than monolingual children in phonological awareness tasks but worse in vocabulary and lexical decision tasks. Objective: To further analyze the effects of learning a second language on metalinguistic and verbal fluency tasks, in children aged 5–14. Method: Forty Spanish speaking monolingual and 40 Spanish–English unbalanced bilingual children matched by age and level of education were studied. Four measures of metalinguistic awareness (Phonemic Blending, Spelling, Phoneme Counting within Words, Word Counting within Sentences) and two verbal fluency tasks (Category Fluency and Phonemic Fluency) were administered. Results: ANOVAs ( $P < .05$ ) revealed a significant group effect over some but not all dependent measures. Bilingualism variables such as percentage of time using the second language had a significant effect over some verbal measures as well. Conclusion: The effect of bilingualism on cognitive tasks is significant and should be taken into account when doing a cognitive assessment.

#### **C65**

##### **Naming Pictures of Objects—DWSMB: a confrontation naming task for Hispanics**

*San Miguel-Montes LE, Margarida-Julia MT, Fournier M*

Objective: Study the discriminant and criterion validity of Naming Pictures of Objects Test (NPO)—Dean–Woodcock Sensory Motor Battery (2003) for Hispanics and its correlation with the Boston Naming Test (1983). Method: One hundred Spanish speaking adults [40 males, 61 females] were administered the NPO (21-items) and BNT (60-item) through neuropsychological evaluations (Neurology, State Medical Center, UPR). An expofacto, three independent group study, observed the records of 20 neurological patients (NI), 29 psychiatric (PI) and 55 controls (NOR), to test the discriminant capacity of NPO (ANOVA, Kruskal–Wallis Test). Correlation analysis (Spearman), compared (raw scores) NPO and BNT for 20 NI, Alzheimer's—7, epilepsy—4, Huntington's—1, MS—3, TBI—6 and brain cancer—2. Education, WMS-Logical Memory and COWAT-FAS were correlated. NPO was expected to discriminate between groups and correlate with BNT. Results: Differences

( $F=28.27$ /significance .000,  $\chi^2=36$ /significance .000) on NPO suggest controls performed better ( $m=19.31$ /S.D. = 1.51) than PI ( $M=16.67$ /S.D. = 3.10) and NI ( $m=15.25$ /S.D. = 2.38). Moderately high correlations were found: BNT [.68 (two-tailed/significance = .01)], education [.52 (two-tailed/significance = .05)], Logical WMS-1 [.60 (two-tailed/significance = .01)] and FAS [.530 (two-tailed/significance = .01)]. Conclusions: NPO is a sensitive measure of lexical retrieval for Hispanics. Correlations (BNT, WMS Logical 1st and FAS) suggest it is a reliable screening for verbal retrieval and semantic memory. Further studies with larger samples of Hispanics should be conducted.

### C66

#### **The impact of culture and language on the Boston Naming Test**

*Wen J, Boone K*

The Boston Naming Test (BNT) is a widely used visual confrontational naming test. Objective: Although researchers have translated this test into other languages (Spanish, Dutch, French, etc.), studies suggest that language and culture affect performance on the BNT (Mitrushina et al., 2005). Method: In the present study, the BNT was administered as part of a larger neuropsychological battery to 334 participants: Caucasians = 173, mean years of education = 13.59, S.D. = 2.6; Hispanics = 54, mean years of education = 10.76, S.D. = 3.3; Asians = 24, mean years of education = 14.18, S.D. = 2.7; and African Americans = 83, mean years of education = 11.82, S.D. = 2.0. Those who failed three or more cognitive “effort” tests were removed from this sample. A one-way analysis of variance (ANOVA) was performed to determine whether ethnic group differences (Caucasian, Hispanics, Asians, and African Americans) affect performance on the BNT. Results: There were significant ethnic group differences on BNT scores,  $F(3, 330) = 33.76$ ,  $P < .001$ . Overall, the Caucasian group obtained the highest score (mean = 52.76, S.D. = 6.6) while Hispanics (mean = 43.48, S.D. = 9.2), African Americans (mean = 43.51, S.D. = 10.2), and Asians (mean = 44.58, S.D. = 8.9) obtained lower scores. Post hoc analysis (Scheffe) found that Caucasians outperformed all three ethnic groups,  $P < .001$ . However, inter-ethnic group differences were statistically significant. Conclusions: At least an 8-point spread should be taken into account when evaluating ethnic minorities. Recommended cut-off scores are provided (corrected for age and education).

### C67

#### **Gender differences in executive functions following traumatic brain injury**

*Niemeier JP, Marwitz J, Leshner K, Walker WC, Bushnik T*

Objectives: The main objective of this study was to look at the effect of gender on presentation of executive dysfunction following traumatic brain injury (TBI). A secondary objective was to identify variables that might impact the course and degree of recovery. Method: This was a multicenter, cohort study which utilized participants in inpatient brain injury rehabilitation units of 17 centers around the US designated by NIDRR as Model Systems of TBI. The study cohort included 1457 individuals, ages 18–49, receiving rehabilitation care, who completed the Wisconsin Card Sort Test (WCST) during their inpatient stay. Approximately 75% of the participants were male, with 67% Caucasian and 33% of minority background. The majority of the sample (71%) had at least a high school education. The Categories Completed Score of the

WCST was selected as the primary measure. In addition, the authors looked at such variables as level of education, ethnicity, and etiology of injury. Results: Female subjects performed significantly better on Categories Completed than male subjects as shown by analysis of variance [females = 4.05 (confidence interval 3.82–4.28), males = 3.61 (confidence interval 3.48–3.75,  $P = .001$ )]. An additional  $2 \times 4$  ANOVA revealed that females outperformed males, regardless of educational level ( $P = .001$ ). Conclusion: Findings indicate superior WCST performance by female participants during acute rehabilitation after moderate to severe TBI. The poster will discuss the implications of these findings and make recommendations for further research.

### C68

#### **Gender differences in recovery trajectories following sports-related concussion in collegiate athletes**

*Kaminaris CI, Schatz P*

Objective: The purpose of this study was to identify gender differences in post-concussion recovery trajectories. Methods: Seventy-seven collegiate athletes from five Northeastern Universities underwent baseline testing using ImPACT, and completed post-concussion testing within 48 h of sustaining a concussion, and 3–5 days, 6–10 days, and greater than 10 days post-concussion. Results: One-way ANOVAs revealed significant post-concussive effects on the ImPACT composite scores of verbal memory, visual memory, motor speed, reaction time, but no significant effect on impulse control. Gender differences up to 48-h post-concussion indicated that male athletes performed significantly worse in motor speed and better in reaction time than female athletes. At 6–10 days post-concussion, male athletes showed improved functioning (e.g., return to baseline) in verbal memory and visual memory, as compared to female athletes; both genders showed similar recovery trajectories in reaction time, with return to baseline seen 6–10 days post-concussion. Conclusions: These findings support the importance of recognizing different recovery curves for male and female athletes. As concussion appears to affect males and females differently, with respect to the type of post-concussion cognitive deficits experienced, there needs to be acknowledgment of gender differences that exist along post-concussion testing continuums. Tracking concussed athletes' recovery trajectories will assist clinicians and sports medicine personnel in making appropriate return-to-play decisions, and may lead to better treatment options and comprehensive care following injury.

### C69

#### **Gender differences in coping, social support, and depression in multiple sclerosis**

*Polen DM, Arnett PA*

Objective: Individuals with multiple sclerosis (MS) consistently show high rates of depression. Two potentially modifiable psychosocial attributes—coping style and social support—have been repeatedly linked to depression. The present study examined gender discrepancies between the comparative ability of active coping (AcCOPE), avoidant coping (AvCOPE), number of social supports (SSQ-N), and satisfaction with social supports (SSQ-S) to predict depression in MS. Methods: Coping was assessed with the COPE, social support was assessed with the Social Support Questionnaire (SSQ), and depression was assessed with the combined Chicago Multiscale Depression Inventory (CMDI) Mood and Evaluative scales, in

101 (84 women, 17 men) definite MS patients. Results: Correlational analyses revealed that for women, the CMDI correlated significantly with AcCOPE ( $r = -.34, P < .005$ ), AvCOPE ( $r = .24, P < .05$ ), SSQ-N ( $r = -.42, P = .000$ ), and SSQ-S ( $r = -.35, P < .005$ ), while for men, the CMDI did not correlate significantly with any of the psychosocial variables. Stepwise linear regression indicated that for women (after removing variance for age, sex, and intelligence at Step 1), SSQ-N and AcCOPE predicted significant variance in the CMDI ( $r^2 = .18, P = .000$  and  $r^2 = .08, P < .01$ , respectively). Conclusion: Our results suggest that social support and coping are more related to depression for women with MS, than for men. Furthermore, a measure of quantity, more than quality, of social support may be a more useful measure of social support for this population, though both social support measures were significantly associated with depression.

### C70

#### **Gender differences in verbal and visual memory on the WMS-III in an adult neuropsychiatric population**

*Durkin M, Fogle M, Foley J, Briker L, Figueroa M, Golden C*

Objective: Research has found that men and women differ in their memory abilities. Women have been found to have greater abilities in memory than men on the RAVLT and the CVLTt. Some research on visual memory has found that males perform better on visual tasks of memory, whereas others suggest that women perform better. The present study examined whether, and to what extent, differences existed between males and females on both the Visual Immediate and Auditory Immediate Indexes of the WMS-III. Method: The participants included 282 adults with an average age of 34.13 (S.D. = 13.71) and average education was 13.59 (S.D. = 2.70). The sample was 45.7% male and predominately right-handed (85.5%). Seventy percent of the sample was Caucasian. Subjects were given an extended neuropsychological battery, which included the WMS-III and other measures. Results: Two one-way ANOVAs were conducted to compare male and female performances on the Visual Immediate and Auditory Immediate memory indexes on the WMS-III. No significant differences ( $P < .05$ ) were found when comparing the genders. Conclusions: The results of this study suggest that no differences major differences exist between males and females in visual and verbal memory abilities. These results contradict what has been found for verbal memory in past research. These results may be specific to the WMS-III. The findings are consistent with the conclusion by the test authors that there was no need for separate gender norms.

### C71

#### **Do current BNT norms generalize to older African Americans from the rural south?**

*Wymer JH, Wagner MT, Bachman D, Mintzer JE*

Objective: To determine the generalizability of the Boston Naming Test (BNT) norms for a sample of African American older adults living in rural South Carolina. Method: Twenty-seven participants were recruited from six sites across South Carolina. Participants are volunteers in a 5-year longitudinal study through the Alzheimer's Research and Clinical Programs consortium at MUSC. Recruitment occurred at hospitals, day programs, outpatient clinics, research centers, and a VA. Participants are 100% African American, 63% female, 37% male. Mean age

is 76 years, mean education is 12 years, and mean IQ is 81. Participants underwent a 2–4 h comprehensive neuropsychological battery. Participants were evaluated by local neurologists and a centralized neuropsychology fellow. Biweekly, diagnostic consensus videoconferences were chaired by a board certified neurologist and included neurologists, neuropsychologists, psychiatrists, and nurses from the six participating sites. Diagnoses were based on NINCDS-ADRDA and Peterson's MCI criteria. Results: Controls (Spontaneous Response [SR] raw = 45/60) and MCI (SR raw = 45/60) participants scored significantly lower than published age norms (SR raw = 52–55/60) on all BNT indices ( $P < .01$ ). Controls and MCI participants were not significantly different on any BNT indices and both groups scored significantly higher than the dementia group (SR raw = 13/60). Conclusion: In using the BNT to identify language impairments, caution is advised due to the high false positive rate in the populations examined. Further study of cognitively intact African Americans from rural southern regions is warranted in order to provide accurate norms.

### C72

#### **Accuracy of WTAR predictions for older African Americans from the rural south**

*Wymer JH, Wagner MT, Bachman D, Mintzer JE*

Objective: To determine the predictive validity of the Wechsler Test of Adult Reading (WTAR) for African American older adults living in rural South Carolina. Method: Twenty-seven participants were recruited from six sites across South Carolina. Participants are volunteers in a 5-year longitudinal study through the Alzheimer's Research and Clinical Programs consortium at MUSC. Recruitment occurred at hospitals, day programs, outpatient clinics, research centers, and a VA. Participants are 100% African American, 63% female, 37% male. Mean age is 75 years, mean education is 12 years, and mean IQ is 81. Participants underwent a 2–4 h comprehensive neuropsychological battery. Participants were evaluated by local neurologists and a centralized neuropsychology fellow. Biweekly, diagnostic consensus videoconferences were chaired by a board certified neurologist and including neurologists, neuropsychologists, psychiatrists, and nurses from the six participating sites. Diagnoses were based on NINCDS-ADRDA and Peterson's MCI criteria. Results: A one-way ANOVA and post hoc analysis identified no significant differences between the control (FSIQ = 91) and MCI (FSIQ = 86) groups, but both groups scored significantly higher than the dementia group ( $P < .01$ ). Conclusion: As cognitive decline progresses beyond MCI, the WTAR becomes less useful as a measure of premorbid IQ. In fact, there is a trend for WTAR scores to decline at a similar rate to IQ score decline as a function of cognitive impairment. Use of demographic information such as educational attainment and occupation are likely to be better predictors of premorbid functioning in a dementing population.

### C73

#### **The effects of race on the revised and old Heaton norms for the HRNB**

*Mohrland M, Piekarsky L, Vargas E, Pollack J, Golden C*

Objective: This study explored the relationship between race (Caucasians and African Americans) and HRNB scoring systems (old Heaton norms and revised Heaton norms). The old Heaton norms did not take race into account, whereas the revised Heaton norms do.



**Method:** The sample included 197 individuals, 82.7% Caucasian, 15.7% African American, and 45.2% male. These individuals included psychiatric diagnoses (24.9%), neurological disorders (37.1%), comorbid diagnoses (22.3%), and no diagnoses (14.2%). Performance on selections of the HRNB was obtained and scored according to both the old norms and re-scored with the new norms. HRNB subtests included Trails, Category, TPT, and Finger Tapping. **Results:** Mixed ANOVAs were run on these tests with post hoc *t*-tests on significant results of the ANOVAs at the  $P < .05$  level. There were no significant main effects for race, but there were significant interaction effects for every variable except Finger Tapping and TPT—Dominant Hand. **Conclusions:** The results indicated that the new norms do a good job of making scores in the two groups more comparable. *t*-tests confirmed that for most variables the Caucasian sample generated lower *T*-scores with the revised norms. The African American sample generated higher *T*-scores when using the revised norms. These results indicate the old Heaton norms overestimated HRNB performance for the Caucasians, and underestimated performance for the African Americans. Additional work is necessary to see if the new norms do a better job in differentiating brain injured from normal subjects in each group.

#### **Poster Session D**

#### **NEUROPSYCHOLOGICAL DOMAINS PART II: ATTENTION**

##### **D1**

##### **Relation between Test of Variables of Attention (TOVA) and Children's Memory Scale (CMS)**

*Riccio CA, Garland BH, Cohen MJ*

**Objective:** There is considerable overlap in the constructs of attention and memory. Depending on the task, it may be difficult to discern the extent to which attentional problems and/or memory deficits yield impaired performance. The objective of this study was to examine the relation between a laboratory measure of attention to various components of memory and learning, including attention/concentration as measured by the Children's Memory Scale (CMS). **Method:** Subjects were consecutive referrals to an out-patient facility who were administered both the Test of Variables of Attention (TOVA) and the CMS. The 105 children had a mean age of 10.20 (S.D. = 2.76). The sample was predominantly male (75.23%) and was White (82.86%). Referrals were for learning or behavioral problems; 79.05% met criteria for ADHD and 50.48% met criteria for some type of learning disability. **Results:** The most frequent significant correlations ( $P < .05$ ) were found between the Omissions score on the TOVA with Learning ( $r = .36$ ), Attention/Concentration ( $r = .30$ ), Visual Immediate ( $r = .21$ ), General Memory Index ( $r = .21$ ) and Verbal Delayed ( $r = .20$ ) from the CMS. TOVA variability was significantly correlated with Verbal Delayed ( $r = .33$ ), General Memory Index ( $r = .26$ ), Verbal Immediate ( $r = .23$ ), and Learning ( $r = .20$ ). TOVA Reaction Time correlated significantly only with Verbal Delayed ( $r = .27$ ) and Verbal Immediate ( $r = .20$ ). TOVA Commission Errors did not correlate significantly with any CMS variables. Although significant, the coefficients indicate that the CMS and TOVA are measuring differing constructs or similar constructs, but in different ways.

**D2****A consideration of the ecological validity of the NEPSY and parental ratings of attention***Wheeler A, Goldberg K, Marczyk G*

**Objective:** Research examining the relationship between neuropsychological test findings and parent ratings of attention is important because it may aid in the assessment of attentional disorders. An exploratory study was examined to determine the relationship between parent ratings of attention using the Brown Attention Deficit Disorder Scales (Brown), the Achenbach Child Behavior Checklist (CBCL) and performance on measures of attention on the NEPSY. **Method:** Participants were 146 (101 male, 45 female) children, mean age 10.08 years, who were administered a neuropsychological battery during the course of an outpatient assessment in a private practice setting. Performance NEPSY subtests Knock and Tap, Auditory Attention and Response Set, Statue, and Visual Attention were compared to parent ratings on the CBCL (Attention Problems) and Brown ADD Scales (Inattention and Total score). **Results:** Performance on the NEPSY subtests Knock and Tap, and Auditory Attention and Response Set were significantly correlated with parental ratings of attention. Knock and Tap correlated with the Brown ADD Scales Inattention ( $r = -.427, P < .05$ ), and Total Score ( $r = -.511, P < .01$ ) as well as the Attention Problems scale of the CBCL ( $r = -.297, P < .01$ ) Auditory Attention and Response Set correlated with the Attention Problems scale for the CBCL ( $r = -.305, P < .01$ ). **Conclusions:** The Knock and Tap and Auditory Attention and Response Set subtests of the NEPSY demonstrated significant correlations with parental ratings of attention. These findings suggest at least limited ecological validity of the NEPSY in examining attentional disorders.

**NEUROPSYCHOLOGICAL DOMAINS PART II: EXECUTIVE FUNCTIONS****D3****The Tower of London predicts goal directed behaviors of Executive Function Performance Test of everyday tasks***Voelbel GT, Gaudino EA, Moore NB, DeLuca J*

**Objective:** The Executive Function Performance Test (EFPT) is an assessment measure of completing six everyday tasks. Each task is rated on five domains of functioning: initiation, organization, performing steps, task completion, and judgment and safety. Although the EFPT is purported to assess cognitive functions of independent living, it is unclear whether the domains of the EFPT are related to a problem solving task. This study examined the validity of the EFPT domains to performance on the Tower of London (TOL) test. **Method:** Seventy-one individuals with multiple sclerosis (MS) (79% female) and 38 healthy controls (HC) (68% female) were administered the EFPT and the TOL as part of a neuropsychological battery. The MS participants were at least one-month post-exacerbation. **Results:** Compared to the HC group, the MS group performed significantly worse on the EFPT domains of organization ( $P < .05$ ), performing steps ( $P < .05$ ), completion of task ( $P < .05$ ), and total score across domains ( $P < .05$ ). The MS group required significantly more additional moves ( $P < .05$ ), time ( $P < .001$ ), and more rules violations ( $P < .05$ ) than the HC group on the TOL. After controlling for group differences, domains of organization, performing steps, judgment and safety, and EFPT total score were significantly predicted by the TOL. **Conclusions:** The results of

this study provide evidence that performance measures of the TOL is related to the amount of cuing needed to organize, sequence, and complete everyday tasks. Furthermore, this study provides evidence that the EFPT taps into similar goal directed processes that are measured by the TOL.

#### **D4**

##### **Sensitivity of the Halstead Category Test factor scores to severity of brain damage**

*Duke LA, Allen DN, Goldstein G*

**Objective:** The current study examined the validity of Halstead Category Test (HCT) factor scores by examining their differential sensitivity to brain damage. The HCT is composed of three factors. The first, made up of subtests 1 and 2, reflects basic counting abilities. The second is comprised of subtest 3, 4, and 7 and reflects Spatial Positional Reasoning, while the third measures Proportional Reasoning and is composed of subtests 5 and 6. **Method:** Participants consisted of 178 veterans with heterogeneous forms of brain damage (age=43.4 years, S.D.=11.7; education=11.3 years, S.D.=2.4; Full Scale IQ=90.6, S.D.=14.7). All were administered the original version of the HCT. They were divided into three groups (mild, moderate, severe) based on severity of brain damage using the Halstead Impairment Index, which was pro-rated to exclude the HCT total error score. **Results:** MANOVA indicated a significant group by factor interaction effect. Post hoc comparisons indicated that for all groups, error scores for factor three were significantly higher than for factor two, which were significantly higher than factor one. **Conclusion:** Results provide additional support for the validity of the HCT factors by demonstrating their differential sensitivity to brain damage. Factor three, representing Proportional Reasoning, is the most sensitive to brain damage, followed by factor two, with factor one being insensitive to brain damage.

#### **D5**

##### **Cognitive factors influencing Wisconsin Card Sorting Test and Category Test performance**

*Lloyd H, Goldberg M*

**Objective:** Two of the most commonly used measures of nonverbal problem solving ability are the Wisconsin Card Sorting Test (WCST) and the Category Test (CT). Though presumed to measure similar constructs the WCST and CT are not interchangeable (Lezak et al., 2004). The aim of this study was to examine underlying cognitive factors that might differentiate WCST and CT performance in a clinical population. **Method:** Subjects were 50 individuals referred for outpatient neuropsychological assessment primarily diagnosed with traumatic or non-traumatic brain injury. Separate stepwise linear regression analyses were conducted, using WCST and CT raw error scores as dependent variables. Predictor variables included tests indexing working memory, immediate verbal and visual memory, visuospatial processing, and executive functioning. **Results:** Different regression equations were generated for the WCST and CT with significantly different amounts of variance explained. For the WCST only Block Design significantly entered to regression equation accounting for 19.2% of the variance ( $P < .01$ ). By contrast, significantly more variance, 58.5% ( $P < .01$ ), in CT performance was

explained by three variables (Block Design, WMS-III Visual Immediate Index, and Trails B). Conclusions: Despite the shared influence of spatial reasoning abilities, reflected by Block Design, these results point to different factors underlying performance on the WCST and CT in this clinical sample. An impressive amount of variance in CT performance was accounted for by three variables, while a considerable amount of variance in WCST performance remained unexplained. These findings have implications for interpretation of performance on these tests.

## D6

### **Examining the interhemispheric transfer hypothesis of switching (ITS) using cognitive versus emotional tasks**

*Watson W, Suchy Y, Liddell J*

Objective: Previous studies have suggested that switching to a new activity requires both inhibition (subserved by the right frontal lobe) and initiation (subserved by the left frontal lobe). As a result, switching from a right-hemisphere activity (RHA) to a left-hemisphere activity (LHA) has been found to be faster than switching in the opposite direction, presumably due to lesser demands on interhemispheric transfer (ITS; Suchy et al., 2003, 2004). The purpose of this study was to (1) replicate prior findings, and (2) examine whether emotional stimuli yield the same results as cognitive stimuli. Method: Three switching tasks were administered to a group of 95 right handed college students aged 18–29. For each of the three tasks, participants were required to switch between RHA and LHA: (1) visual–spatial and word classifications, (2) local and global classifications, as well as spatial and numeric classifications, and (3) emotionally charged approach and withdrawal images. Administration of one emotional and two cognitive tasks allowed examination of the ITS effect across a variety of stimulus types. Results: Repeated measures analysis of variance using switch direction (right to left vs. left to right) and task as within-subjects factors showed a significant interaction between Switch Direction and Task,  $F(1, 94) = 16.32, P < .001$ . Follow-up analyses showed that for cognitive tasks,  $F(1, 94) = 22.64, P < .001$ , right to left switches were faster than left to right switches. The emotional tasks showed an opposite effect of switch direction,  $F(1, 94) = 15.07, P < .001$ , with left to right switches being faster. Conclusions: The results replicate prior findings and provide support for the Interhemispheric Transfer Hypothesis of Switching (ITS) for cognitive tasks. However, the results do not hold for emotional stimuli. Future research should examine the possible underlying mechanisms that might be responsible for different results for cognitive and emotional tasks.

## D7

### **Support for frontal deactivation and posterior activation to rotary stress**

*Carmona J, Harrison DW, Mollet GA, Harrison KC*

Objective: Research has supported a regulatory role of the cerebral frontal regions over posterior regions during autonomic reactivity to stress. To date, no systematic investigation has dealt with the role of the frontal regions in motion sickness as a type of stress. Motion sickness due to whole-body rotation has been proposed to involve multiple brain areas including the vestibular nuclei, reticular systems, and temporal parietal regions. Despite prior findings

in aviation and physiological literature of reduced frontal activation to motion sickness after rotary stress, the role of the frontal regions in regulation of motion sickness is still debated. A case study using topographical brain mapping and QEEG was used to test the hypothesis of concurrent decreased frontal activation and increased posterior regions during rotary stress. Method: A 50-year-old healthy female volunteer was subjected to one trial of 30 horizontal angular rotations in the clockwise direction at a rate of approximately 120°/s. Onset and cessation of rotation occurred at the same point. Verbal self-reports of motion sickness were taken subsequent to rotation. Two minute trials of QEEG recordings occurred pre- and post-rotary stress. Results: Clockwise rotation resulted in bilateral magnitude increases in frontal region delta and posterior region (temporal, occipital, parietal) beta. Conclusions: The case study supports the application of the anterior–posterior relationship to motion sickness. Specifically, it is proposed that the frontal lobes are involved in inhibition and awareness of impending rotary stress. When overstressed, frontal lobe resources become depleted resulting in dysregulation of interdependent posterior activating systems.

## D8

### **Test anxiety in relation to performance on measures of attention and executive functions**

*Gass CS, Howell S, Ardern H, Dowd A, MacKenzie K, Levy S*

Objective: Evaluate the relationship between test anxiety and performance on widely used tests of attention and executive functions in a neuropsychological referral sample. Method: This study used a sample of 646 neuropsychological referrals (predominantly male outpatients) who were examined in a VA Medical Center. Most referrals were made by the Primary Care, Neurology, and Psychiatry Services and constitute a diagnostically diverse group. After examination, patients completed the Test Anxiety Profile (TAP; Oetting & Deffenbacher, 1980), which assesses anxiety-related feelings, physiological reactions and cognitions that occurred during testing. Subsamples were formed based on level of test anxiety: Low (TAP = 0–39,  $n = 202$ ), Moderate (TAP = 40–47,  $n = 223$ ), and High (TAP = 48–83,  $n = 221$ ). One-way ANOVAs assessed differences in age- and education-corrected scores on: Digit Span, Rhythm, Speech Perception (SPT), Corsi Block-Tapping, Category Test, Trail Making, Part B (TMT-B), COWAT, Design Fluency, and Mazes. Results: Significant intergroup differences emerged on the Category Test, SPT, TMT-B, COWAT ( $P_s < .001$ ), and on Mazes, Corsi, and Rhythm ( $P_s < .05$ ). Post hoc analyses revealed that on each test, the mean performance was the poorest in the high anxiety group. Moderate anxiety was not an enhancement. Across these tests, the average performance difference between the high and low anxiety groups approximated one-half standard deviation. Conclusion: A small but significant relationship exists between test anxiety and performance on measures of attention and executive functioning. Although these findings are consistent with previous studies showing an adverse impact of high test anxiety on performance in academic settings, an analysis of causal impact requires additional investigation.

**NEUROPSYCHOLOGICAL DOMAINS PART II: MEMORY AND AMNESIA****D9****A multiple choice test for assessing logical memory recognition on the Wechsler Memory Scale-III***Gass CS, Howell S, Ardern H, Dowd A*

Objective: Development of an improved measure of Logical Memory recognition, including normative data with age and education corrections. Method: A 20-item, five-response option multiple choice test (LM-REC) was designed as an alternative to the 30-item true–false procedure on the WMS-III. Neuropsychological referrals in a VA Medical Center ( $N = 167$ , mean age = 62 years and education = 13 years) completed this test following their 30-min delayed free recall of the Logical Memory stories. Referrals were made mostly by the Primary Care, Neurology, and Psychiatry Services and constituted a diagnostically diverse group of out-patients. The True–False test was given immediately after LM-REC. Regression procedures were employed to establish appropriate age and education corrections as well as scaled scores for estimating degree of impairment. Results: Performance on LM-REC was strongly related to delayed free recall performance  $r = .75$ ,  $P < .001$ , accounting for 57% of the variance. In contrast, the true–false test yielded a correlation coefficient of  $r = .65$  ( $P < .01$ ), accounting for 43% of the variance in free recall scores. Regression procedures revealed normal-range raw scores (17–20), borderline (14–16), mild (11–13), moderate (8–10), and severe impairment (below 8). Age and education corrections were established. Conclusion: A new procedure is presented which reduces the error variance associated with guessing and provides a correction for age and educational background. This can assist in differentiating between storage and retrieval deficits on the Logical Memory subtest of the WMS-III.

**D10****Activity of left inferior frontal gyrus related to repetition priming: LORETA imaging with 128-channel EEG and individual MRI***Kim Y, Kwon J, Kim M*

Objective: We investigated the brain substrate of word repetition effects on the implicit memory task using low-resolution electromagnetic tomography (LORETA) with high-density 128 channel EEG and individual MRI as a realistic head model. Method: Thirteen right-handed, healthy subjects performed a word/nonword discrimination task, in which the words and non-words were presented visually, and some of the words appeared twice with a lag of one or five items. Results: All of the subjects exhibited word repetition effects with respect to the behavioral data, in which a faster reaction time was observed to the repeated word (old word) than to the first presentation of the word (new word). The old words elicited more positive-going potentials than the new words, beginning at 200 ms and lasting until 500 ms post-stimulus. We conducted source reconstruction using LORETA at a latency of 400 ms with the peak mean global field potentials and used statistical parametric mapping for the statistical analysis. We found that the source elicited by the old words exhibited a statistically significant current density reduction in the left inferior frontal gyrus ( $P < .05$ ). Conclusion: This is the first study to investigate the generators of word repetition effects using voxel-

by-voxel statistical mapping of the current density with individual MRI and high-density EEG.

### **D11**

#### **Equivalent current dipole of word repetition effects in patients with obsessive–compulsive disorder**

*Kim Y, Lee K, Kim M, Kwon J*

**Objective:** We investigated cortical source localization of word repetition effects in patients with obsessive–compulsive disorder (OCD) by employing the equivalent current dipole (ECD) model with high-density 128 channel EEG and individual MRI as a realistic head model. **Method:** OCD patients ( $n = 12$ ) and age-, sex-, and handedness-matched normal controls performed a word/nonword discrimination task, in which the words and nonwords were presented visually, and some of the words appeared twice with a lag of one or five items. **Results:** During the 200–500 ms period post-stimulus, control group showed more positivity in the ERPs elicited by old words than those elicited by the new words, while OCD group did not. Furthermore, OCD patients showed prolonged response times to the old words compared to the controls. We calculated the location and power of ECD sources at about 400 ms post-stimulus with the peak mean global field potentials. For both groups, source of word repetition effects was determined to be located in the inferior frontal gyrus. OCD patients showed significantly altered hemispheric asymmetry of ECD power during the processing of new words ( $\chi^2$  test = 4.81,  $P < .05$ ). **Conclusion:** These results indicate that OCD patients have the encoding deficits of word processing, especially in the left hemisphere.

### **D12**

#### **The relation of cumulative inorganic lead exposure and visual–perceptual organization, encoding and retrieval**

*Walsh KS, Vaughan CG, Lindgren KN, Bleecker ML*

**Objective:** To determine the effect of chronic occupational inorganic lead exposure on performance on a neuropsychological measure of visual encoding and retrieval. **Method:** Four hundred and sixty-one Canadian male lead smelter workers age 43.2 (10.8) years, who were employed 17.6 (7.4) years, with time weighted average (TWA) blood lead levels of 40.4 (12.2)  $\mu\text{g}/\text{dl}$  were administered the Rey Complex Figure (RCF) Copy and Delayed Recall as part of a larger neuropsychological battery. TWA were developed from B–Pb records obtained through regular medical monitoring. Relations between occupational lead exposure and reaction time, verbal memory, and visuomotor functioning have been demonstrated. The impact of chronic lead exposure on encoding and retrieval of visually mediated stimuli has not been adequately addressed. It was hypothesized that chronic lead exposure would be related to disruption in visual–perceptual integration, encoding and retrieval. Alpha was set at .05 for all analyses. Multiple regression analysis (MRA) was utilized to analyze the relation between TWA and visual–motor integration (Rey Complex Figure Copy), and TWA and visual memory (Rey Complex Figure Delayed Recall), controlling for age and reading level (Wide Range Achievement Test—Revised), a more accurate estimate of education. **Results:** After adjusting for age and reading level, TWA significantly contributed to the explanation of variance when mod-

eled on the RCF Copy ( $\Delta R^2 = 0.4\%$ ,  $P = .05$ ); and RCF Delayed Recall ( $\Delta R^2 = 2\%$ ,  $P = .001$ ). Conclusions: There was a significant relation between chronic occupational lead exposure and performance on visual–motor and visual memory tasks.

### D13

#### **Activation of the frontal cortex during words memory learning: a near-infrared spectroscopy study**

*Matsui M, Tanaka K, Yonezawa M, Kurachi M*

Objective: A near-infrared spectroscopy (NIRS) is an optical method to determine oxy- and deoxy-generated hemoglobin concentration changes in the human cerebral cortex. This method has been proven to reflect cortical activation related to motor activity, mental tasks, and auditory stimulation, but not enough memory. The purpose of this study was to examine the hemodynamic response of the prefrontal area during words memory learning using NIRS. Methods: Twenty-three subjects (9 males and 14 females aged 20–26 years; mean 22.6 years; S.D. 3.6) participated in the present study. The subjects had estimated IQ of 100.6 (S.D. = 14.5), as assessed by the Japanese Adult Reading Test (JART). All subjects were right-handed. Hemodynamic response in the frontal cortex was measured using a near-infrared spectroscopy system. The words memory learning task was composed of 16 nouns. In this task, four exemplars from each of four categories were constructed so that related items never appeared consecutively. Results: During the words memory learning task, oxygenated hemoglobin concentrations increased and deoxygenated hemoglobin concentrations decreased. There were difference in changes of oxygenated hemoglobin depend on memory process (encoding or retrieval). Moreover, activation of prefrontal area decreased following instruction of effective strategy. Conclusions: Usefulness of NIRS was suggested as method to measure function of prefrontal area. This method allows us to observe memory process successively. It suggests that giving instruction of strategy makes the task easy and brings inhibition of frontal function in healthy people.

### D14

#### **Pattern of memory deficits in adult HIV/AIDS patients on the WMS-III**

*Allen S, Burns W, Foley J, Garcia J, Sellers A*

Objective: Research has inconsistently identified patterns of memory deficits in HIV/AIDS patients. This study will compare an HIV+ male sample to HIV– male controls using WMS-III indices. Method: Participants were recruited from an HIV community agency and from local hospitals/libraries in South Florida and Boston. Twenty-two HIV+ males (age  $M = 48$ , S.D. = 8.3, education  $M = 13.5$ , S.D. = 2.4), and 22 normal male controls (age  $M = 42.5$ , S.D. = 13.3, education  $M = 16.1$ , S.D. = 2.3) were included. Participants were administered the WMS-III to obtain eight index scores, and WAIS-III subtests Matrix Reasoning and Vocabulary to obtain premorbid PIQ and VIQ estimates. Data were analyzed using multiple independent  $t$ -tests. In cases where homogeneity of variance was not found, corrected  $t$  statistics were calculated. Results: A priori alpha was set to .006 using Bonferroni family-wise adjustment. Analyses revealed significantly lower scores ( $P < .006$ ) in the HIV+ group on all WMS-III indices except Auditory Delayed Recognition. The HIV+ sample was also significantly lower



on several demographic variables, including education ( $P = .001$ ), an estimate of premorbid FSIQ ( $P = .003$ ), and estimates of Verbal IQ ( $P = .004$ ) and Performance IQ ( $P = .001$ ), each of which correlated significantly with WMS-III performance. When demographic variables were controlled, post hoc ANCOVAs found no significant differences between the HIV+ and controls ( $P > .006$ ). Conclusions: Because of interactions between demographic variables and HIV status, attributions of memory impairment become difficult. However, findings raise new questions about memory decline in HIV.

## NEUROPSYCHOLOGICAL DOMAINS PART II: OTHER

### D15

#### **The MACK Complex Figure: replication study and scoring system**

*Kennerly R, Covert J*

**Objective:** Compare the REY and MACK Complex Figures to replicate Frazier et al., findings that the MACK can be used interchangeably for the REY on both the Copy and Recall tasks. **Method:** Five hundred and twenty-five undergraduate students at the University of North Texas were randomly assigned to an initial administration of the REY with a follow-up administration of the REY five weeks later, or initial administration of the REY with follow-up administration of the MACK five weeks later. Since no scoring system is available for the MACK a scoring system developed by one of the authors and included in the paper. **Results:** For the Copy Task, no clinically or statistically significant difference,  $t(283) = .105$ ,  $P = .916$  (two-tailed) was found between the mean scores for the REY ( $M = 34.6$ ,  $S.D. = 4.1$ ) and the MACK ( $M = 34.5$ ,  $S.D. = 2.2$ ). Likewise for the Delayed Recall Task there was no clinical or statistically significant difference,  $t(278) = -.991$ ,  $P = .323$  (two-tailed) in mean scores between the REY Figure ( $M = 23.6$ ,  $S.D. = 7.8$ ) and MACK Figure ( $M = 24.2$ ,  $S.D. = 7.6$ ). **Conclusion:** Results support the earlier report of Frazier et al., and show that the MACK and REY are comparable figures on both the Copy and the Delayed Recall Tasks.

### D16

#### **Classification of individuals with anxiety disorders based upon sensory–motor skills**

*Stage KA, Davis AS, Finch WH, Trinkle JM, Dean RS*

**Objective:** Recent research has indicated an increased link between psychiatric disorders, such as anxiety and depression, and impaired neurological functioning. For example, anxiety has been linked to abnormalities in areas of the limbic system, specifically the amygdala and hippocampus. However, there is a paucity of research regarding the cortical and subcortical sensory and motor functioning of patients with anxiety disorders. Sensory and motor functions are a crucial part of the neuropsychological examination, as even one error may be pathogenic of dysfunction. **Method:** This study examined the sensory–motor performance of 146 individuals diagnosed with an anxiety disorder (mean age = 48.16 years,  $S.D. = 21.1$  years) and 950 normal individuals (mean age = 29.7 years,  $S.D. = 21.3$  years). All participants were administered the Dean–Woodcock Sensory Motor Battery (DWSMB). **Results:** Classification and Regression Tree (CART) analysis is a statistical method of classification that uses a series of decision steps to develop clinically useful separation of groups. A 10-node decision tree was

gauged to be optimal. The primary separator variable was Gait and Station, with secondary separation variables of Cross Construction and Object Identification. The resubstitution classification rate was 90%. Conclusions: Sensory and motor variables were able to differentiate individuals with anxiety disorders from normal individuals using a clinically significant hierarchical decision tree. The primary separator variable was a subcortical motor task. This poster will discuss the findings and implications for practitioners and future researcher.

#### **D17**

##### **Cognitive impairment and decision-making capacity**

*Sarazin F, Walker L, Mendella P*

**Objective:** Cognitive impairment poses a threat to decision-making capacity. This study aimed at delineating the predictive value of cognitive screening examination (MMSE) in determining decision-making capacity. **Method:** A retrospective single cohort chart review of medical/surgical inpatients admitted to a tertiary care facility and referred for neuropsychological assessment of capacity in discharge planning decision-making yielded 58 evaluable cases where cognitive status was documented using MMSE. **Results:** Capable (C = 26) and Incapable (I = 25) patients were distributed evenly, with C patients achieving significantly higher MMSE scores than I patients ( $25.6 \pm 3.0$ ,  $17.1 \pm 7.1$ ;  $P < .0001$ ). Following common clinical practice, a cut-off score of 23 was used for allocation to high and low cognitive status groups. Nineteen percent of C patients fell in the low MMSE group and 20% of I patients in the high MMSE group. Mean cognitive scores of the C and I patients were comparable in the high MMSE group ( $C = 26.7 \pm 2.1$ ,  $I = 26.4 \pm 2.2$ ,  $P = .7658$ ) but significantly different in the low MMSE group ( $C = 21.0 \pm 1.0$ ,  $I = 14.7 \pm 5.9$ ,  $P = .289$ ). **Conclusion:** Determination of incapacity based on cognitive screening examination alone could produce a significant error rate (up to 20%) independently of whether patients have relatively intact or documented impairment of higher mental functions. These findings argue in favor of assessing capacity on the basis of understanding and appreciating criteria set out by provincial legislation in Ontario rather than by cognitive assessment alone.

#### **D18**

##### **WISC-III and Children's Memory Scale (CMS): replication of combined 5-factor structure**

*Riccio CA, Siekierski B, Cohen MJ*

**Objective:** There is some question of the benefits of administering both types of measures as a result. With the linked standardization sample, confirmatory factor analysis indicated that a five factor model had the best fit when subtests for both the WISC-III and CMS were used. The purpose of this study was to determine if this five factor solution would be acceptable with a clinical sample of children. **Method:** Subjects were 218 consecutive referrals to an out-patient facility who were administered both the WISC-III and the CMS. The children had a mean age of 10.44 (S.D. = 2.66). The sample was predominantly male (71.56%) and White (80.73%). Referrals were generally for learning or behavioral problems; 60.55% met criteria for ADHD and 48.17% met criteria for some type of learning disability. **Results:** The five factor model (Verbal Comprehension, Perceptual Organization, Processing Speed, Auditory Memory, and

Working Memory) using subtests from the CMS and the WISC-III standardization sample provided an acceptable fit to the sample data. Fit indices improved when Picture Arrangement and Story Immediate Memory were allowed to correlate and when Object Assembly and Block Design were allowed correlate. Results indicate that, when both the WISC-III and CMS were administered, additional information was gained that would not have been obtained if only one or the other were administered. The extent to which this continues to be true with the WISC-IV warrants investigation.

### **D19**

#### **Anosmia and executive functions in a head injured population**

*Jacobs ML, Prosje M, DeFilippis NA, Hill FF*

**Objective:** In the field of neuropsychology, there exists controversy about the need to assess for olfaction. The principal objective of this study was to examine in a head-injured population the relationship between performance on an olfactory screener and performance on neuropsychological measures of executive function, attention, and memory. **Method:** Archival data from 72 inpatients from a hospital specializing in brain and spinal cord injuries was utilized. The following tests were administered: Pocket Smell Test (PST), WCST, COWA, Trails A and B, Logical Memory, Visual Reproduction, Spatial Span, Digit Span, RAVLT, Token Test, Symbol Digit Modalities Test (written and oral), and Block Design. Correlation analyses were used to compare performance on the PST to other measures. **Results:** Results indicated that the PST was significantly correlated to the WCST number of categories completed and perseverative responses, Block Design, and the RAVLT trials 1, 5, and list B. A significantly higher percentage of subjects with moderately impaired performance ( $T < 35$ ) on WCST categories correctly identified one or less of the odors compared to participants who correctly identified two or more odors. A significantly higher proportion of participants with impaired performance on WCST perseverative responses scored a one or less on the PST compared to subjects who scored a three. **Conclusions:** The findings indicate some relationship between olfactory loss and frontal lobe functions such as perseveration, problem solving, and attention. This study supports routine testing of olfactory loss, as 68% of the sample obtained scores of two or less on the PST, suggesting at least partial anosmia.

### **D20**

#### **Neuropsychological effects of escitalopram treatment in middle-aged women**

*Wroolie T, Keller J, Rasgon N*

**Objective:** This study assessed mood and neuropsychological changes in a population of middle-aged depressed women treated with escitalopram. **Method:** Eighteen women between the ages of 45 and 65 with a DSM-IV diagnosis of major depression were consecutively enrolled in the study at Stanford University School of Medicine, Department of Psychiatry and Behavioral Sciences. All women were treated with escitalopram in an open label design. Women were recruited from the community and all but three were Caucasian. Mean age was 55.94 and mean years of education was 16.36. Mood and cognition were assessed at baseline and 3-months post-treatment. Mood was assessed with the Hamilton Rating Scale for Depression (HAM-D). The neuropsychological test battery included an abbreviated measure

of FSIQ, and measures of attention and concentration, verbal and nonverbal memory, and executive functioning. Paired sample *t*-tests were used to analyze the data. Analysis of change in depression was conducted on total as well as endogenous depressive symptoms. Results: Statistically significant differences (improvements) were found in total HAM-D score (95% CI,  $P < .000$ ), HAM-D endogenous symptoms (95% CI,  $P < .000$ ), WMS-III Logical Memory II total score (95% CI,  $P = .003$ ), WMS-III Visual Reproduction I total score (95% CI,  $P = .025$ ), and Trails B (95% CI,  $P = .017$ ). Conclusions: Treatment of depression with escitalopram in a population of middle-aged women was shown to improve mood and cognitive efficiency in long-term recall of contextual information, visuospatial attention and learning, and executive functioning.

## **NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART II: CEREBROVASCULAR DISEASE**

### **D21**

#### **Neuropsychological improvement after anoxic encephalopathy: a case study**

*Friedman AL*

Objective: To investigate neuropsychological improvements in a patient with anoxic encephalopathy secondary to cardiac arrest. Research has documented anoxic encephalopathy following cardiac arrest resulting in extensive brain damage including diffuse cognitive deficits with a predominance of amnesic and executive impairments and poor response to rehabilitation. Method: Mr W, a 39-year-old African American attorney, was transferred to our hospital on 3/16/05 for “heart transplant evaluation.” The patient had a recent history of sudden death (cardiac and respiratory arrest) on 3/6/05 during a previous hospitalization. Diagnoses included idiopathic dilated cardiomyopathy per cardiac catheterization, and anoxic encephalopathy. Brain MRI revealed “no abnormality.” Results: Initial neuropsychological evaluation (18 days post-MI) revealed dysarthria and severe diffuse cognitive dysfunction. On the MMSE he scored 14/30, on the BNCE (Brief Neuropsychological Cognitive Exam) he scored 2/30. Impairments included disorientation, agraphia, word generation, drawing (simple design, clock), naming (5/10), set shifting (go-no-go, trails), divided attention (months backward) and working memory (0/3) with no improvement from cues. Four weeks later, his MMSE score was 19/30, and improvements included: orientation to place, writing, naming, word generation, simple design and clock drawing, and set shifting. Persistent impairments included dysarthria, perseveration, disorientation to time, and short-term memory. Of note, verbal recall improved when cues were given both during encoding and retrieval. Conclusions: Despite prior research suggesting permanent diffuse cognitive decline following anoxic encephalopathy, this patient demonstrated spontaneous cognitive improvements (with no formal cognitive rehabilitation), in selected areas including some executive functions and working memory with appropriate cues.

**D22****From tears to laughter and back again: a case of pathological crying after stroke***Ferrari M*

**Objective:** Pseudobulbar affect and pathological crying are terms used to describe the ostensible ease with which some persons following stroke and other neurological injuries cry more frequently and demonstrate exaggerated emotional responses. This presentation describes the salient features of pathological crying, reviews relevant literature on its clinical course, and details an unusual case progression. **Method:** The case is a 56-year-old, high school educated woman with left hemisphere ischemic stroke involving the middle cerebral artery, temporal structures and areas of the caudate. Significant expressive aphasia endured through 10 weeks of followup, with no impairment of consciousness beyond the first several days post-stroke. **Results:** The subject was in acute care for 6 days. Five days after transfer to inpatient rehabilitation, her family reported her more tearful than pre-stroke with rapid crying progression and fast resolution. They also reported depression. She was tried on an SSRI. Within 7 days, the crying episodes ceased. However, 5 days later, pathological laughing emerged, with exaggerated smiling, vocal laughter and rapid resolution. One week later, the antidepressant was discontinued. After 4 days, pathological crying returned. The family asked for reinstatement of SSRI treatment. Within 3 days, the crying episodes stopped. Three days after this, pathological laughter again returned. The family decided that laughing was better than crying and elected to continue treatment. **Conclusion:** Comparative review of adult clinical cases is presented. Variability in etiologic and symptomatic presentations of pathological crying is seen. This case questions the relationship between post-stroke anatomic injuries, neurophysiology and antidepressant mechanisms of action.

**NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART II: PSYCHIATRIC ILLNESS****D23****Differentiating cognitive dysfunction associated with psychiatric disorders and acquired brain injury using the average impairment rating***Barry D, Wilson BJ, Lawrence M*

**Objective:** Russell's Average Impairment Rating (AIR) is a measure based on tests from the Halstead Reitan Battery that are highly sensitive to organic dysfunction. This study aimed to determine if a modified version of the AIR can be used to differentiate cognitive dysfunction associated with acquired brain injury from that associated with psychiatric disorders. We predicted that the AIR would be greater in the brain injury sample. **Method:** Seven individuals with acquired brain injuries, including TBI, stroke, and anoxic brain injury, and seven individuals with DSM-IV psychiatric disorders, including major depression, bipolar disorder, PTSD, and ADHD, were included. All patients had significant cognitive impairments. The modified AIR was based on performance on the Category Test, Tactual Performance Test, Trail Making Test, Speech Perception Test, Rhythm Test, Finger Tapping Test, and Digit Symbol Coding. AIR raw scores and *T*-scores were compared using *t*-tests. **Results:** The mean AIR raw score was 2.00 in the brain injury group and 1.06 in the psychiatric group [ $t(12) = 2.15, P = .053$ ].

The mean AIR *T*-score was 30.7 (mild to moderate impairment), in the acquired brain injury group and 51.0 (average performance) in the psychiatric group [ $t(12) = -2.12, P = .056$ ]. Conclusion: Although these results did not achieve the conventional level of significance, there was a measurable difference in Average Impairment Ratings between the two samples. These findings suggest that the modified AIR is sensitive to organic dysfunction associated with acquired brain injury but not that associated with psychiatric disorders.

#### **D24**

##### **Clinical normative data for the RBANS in inpatient psychiatry**

*Iverson GL, Brooks BL, Haley GM*

Objective: Neuropsychological screening evaluations are frequently conducted in inpatient psychiatric settings. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) is a screening battery that takes 20–40 min to administer and is designed to measure attention/processing speed, expressive language, visual–spatial and constructional abilities, and immediate and delayed memory. The purpose of this study was to replicate and extend the clinical normative data for the RBANS (Wilk et al., 2004) for use in inpatient psychiatry. Method: Participants were 288 inpatients from a provincial psychiatric hospital. Results: Men performed better than women on the Visual–Spatial/Constructional Index ( $P < .02$ , Cohen's  $d = .31$ ), and women performed better than men on the Delayed Memory Index ( $P < .02$ ,  $d = .30$ ). There were significant main effects for education for all five index scores and the total score. Patients with more than 12 years of education performed significantly better on every index score than patients with less than 12 years. Patients with more than 12 years of education performed better than those with 12 years on the Immediate Memory, Visual–Spatial/Constructional, and Language Indexes. Patients with diagnoses of schizophrenia ( $n = 111$ ) or schizoaffective disorder ( $n = 63$ ) were compared. Those with schizoaffective disorder performed better on the Language Index ( $P < .03$ ,  $d = .35$ ). Conclusion: Overall, the performance of this inpatient sample was very similar to the clinical normative data for inpatients and outpatients presented by Wilks et al. (2004). Detailed normative tables by gender, education, and diagnosis will be provided.

#### **D25**

##### **Pre-surgical neuropsychological functioning of a prospective clinical trial of thalamic deep brain stimulation for Tourette syndrome**

*Schoenberg MR, Ogrocki P, Riley D, Maddux B, Gould D, Whitney C, Maciunas R*

Objective: Tourette syndrome (TS) is a neuropsychiatric disorder associated with fronto–striatal dysfunction. Some patients experience disabling motor/vocal tics into adulthood. This study is evaluating the clinical efficacy of bilateral thalamic Deep Brain Stimulation for selected patients with medically refractory TS. Method: The study is a repeated measures design with pre-test and 3 and 12 month follow-up. Participants: Nine males and one female completed Screening Phases I and II. Phase I included neuropsychological and neurological evaluations with video monitoring. Phase II was comprehensive psychiatric and neurosurgical evaluations, including high resolution MRI. Measure: Frequency and severity of motor/verbal tics based on blinded objective video scoring, quality of life, neuropsychological measures (psychomotor

speed, attention, memory, speech, visuoconstructional, executive), and psychiatric (symptoms of OCD, ADHD, Depression, and Anxiety). Results: Average age was 28.5 years (S.D. = 7.5) with 10–17 years of education. Participants were disabled from tics, with a tic frequency of 50–80 per min. On average, attention and memory performances were average. Mild difficulties were exhibited with tasks requiring rapid sequencing or mental flexibility (Trials B, COWAT). Average OCD symptom severity was mild to moderate (YBOCS total = 14). Conclusion: Little neuropsychological data are available for adults with medically refractory TS. These data are discussed in context of previous studies suggesting TS may involve dysfunction of the fronto-striatal system.

## **D26**

### **Minor physical anomalies in severe developmental disabilities**

*Soper HV, Gaier DJ, DeLuca JJ*

Objective: We have noticed, and the literature has confirmed, a high rate of minor physical anomalies among our clientele, including those with autism, mental retardation, attention deficit disorders, learning disorders, schizophrenia, bipolar depression, conduct disorder and antisocial disorder, and fetal alcohol syndrome. These anomalies are often thought of as reflective of early uterine events or complications. We evaluated some old data on 100 normal controls and people with severe to profound mental retardation, 72 of who also were diagnosed with autism and 148 who were not. Method: The Waldrop Scale, administered to each of these 320 participants, looks at three measures of the head, eyes, mouth, hand and four each of the ear and feet. The lower-functioning participants were residents of Camarillo State Hospital and Developmental Center, with permission being granted by the parent or guardian as was appropriate. Results: As expected, the normal group had significantly fewer anomalies (mean score of 0.92) than either the autism group (mean of 1.50) ( $t = 2.68, P = .008$ ) or the mental retardation alone group (mean of 2.62) ( $t = 7.452, P < .001$ ). In addition, the mental retardation along group had a mean significantly higher than the autism group ( $t = 4.010, P < .001$ ), even though the groups were equivalently cognitively challenged. Detailed analyses revealed many interesting comparisons. Conclusion: The results are strongly suggestive of minor physical anomalies being reflective of developmental disorders, especially severe ones, and the results suggest that Waldrop scores may be helpful when assessing individuals with other developmental disabilities.

## **D27**

### **Comorbidity of psychiatric disorders in diagnosed neurology patients**

*Brinkman Jr JJ, Noggle CA, Dean RS*

Objective: Epidemiological research has demonstrated that psychiatric disorders are more prevalent among patients in primary care settings than in the general population (Kessler, 2000). More specifically, epidemiological research carried out in neurological care settings suggests that the prevalence for a psychiatric disorder increases following neurological impairment and exceeds the prevalence found in the general population and primary care settings (Carson et al., 2000; Fink et al., 2003). Despite the high prevalence of psychiatric disorders found in neurological care settings, further research is needed because the studies are few

and inconsistencies in research designs and assessment techniques exist (Fink et al., 2003). **Methods:** The present study examined the relative risk of psychiatric disorders (DSM-IV-TR) occurring in patients diagnosed with neurological disorders. Participants ( $n = 367$ ) included individuals diagnosed with a neurological disorder (ICD-9). Patients were all administered the Dean–Woodcock Mental Status Exam and the Minnesota Multiphasic Personality Inventory-II. A control group ( $n = 19,640$ ) was derived from Robins and Reiger's (1991) Epidemiological Catchment Area Study (ECA). **Results:** Of the 367 neurology patients, 246 were found to have a comorbid psychiatric disorder (ICD-9). Statistical analyses of relative risk indicated patients with neurological disorders are more likely to present with psychiatric disorders compared to the general population. Results demonstrate a relationship between neurological and psychiatric disorders. Break downs of specific neurological disorders will be offered. **Conclusions:** This study provides implications to direct the practice of all neurology and neuropsychology professionals. A more complete discussion of these data will be presented in the poster.

## **NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART II: TRAUMATIC BRAIN INJURY**

### **D28**

#### **Prevalence of aggressive behavior after pediatric traumatic brain injury**

*Gray RM, Slomine B, Gerring J*

**Objective:** Estimating the frequency of aggressive behavior in adults with TBI has proven difficult due to the use of differing operational definitions, resulting in prevalence rates of various “aggressive” behaviors ranging from 11 to 96%. While aggression is also noted clinically in pediatric TBI populations, there are similar problems with poor operational definition, and limited data regarding the prevalence, type and correlates of aggressive behavior in this population. **Method:** The current study summarizes general (Child Behavior Checklist—CBCL) as well as aggression specific (Overt Aggression Scale—OAS) parent behavioral rating data obtained via premorbid estimates and 1 year post-injury ratings for a sample of 97 children (mean age 10.56) with severe TBI (mean initial GCS 5.42). **Results:** Examination of CBCL aggression ratings indicated significant levels of overall aggressive behavior in 20% of the sample post-TBI. The group as a whole demonstrated significant increases post-TBI in total aggression, verbal aggression, and aggression towards property and individuals, with no significant increase in self-injurious behavior. These changes were independent of gender, age, or SES. Post-TBI aggressive behavior was most strongly associated with premorbid levels of externalizing behavior, attentional problems, as well as anxious behavior. **Conclusions:** Results emphasize the increased risk of significant aggressive and destructive behavior after TBI, particularly among children with premorbid anxiety, attentional difficulties, and externalizing behavioral difficulties.



**D29****Importance of obtaining a psychiatric history in managing sports concussions among adolescents: case study***Kirk JW, Zacharewicz M, Pierce C, Schmitz S*

Objective: To examine the utility of obtaining a thorough psychiatric/medical history when interpreting ImPACT data for determining Return to Play (RTP). Method: Sixteen years old football player, who sustained a concussion, with no LOC, retrograde or anterograde amnesia, but confused/disoriented for up to 30 min and symptoms resolved within 4 days. Premorbid history indicated OCD, motor tic disorder, and one previous concussion. Athlete completed baseline testing, post-concussive testing (1, 9, and 14 days post-injury), and neuropsychological evaluation when neurocognitive symptoms resolved (to determine special education programming for previous academic/psychiatric difficulties). Results: Baseline ImPACT indicated significant post-concussive symptoms with an elevation and eventual decrease over post-concussion testing. Baseline ImPACT revealed deficient Visual Memory (1st percentile) and Visual–Motor Speed (1st percentile) with average Reaction Time (33rd percentile) and low average Verbal Memory (21st percentile). Serial post-concussive testing revealed a “traditional” recovery curve for reaction time, while verbal memory, visual memory, and visual motor speed only improved to the borderline-low average range by day 14. Neuropsychological data revealed average verbal intellectual skills and borderline non-verbal intellectual skills (WAIS-III, VIQ = 96, PIQ = 75), in the context of inattention and executive dysfunction (TOVA Omission, SS < 40, Variability, SS = 84; D-KEFS, TMT-4, ScS = 3; Tower Test Achievement, ScS = 4). Conclusion: Findings indicate a psychiatric history complicates baseline performance with elevated symptoms and deficient performance among certain ImPACT composites, compromising the utility of change in scores. A thorough clinical interview provides relevant historical information essential for determining RTP status.

**D30****Concussion history and acute neuropsychological functioning following sport-related concussion***Alfano DP, Nicholls MJ*

Objective: Most individuals who sustain a single concussion experience no long-term consequences. Athletes, however, represent a group where the potential for multiple concussions is high. A critical issue in the management of sport-related concussion is therefore the extent to which concussion history is related to the consequences of subsequent concussion. The objective of this study was to examine the relationship between concussion history and neuropsychological functioning during the acute period of recovery from sport-related concussion. Method: The 33 participants were male ( $n = 15$ ) and female ( $n = 5$ ) hockey and football ( $n = 13$ ) players who underwent neuropsychological evaluation within 5 days of sustaining a concussion during regular season play. Assessment consisted of individual administration of a comprehensive set of measures designed to examine a broad range of neurocognitive domains. Post-concussion complaints were assessed using a neurobehavioural symptom inventory. Concussion history was obtained via clinical interview. Results: Total number of reported prior concussions was significantly correlated with scores on measures of verbal learning, sustained

and selective attention, and psychomotor speed, and with the number and severity of endorsed post-concussion symptoms. Athletes with a history of two or more prior concussions had significantly lower scores on measures of sustained and selective attention, and psychomotor speed. Athletes with a history of three or more concussions endorsed a significantly greater number and severity of post-concussion symptoms. Conclusion: These findings provide preliminary support for the idea that concussion history is significantly related to the severity of acute neuropsychological disturbance following sport-related concussion.

### D31

#### **WAIS-III intersubtest scatter: a comparison of brain damaged patients and normal controls**

*Ryan JJ, Tree HA*

Objective: It is generally assumed that marked intersubtest scatter on the Wechsler Scales of intelligence is suggestive of brain damage. However, no investigations have tested this assumption. The present study explores the diagnostic usefulness of intersubtest variability by comparing the scatter ranges of healthy individuals from the WAIS-III standardization sample and a group of patients with confirmed brain damage. If scatter is a valid index of brain dysfunction, then neurologically compromised patients should demonstrate larger ranges than healthy individuals. Method: Participants were 175 individuals from both inpatient and outpatient settings. Means for age, education, and WAIS-III Full Scale IQ were 48.03 years (S.D. = 15.46), 12.57 years (S.D. = 2.77), and 88.60 (S.D. = 15.92), respectively. There were 146 Whites, 25 Blacks, 2 Hispanics, and 2 others. The etiologies of brain damage were 84 TBI, 40 stroke, 15 dementia, and 36 other. Results: For the patients, Table 1 presents scatter range means and standard deviations for the Verbal Scale (six and seven subtests), Performance Scale (five and six subtests), Full Scale (11 subtests), Index groupings (11 subtests), and 13 subtest grouping (Object Assembly omitted). Also provided are the same scatter ranges in the standardization sample. Of the seven contrasts between the patients and standardization sample, none were statistically significant. Conclusion: The present findings suggest that intersubtest scatter among brain-damaged patients is no greater than among normal persons. Interpretation of intersubtest scatter as a sign of brain damage in persons with low average intelligence is unwarranted and should be avoided.

### D32

#### **Personality assessment inventory profiles in traumatic brain injury**

*Demakis G, Hammond F, Knotts A, Cooper D, Clement P, Kennedy J, Sawyer T*

Objective: To evaluate Personality Assessment Inventory (PAI) profiles in two TBI populations, one a civilian population evaluated at a rehabilitation hospital and the other a military sample evaluated at a military hospital. Method: Participants were evaluated approximately one year post-injury. Demographic and injury characteristics for each sample are as follows: Military: age = 27.8 years (S.D. = 7.3), education = 12.7 (S.D. = 1.9), gender = 97% male, and post-traumatic amnesia = 19 less than 1 day and the others 12.5 days. Civilian: age = 35.9 (S.D. = 16.7), education = 12.5 (S.D. = 2.2), gender = 70% male, and post-traumatic amnesia = 29.9 days (S.D. = 16.8). Results: Participants with profile elevations above cutoffs on

the validity scales (e.g., Negative Impression Management) were excluded. The top three scale elevations (above a *T*-score of 60) were as follows: Civilian: Somatization, Depression, and Borderline. Military: Somatization, Depression, and Paranoia. Using cluster analytic techniques from the PAI manual, the configuration of scale elevations were examined. For the civilian sample, the top three cluster patterns were Cluster 1 (26%) with a lack of elevations, Cluster 2 (21%) with elevations on Depression and Suicide, and Cluster 6 (21%) with elevations on Schizophrenia and Borderline. For the military sample, cluster patterns were Cluster 1 (33%), Cluster 8 (23%) with elevations on Somatization, and Cluster 6 (17%). Conclusions: These are the first data using the PAI in TBI populations. Much like MMPI findings, they demonstrate multiple PAI elevations in TBI, particularly on scales measuring somatization and depression.

### **D33**

#### **Factor structure of the personality assessment inventory in traumatic brain injury**

*Demakis G, Cooper D, Clement P, Kennedy J, Hammond F, Knotts A*

Objective: To evaluate the factor structure of the Personality Assessment Inventory (PAI) profiles in a TBI sample comprised of participants from two sources—a civilian rehabilitation hospital and an army hospital. Method: Participants from both hospitals were evaluated approximately 1 year post-injury and all suffered a moderate to severe TBI as determined by loss of consciousness and/or post-traumatic amnesia. Demographic characteristics for the combined samples were as follows: age = 32.8 years (S.D. = 14.5), education = 12.6 years (S.D. = 2.1), gender = 77% male, and race = 77% Caucasian. Results: Participants with profile elevations above cutoffs on any of the validity scales (e.g., Negative Impression Management) were excluded. Because mean elevations were not different on any of the clinical scales between groups, data were combined. An exploratory factor analysis with orthogonal rotation was performed on the eleven clinical scales. It yielded a three-factor solution (with eigenvalues above 1.0) accounting for 76% of the variance. Clinical scale loadings on each factor above .5 are as follows: Factor 1 (51% variance): Somatization, Anxiety, Anxiety-Related Disorders, Depression, Paranoia, Schizophrenia, and Borderline Features. Factor 2 (16% variance): Antisocial Features, Alcohol Problems, Drug Problems. Factor 3: (10% variance) Mania. Conclusions: These are the first data using the PAI in TBI populations and demonstrate a stable factor structure. In fact, the obtained factor structure is similar to that obtained with a clinical psychiatric population as specified in the PAI manual.

### **D34**

#### **Personality Assessment Inventory (PAI) profiles in cases of no detectable brain injury, mild brain injury, and severe brain injury**

*Mendella PD, McFadden L*

Objective: To characterize the validity, clinical, treatment, and interpersonal scale profiles on the Personality Assessment Inventory (PAI; Morey, 1991) in a sample of individuals who had experienced a suspected or known traumatic brain injury. Method: Participants included 73 consecutive referrals to a private practice setting for neuropsychological assessment. Participants were assigned to one of three head injury severity groups based on available medical

data (no detectable brain injury—NDTBI,  $n = 30$ ; mild brain injury—MBI,  $n = 20$ ; severe brain injury—SBI,  $n = 23$ ). Only valid PAI protocols were included in constructing the profiles and for making group comparisons. Results: Validity scale scores did not differ significantly as a function of head injury severity. The NDTBI and MBI injury groups had higher Somatization (SOM) scale scores compared to the SBI group ( $P = .008$ ). The MBI group also had higher scores on the Dominance (DOM) scale compared to the SBI group ( $P = .018$ ). Scores for the NDTBI and MBI groups were relatively elevated from a clinical perspective (approximately  $T = 65$ ) on the SOM and Depression (DEP) scales. In contrast, none of scale scores were higher than  $T = 60$  in the SIB group. Conclusion(s): PAI profiles varied as a function of head injury severity. While individuals in the NDTBI and MBI groups appeared to experience relatively greater difficulties related to Somatization and Depression, the low scores in the SBI group could represent underreporting secondary to diminished insight. These group differences could have important diagnostic and/or treatment implications.

### D35

#### High scatter and WAIS-III short form validity

*Schnakenberg-Ott SD, Ryan JJ, Tree HA, Kreiner DS, Halfaker DA*

Objective: It is widely believed that marked intersubtest scatter on a WAIS-III short form reduces the validity of the estimated IQ. This makes sense, but empirical support for this position is lacking. The present study utilized traumatic brain injury patients and assessed the validity of Ward's 7-subtest short form FSIQ obtained from abbreviated protocols with either low or high amounts of scatter. Method: From a large database, 30 cases (group 1) were selected with a complete WAIS-III and a short form with a large scatter range ( $\geq 6$ ). For comparison, a group of 30 patients (group 2) matched on key demographic variables was selected who had low scatter ( $\leq 5$ ). Table 1 presents means and standard deviations for the groups on demographic variables, scatter, short form FSIQs, and WAIS-III subtests and FSIQs. Results: The Potthoff method was used to compare regression equations based on short form FSIQs from groups 1 and 2 in predicting WAIS-III FSIQs. The simultaneous  $F(2, 56)$  of 3.16,  $P < .05$  was significant, requiring the calculation of separate  $F$ s to determine whether the slopes, intercepts, or both differed. Subsequent analyses revealed that the slopes differed,  $F(1, 56) = 6.23$ ,  $P = < .05$ , but the intercepts did not,  $F < 1$  (see Table 2). Discussion. These findings suggest that high scatter reduces the accuracy of the 7-subtest short form composite for predicting standard WAIS-III FSIQs. Research on other short forms using larger samples that allow for the simultaneous evaluation of demographic variables on prediction accuracy appears warranted.

### D36

#### Neurodiagnostic implications of large WAIS-III VIQ–PIQ discrepancies

*Ryan JJ, Tree HA, Morris J*

Objective: Based on research with the WAIS and WAIS-R, many practitioners believe that a marked discrepancy between the WAIS-III VIQ and PIQ has diagnostic implications. The present investigation constitutes the first empirical test of this hypothesis with brain damaged patients. Taking into consideration the level of FSIQ, the frequencies of large discrepancies among patients were compared to those of persons from the WAIS-III normative sample.

**Method:** Participants were 175 patients with brain damage who had been administered the WAIS-III. The magnitude of each VIQ–PIQ discrepancy was evaluated for rarity of occurrence. A marked discrepancy was defined as one that occurred in approximately 5% of the WAIS-III standardization sample. The percentages of brain damaged patients with marked discrepancies were compared with those of the normative group. **Results:** Table 1 reports the percentages of brain damaged individuals whose VIQ–PIQ differentials were unusually large. When FSIQ level was ignored, the proportion of atypical discrepancies in the brain damaged group (9.7%) did not differ from that in the standardization sample (4.9%). Likewise, when samples were classified according to ability levels ( $\leq 79$ , 80–89, 90–109,  $\geq 110$ ) the proportions of cases with unusually large VIQ–PIQ discrepancies were statistically the same for both groups. **Discussion:** These findings suggest that large VIQ–PIQ differences occur rarely among brain damaged individuals. Therefore, it is unlikely that a large VIQ–PIQ split, taken in isolation, carries neurodiagnostic implications for individuals with FSIQs less than 120. Practitioners should look elsewhere for a practical WAIS-III derived sign of brain damage.

### **D37**

#### **Prevalence of abnormal CT scans in trauma patients with MTBIs**

*Iverson GL, Brooks BL, Bernardo J, Lalani K, Franzen MD*

**Objective:** The purpose of this study was to examine the prevalence of intracranial abnormalities in trauma patients with presumed mild traumatic brain injuries. **Method:** Patients were seen as part of a trauma clinical pathway and selected for inclusion if their Glasgow Coma Scale (GCS) score was between 13 and 15, and their mechanism of injury was known ( $N=1082$ ). From this sample, 591 (54.6%) underwent computed tomography. The results are based on this sub-sample ( $n=591$ ). **Results:** The prevalence of intracranial abnormalities was 14.4%. The rates of abnormalities by GCS score were as follows: 13 ( $n=20$ )=52.2%, 14 ( $n=77$ )=27.1%, and 15 ( $n=494$ )=11.7%. The rates of abnormalities by age were as follows: patients under 55 years of age ( $n=434$ )=12.6%, and patients 55 and older ( $n=127$ )=21.0%. The rates of abnormalities by mechanism of injury were as follows: motor vehicle accident ( $n=743$ )=11.2%, pedestrian struck by a vehicle ( $n=40$ )=10.0%, falls ( $n=220$ )=22.7%, and blows to the head or assaults ( $n=79$ )=24.1%. The rate of abnormalities for patients under the age of 55 ( $n=320$ ) in a MVA was 9.9% and for patients 55 or older ( $n=61$ ) was 17.7%. **Conclusions:** The prevalence rates of intracranial abnormalities in this study are under-estimated because a large number of patients were not scanned. Nonetheless, these rates are comparable or higher than those reported in the literature.

### **D38**

#### **Differences in verbal and visual memory in pediatric closed head injury**

*Tangen RB, Thompson M*

**Objective:** Verbal and visual memory deficits have been documented after pediatric closed head injury (CHI); however, few studies have examined differential verbal versus visual memory performance. It was hypothesized that children with CHI would perform more poorly on verbal than visual memory indexes on the Children's Memory Scale (CMS), based on pilot data published in the CMS manual. It was also hypothesized that children with mild/moderate CHI

would perform better than severely injured children, with better visual than verbal performance in both groups. Method: Participants ( $n = 50$ , 66% male) were selected from consecutive referrals with CHI who completed the CMS at a regional children's hospital. Participants (mean age = 10.6) were an average of 6 months post-injury. CHI severity level was rated according to published criteria. Memory indexes were analyzed using repeated measures MANOVA. Results: Repeated measures MANOVA revealed a significant main effect for CMS index scores [ $F(3, 46) = 12.27, P < .01$ ]. Planned contrasts revealed Verbal Immediate memory to be significantly worse than Visual Immediate memory [ $F(1, 48) = 10.29, P < .01$ ], and Verbal Delayed memory to be significantly worse than Visual Delayed memory [ $F(1, 48) = 16.61, P < .01$ ]. Participants with mild/moderate injuries demonstrated the same pattern but performed better than participants with severe injuries [ $F(1, 48) = 7.90, P < .01$ ]. Conclusions: Children with CHI appear to experience greater verbal than visual memory deficits. These findings indicate the need for further research pertaining to material-specific memory deficits and remediation in children with CHI.

### D39

#### Set shifting following severe closed-head injury

Schmitter-Edgecombe M, Kayne Langill M

Objective: We used a variant of the design fluency task to investigate set shifting abilities following severe closed-head injury (CHI). Method: Participants were 22 individuals with severe CHI (coma duration > 24 h) who were more than 1 year post-injury, and 22 controls matched closely for age (CHI = 31.64, controls = 31.95) and years of education (CHI = 12.81, controls = 13.54). For each of three different one-minute trials, participants were presented with squares that contained five solid dots and five open dots. Their task was to draw different designs in each square using four straight lines. Participants were instructed to make the designs by connecting solid dots in trial 1 and open dots in trial 2. In trial 3, they were to switch between connecting solid dots in one square and open dots in the next square. Results: The CHI and control participants did not differ significantly in the mean number of different designs produced on trial 1 [CHI:  $M = 8.09$ , control:  $M = 8.95, t(42) = -1.03, P = .31$ ] or trial 2 [CHI:  $M = 9.91$ , control:  $M = 11.23, t(42) = 1.46, P = .15$ ], the nonswitch trials. In contrast, the control participants ( $M = 12.14$ ) produced a greater number of different designs than the CHI participants ( $M = 8.63, t(42) = -4.11, P < .001$ ), on the switch trial. Conclusion: Severe CHI participants demonstrated difficulty in their ability to switch rapidly and fluidly between tasks, a skill that is an important component of many everyday activities.

## NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART II: TREATMENT AND REHABILITATION

### D40

#### Response optimization: a central issue in recovery from TBI

Schutz LE

Objective: There is no generally accepted label for the process of automatically, synchronously adjusting levels of effort, care, caution, preparation, and arousal control to meet task demand,

so the author has advanced the term “response optimization.” Breakdown in this function is responsible for frequent errors and the general reduction in response consistency seen after traumatic brain injury (TBI). Optimization deficit is addressed in a nonsystematic and often ineffectual fashion in neurorehabilitation. Method: Beginning with Yerkes and Dodson, the cognitive and behavioral literature includes more than 30 references to optimization effects. When the low, default level of optimization is inadequate, a deliberate problem solving process can correct it, according to Norman and Shallice. Five articles report that this upgrading does not take place after TBI. Informal observations of TBI patients in cognitive rehabilitation training verify a conspicuous dearth of autonomous adjustment of optimization. Results: Therapists often cue patients to adjust optimization with good, but non-generalizing, results. Without generalization training, patients continue to emit insufficiently optimized responses in the real world, causing high error rates in discharging their most complex responsibilities. Moreover, they do not learn to make these adjustments by trial and error, rendering the resulting disabilities permanent. Generalization training produces active adjustment of optimization, an effect observed in cases as late as 15 years post-discharge. Conclusion: Both the patients and their therapists need to become actively and aggressively concerned about optimization, as the compensation strategy for this singular deficit is easily trained and reaps long-term benefits in all areas of functioning.

#### **D41**

##### **Neurorehabilitation treatment interventions for stimulus flooding**

*Schutz LE*

Objective: Although it is generally known that diffuse brain injuries tend to produce a profound cognitive and behavioral vulnerability to stimulus flooding or overload, this “Achilles heel” is not an identified concern of any neurorehabilitation discipline, and consequently tends to receive only incidental or cursory attention. Method: A literature review of articles on stimulus flooding finds 25 references on cognitive deterioration due to flooding from 12 specific causes. Twenty-eight articles document the special vulnerability of patients with traumatic brain injury or other diffuse brain disorders. Informal observation finds the majority of errors reported by patients in postacute cognitive rehabilitation to be attributable to the effects of overload. Results: A protocol is recommended consisting of six steps: (1) achieve insight into the vulnerability to overload and the effects of overload on functional abilities (2) identify those specific causes which are most likely to trigger overload effects for self (3) when scheduling daily activities, highlight those that are most prone to produce overload and predict the specific cause or causes in that situation; prediction reduces surprise which in turn reduces overload (4) utilize situational modification to reduce stimulus overload, for example, employing partial-blockage earplugs to control phonophobia (5) utilize counterconditioning to minimize emotional reactions as a specific cause (6) deploy a problem solving algorithm to monitor and adjust the strategies until results are fully satisfactory. Conclusion: A relatively complex protocol needs to be taught and perfected to provide good protection against the cognitively toxic effects of stimulus flooding.

**D42****Public policy implications of advances in neuropsychological rehabilitation***Schutz LE*

After successfully developing an effective, if elaborate, “holistic” paradigm for head injury rehabilitation, neuropsychology must now come to terms with stark, present-day limitations on treatment intensity enforced in the public sector. Holistic programs survive thanks to special funding sources, but as such offer no practical help to the mainstream clinician. A pragmatic rationale for converting this model into one which can be conducted under current reimbursement practices is needed. A conceptual model of the treatment process is proposed, identifying five components of any training intervention: induction (recruitment), instruction (introducing the corrective or compensatory technique), refinement (guided practice), application (transfer of the strategy to real-life situations and activities), and integration (establishing real-world triggers and repair processes). Customary clinical practice allocates more hours to the third phase than to the other four phases combined, yet this phase is one most readily shifted out of the clinic to the home or classroom. On this basis, therapy can be restructured so that only the most technically demanding first and last stages are fully interactive, while utilizing video recordings and homework assignments to support the middle three phases. In this way, therapy modules of demonstrated effectiveness for key processes such as insight, problem solving, and self-management can be deployed with a modest expenditure of therapist time. This strategy allows a full training program to be accomplished within the confines of conservative reimbursement limitations.

**D43****Impact of Medicare prospective payment system on right hemisphere stroke patients with unilateral spatial neglect***Gillen R, Tennen H, McKee T*

**Objective:** To investigate the impact of the Medicare prospective payment system (PPS) on rehabilitation outcomes of right hemisphere stroke patients with unilateral spatial neglect (USN). Research conducted prior to implementation of the PPS suggested that USN patients had longer lengths of stay (LOS) and progressed more slowly in rehabilitation than patients without USN (Gillen et al., 2005). It was hypothesized that financial pressures associated with PPS would result in shorter LOS, decreased functional improvement, and increased risk of nursing home placement in USN patients. **Method:** Fifty right hemisphere stroke patients with USN admitted to an acute rehabilitation hospital from 1997 to 2001 (prior to implementation of PPS) were compared with 38 USN patients admitted from 2002 to 2004. Neglect classification was based on previously established criteria on the Weintraub and Mesulam Letter Cancellation Test. Outcome measures included LOS, rehabilitation progress as measured by the Functional Independence Measure (FIM), and rate of nursing home discharge. **Results:** Following implementation of PPS, USN patients had shorter LOS ( $t=2.03$ ,  $P<.05$ ), made less functional progress ( $t=2.59$ ,  $P<.05$ ), and were discharged at a lower functional level ( $t=P<.10$ ). Whereas 14% of USN patients were discharged to nursing homes prior to PPS, the rate of nursing home discharge increased to 33% following PPS implementation. **Conclusions:** Since implementation of PPS, USN patients were discharged earlier and at lower



functional levels. Nursing home discharges more than doubled. The Medicare PPS has negatively impacted rehabilitation outcomes of stroke patients with more severe neuropsychological problems.

#### **D44**

##### **Neurocognitive improvement with targeted motor cortex stimulation in hemiparetic stroke patients**

*Ruth A, Lei X, Gliner B, Levy R*

**Objective:** Neuroplasticity plays a critical role in post-stroke recovery. Transfer of function to undamaged brain regions may overlie motor and neuropsychological recovery. We evaluated the potential effects of subthreshold targeted motor cortex stimulation (MCS) on motor and neurocognitive performance in patients with hemiparetic stroke. **Methods:** Twenty-four hemiparetic stroke patients underwent motor hand fMRI and were randomized to 6 weeks (a) rehabilitation plus investigational epidural MCS ( $N=12$ ) or (b) the same rehabilitation protocol alone ( $N=12$ ). Motor functional and neuropsychological testing was performed at baseline and 4 weeks following protocol completion. **Results:** Complete data was available for 19 right-handed patients (9 control, 10 MCS). Nine suffered right hemisphere stroke (5 control, 4 MCS); 10 left hemisphere stroke (4 control, 6 MCS). All subjects were at least 4 months post-stroke. Demographic variables differed only for age (controls =  $66 \pm 11$  years; MCS =  $55 \pm 9$  years,  $P = .03$ ). MCS subjects with left-sided lesions demonstrated a greater degree of language improvement than controls (mean change in WASI vocabulary  $t$ -score: control =  $-3.8 \pm 3.8$ ; MCS =  $1.3 \pm 3.3$ ,  $P = .05$ ). Non-statistically significant trends suggested that MCS produced greater gains in confrontation naming (in left-sided stroke patients) (mean change in BNT score: controls =  $1 \pm 23.3$ ; MCS =  $8.2 \pm 12.6$ ) and on visuospatial abstraction (in right-sided stroke subjects) (WASI Matrix Reasoning: controls =  $0.4 \pm 5.6$ ; MCS =  $6.6 \pm 7.9$ ). **Conclusions:** These results suggest that MCS in stroke survivors may improve neurocognitive functioning in addition to motor function.

#### **D45**

##### **Driving assessment after acquired brain injury: neuropsychological assessment within a multidisciplinary approach**

*Smigielski JS, Stobaugh WS*

**Objective:** The cognitive, physical and behavioral sequelae of Acquired Brain Injury (ABI) often interfere with the ability to perform important life tasks, including driving. Neuropsychologists are frequently involved in assessing driving capacity for individuals with ABI. The literature shows a focus upon a variety of assessment techniques ranging from selected standard neuropsychological instruments to sophisticated virtual reality technology. However, there has been little discussion of the manner in which such assessments may best be used to make driving recommendations. Using a case study, we describe the use of neuropsychological assessment within a multidisciplinary approach to assess driving capability. **Method:** This case involves a 25-year-old male with severe ABI in a motor vehicle crash (Glasgow Coma Scale = 4, abnormalities on MRI). Neuropsychological assessment showed mild to moderate neurocognitive impairment. This evaluation was part of a multidisciplinary assessment

process. This includes Psychiatric evaluation, followed by Occupational Therapy (OT) and Neuropsychology pre-driver's evaluations. Successful participants then begin driver's manual study with OT support, including practice written exams. Favorable completion leads to the state written driver's exam; passing is followed by behind-the-wheel practice provided by a specialized instructor. Successful completion of the state road test is the final step. Results: The patient was able to successfully obtain a driver's license through this process. Conclusions: This multidisciplinary approach is a practical means of assessing driving ability after ABI. The process is typically well-accepted by patients, and is sufficiently thorough that patients, families and professionals may have confidence in assessment findings.

#### **D46**

##### **Do neuropsychological tests tell the full story about driving?**

*Schultheis MT, Millis SR, Fleksher C, Ang J, Elovic E, Massler D, Nead R*

Objective: It was hypothesized that cognitive domains relevant to driving in other clinical populations would also be related to driving behaviors in drivers with multiple sclerosis (MS). To examine this, a preliminary evaluation of the relationship between neuropsychological performance and driving ability was conducted. Method: The study included 48 individuals with documented MS, who were active drivers and between the ages of 18 and 56. All participants received a neuropsychological evaluation which included assessment of domains relevant to driving (attention, information processing speed, visual-perceptual skills, executive functions) and domains not relevant to driving (verbal memory, visual memory, IQ). Two measures of driving were calculated: (1) performance on a standardized behind-the-wheel (BTW) driving evaluation and (2) driving frequency (total number of days/week). Results: Poisson regression was used to determine the relationship between neuropsychological predictors and the two driving outcome measures. Among neuropsychological measures relevant to driving, Block Design ( $P = .17$ ) was found to be most predictive of performance on the BTW evaluation, followed by DFES Tower ( $P = .18$ ), Trail Making B ( $P = .31$ ), PASAT ( $P = .53$ ), and Digit Span ( $P = .98$ ). Similar findings were observed in predicting driving frequency. As hypothesized, neuropsychological performance of domains not relevant to driving were not found to be significantly predictive of BTW performance or driving frequency. Conclusions: The current findings did not support previous studies on cognition and driving. The lack of significant relationships between neuropsychological measures and driving performance raises several questions regarding the potential lack of sensitivity of these measures among this clinical sample.

#### **D47**

##### **Motor imagery and direct brain computer communication**

*Kit W, Riss RH*

Objective: A "brain-computer interface" or BCI endeavors to bypass motor pathways of the nervous system to establish a direct communication channel between the brain and an output device for environmental control or communication. BCI holds greatest potential for disabled individuals who are cognitively intact, yet are "locked in" due to severe physical disabilities. Scalp recorded electroencephalogram (EEG) provides a convenient noninvasive way of detect-

ing cortical activity in real-time. However, accuracy of EEG triggered environmental control interfaces has not been sufficiently high to warrant wide clinical adoption. A classification accuracy rate of 90% or better would be necessary for clinically useful environmental control. We describe current methods to establish brain activated environmental control, and present a pilot study of classification accuracy rates associated with alternative mental imagery tasks. Method: Scalp EEG was recorded from six healthy adult volunteers aged 24–50. Subjects were instructed on cue to imagine one of four motor imagery tasks (e.g., movement of “right hand” “left hand” “both hands” or “both feet”). Offline pattern recognition and signal extraction routines were applied to compare classification accuracy rates for the four motor imagery tasks. Results: No imagery task yielded a classification accuracy approaching the 90% target that would be required practical application in the clinic. Conclusions: Low classification accuracy for surface recorded EEG continues to impede widespread adoption of BCI for environmental control. Recent FDA approval of an implanted electrode BCI may open the door for advances in this field.

#### **D48**

##### **Enhancement of auditory memory via operant conditioning of electrocortical potentials**

*Riss RH*

Objective: Compensatory strategy training for memory loss has demonstrated limited efficacy. While useful in reducing the practical impact of the underlying memory disorder, actual restoration of memory function has met with limited success (Chesnut et al., 1999; Cicerone et al., 2000). Much has been learned in the past decade about the electrophysiological substrates of effective memory encoding and retrieval (Bastiaansen & Hagoort, 2003). Moreover, transient working memory enhancement been demonstrated via rTMS-induction of specific EEG oscillatory patterns (Kohler, Paus, Buckner, & Milner, 2004). We describe an operant conditioning procedure that may hold promise for memory enhancement via functional reorganization of the electrophysiological substrates of memory. Method: Electrocortical correlates of memory performance were examined in a pilot group of brain injury survivors, greater than 1 year post-injury. Patterns associated with efficient encoding and recall were then reinforced, via EEG operant conditioning, while subjects simultaneously engaged in an auditory learning and recall task. Results: Subjects experienced gains on CVLT and story recall of greater than 1 standard deviation, with greatest improvement at the retrieval stage. One subject, with a history of extensive left medial temporal lobe trauma, demonstrated no evidence of benefit. Conclusions: Preliminary data supports a promising role for direct modification of the functional electrophysiological substrates of memory via operant conditioning.

#### **NEUROLOGICAL AND NEUROPSYCHIATRIC DISORDERS PART II: OTHER**

#### **D49**

##### **Neuropsychological sequelae of lymphangiomyomatosis: extended case study**

*Grayson RL, Broshek DK, Robbins M*

Objective: Lymphangiomyomatosis (LAM) is a rare progressive pulmonary disorder primarily affecting women. The disease is characterized by the development of smooth muscle-

like cells and cysts in the lungs, ultimately restricting vascular and airway flow; the prognosis is typically poor. Although first described in 1937, LAM remains inadequately understood and to date there have been no published reports examining neuropsychological sequelae of the disease. The purpose of the present study is to familiarize neuropsychologists with this rare disease and its associated cognitive and personality profile. Method: Of 375 consecutively-referred patients for lung transplant evaluation, five had LAM (1%). This extended case study retrospectively examined neuropsychological test data in the four LAM patients who underwent a comprehensive evaluation to determine lung transplantation candidacy. Subjects were highly educated ( $x = 15.75$  years, range 12–18 years) Caucasian females with a mean age of 52 years (range 51–54 years), seen at a tertiary medical center from 1999 to 2005. Results: Verbal intelligence was average to high average for all subjects; non-verbal intelligence was less well developed in all but one. Simple cognitive processing speed was average for three patients; moderately impaired for one. All patients demonstrated relative declines for complex cognitive processing speed and delayed nonverbal memory. Immediate and delayed recall for verbal prose was generally intact. Clinically significant personality indicators suggest heightened psychological distress and somatic concerns. Conclusions: Consistent with the literature examining neuropsychological sequelae of end-stage pulmonary disease (e.g., cystic fibrosis, COPD), LAM patients exhibited patterns of impairment suggestive of reduced cognitive efficiency and psychological distress.

#### **D50**

##### **A longitudinal study of ethylene dichloride and its effects on executive functions**

*Dilks LS, Matzenbacher DS, Marceaux JC, Mayeaux BD*

Objective: Ethylene dichloride (EDC) is an organic solvent critical in the production of cleaning agents and plastics. It is a carcinogen, neurotoxin and DNA mutating agent. Some researchers argue the effects of exposure are transient and likely to subside once exposure is terminated. The current study reevaluated individuals ten years post-exposure to assess stability, improvement, or deterioration. Method: Twelve individuals exposed to EDC while working at a cleanup site in 1994 underwent neuropsychological evaluations in 2000 and again in 2004. Individuals varied in age from 33 years to 53 years, with a mean age of 44.58 years. In 2000, participants were assessed using the Trails A and B followed by the Shipley Institute of Living Scale (SILS). The same 12 individuals were evaluated in 2004 using the same instruments. Results: The SILS abstraction scores from the follow-up evaluation ( $M = 47.67$ ,  $S.D. = 8.64$ ) were somewhat higher than the initial evaluation ( $M = 38.25$ ,  $S.D. = 13.73$ ),  $t(22) = -2.191$ ,  $P = .057$ ; this was approaching significance. The mean scores for the vocabulary subtest had not significantly changed. Also, there were no significant changes in the time of completion on the Trails A and B tests. Conclusions: A follow-up evaluation conducted at 10 years post-exposure supported this original observation. The lack of change indicates that these individuals have stabilized at a mild level of impairment. Any further improvement in functioning appears unlikely.

**D51****Learning and memory impairments secondary to ethylene dichloride exposure***Marceaux JC, Dilks LS, Matzenbacher DS, Mayeaux BD*

**Objective:** Ethylene dichloride (EDC) is an organic solvent used in the production of cleaners and plastics. It is a neurotoxin which has adverse effects at one part per million, resulting in close monitoring by numerous government agencies. Previous research into the neurocognitive consequences has demonstrated impairments regarding expressive language, working memory and executive functions. This study focused on adverse effects regarding learning and memory. **Method:** Seventeen individuals exposed to EDC underwent neuropsychological evaluations in 2004. Individuals varied in age from 33 years to 53 years, with a mean age of 44 years. A control group consisted of 60 individuals without any neurological damage or exposure to toxic chemicals. These individuals varied in age from 18 to 67, with a mean age of 29 years. Fourteen individuals exposed to EDC and 14 controls were assessed using the Rey Auditory Verbal Learning Test (RAVLT) and all participants were administered the Wechsler Memory Scale, Third Edition (WMS-III). **Results:** The results of this study indicate significant deficiencies in learning and memory for individuals exposed to EDC. For example, the exposed group ( $M = 85.35$ ,  $S.D. = 14.86$ ) had significantly lower mean scores in the area of general memory than the control group ( $M = 98.40$ ,  $S.D. = 13.92$ ),  $t(75) = -3.361$ ,  $P = .001$ . **Conclusions:** Those exposed are likely to have difficulty encoding, managing, storing, and providing output of verbal material. Any further advance in cognitive reorganization appears unlikely.

**D52****Neuropsychological effects of wood preserving chemicals***O'Jile JR, Finlay CG*

**Objective:** This study was conducted to determine the neuropsychological deficits associated with exposure to chemicals emitted from a wood treatment plant. Such plants use creosote and pentachlorophenol, discharging these chemicals into the air, ground, and water supply. Health of nearby residents can be affected. Adverse physical effects include cancer, birth defects, premature birth, and respiratory and neurological injury, but neuropsychological sequelae are less well documented. **Data selection:** In this study, a comprehensive neuropsychological evaluation was conducted on nine individuals with chronic exposure to these compounds through environmental contact. Neuropsychological measures included the Wechsler Adult Intelligence Scale-III (WAIS-III), California Verbal Learning Test-II (CVLT-II), Rey Complex Figure, Trail Making Test (TMT), Auditory Consonant Trigrams (ACT), Wisconsin Card Sorting Test (WCST), motor and sensory measures (finger tapping, finger sequencing, graphesthesia, and grooved pegboard), verbal fluency, and Boston Naming Test. **Data synthesis:** While all but one case demonstrated an IQ in the normal range, these individuals demonstrated the most significant difficulties with verbal memory (CVLT: 33%), working memory (ACT: 77%), conceptualization (WCST: 33%) finger tapping and finger sequencing (55%), and graphesthesia (33%). Other areas assessed were relatively unaffected with impaired functioning noted for 22% of the cases or less. Severity of deficits seen were primarily in the mildly to moderately impaired range. **Conclusions:** While these findings are consistent with the findings of some investigators, the literature is contradictory because most exposures involve more than one

toxin, making attribution of effects problematic. More controlled research is needed to better determine cognitive effects of these chemicals.

### **D53**

#### **Memory functioning consequent to pesticide exposure**

*Mayeaux BD, Dilks LS, Marceaux JC, Turner D*

**Objectives:** Eleven children exposed to 2,4-dichlorophenoxy acetic acid (2,4-D), pendimethalin (Prowl), and Diuron were assessed 50 months post-exposure for memory functioning. These chemicals are easily absorbed and can cause lymphatic cancer in exposed humans and brain tumors in rats. The children were attending a school adjacent to a corporate farm, which should have notified school officials when spraying was going to take place. **Method:** Children in the study were between the ages of 7 and 14. They were from the same community and were exposed to a single dose. Parent interviews revealed that none of the children had a prior history of acute or chronic exposure. The Wide Range Assessment of Memory and Learning, First edition (WRAML) is comprised of nine subtests in three realms. It yields information regarding immediate, recent, visual, and verbal memory, which combines to offer a total memory index. Children were assessed on an individual basis by a trained assistant. Testing took approximately one hour and ten minutes per child. **Results:** The results of this study indicate a significant impairment in visual memory, with the mean of the exposed children being 2 standard deviations below a normal population. Other realms of memory seem to be unaffected by pesticide exposure. **Conclusions:** The clients' demonstrated a significant weakness in visual delayed memory with other realms within normal limits. This may reflect a specific handicap related to accessing long-term information. Considering the time since exposure, the clients' handicaps appear to be permanent.

### **D54**

#### **The consequences of misdiagnosis: a case study of lead poisoning identified as ADHD**

*Turner D, Dilks LS, Mayeaux BD, Marceaux JC*

**Objective:** Misidentification of signs and symptoms by knowledgeable individuals can result in inappropriate treatment programs, which have long-term consequences. The behavioral manifestations of ADHD and lead poisoning are similar with distractibility, agitation and hyperactivity being notable. **Method:** This individual was an 18-year-old male who underwent a neuropsychological assessment by Louisiana Rehabilitation Services following standardized procedures using 28 instruments over a period of 7 h. The participant in this case study was diagnosed with ADHD at the age of five with reevaluation at seven due to a poor response to medication. At that time blood levels were found to have high concentrations of lead and appropriate medical treatment was initiated. **Results:** Test results for this individual at age 18 were significant for deficiencies in executive functions, specifically attention and concentration, language processing, word generation, and perceptual-motor functions. Significant behavioral features included chronic depression, irritability, low self-esteem and anxiety. A significant reading impairment was also revealed. **Conclusions:** The client demonstrates significant features of chronic toxic exposure more than 10 years post-treatment. Though his intelligence is in the average range, he demonstrates significant neurocognitive weaknesses

and behavioral abnormalities as a consequence of his prolonged exposure. Diagnosis of ADHD from cursory observations is risky and may delay or circumvent appropriate treatment.

#### **D55**

##### **Neurocognitive recovery from hypothyroid dementia after thyroid replacement therapy**

*Locketz AJ, Bergquist TF, Rohe DE*

**Objective:** To describe improvement in neuropsychological function seen in a patient with severe hypothyroidism after a year of thyroid replacement therapy (TRT). **Method:** The patient is a 63-year-old woman with a past medical history of steroid dependent Rheumatoid arthritis and major depressive disorder. She had a left hip arthroplasty revision 5 days prior to admission to the rehabilitation unit. On admission she appeared older than her age, her mannerisms were slow, and her voice was low. Her plasma thyroid stimulating hormone level was 33.8 ml U/L (normal 0.3–5.0 ml U/L) and her plasma thyroxine level was undetectable. She was started on TRT. Brief neuropsychological assessment which included the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) was obtained to document any cognitive impairment. Comprehensive neuropsychological reassessment was obtained 1 year later. **Results:** The initial RBANS Total Scale Score was at the 3rd percentile. Her premorbid intellectual ability was estimated to have been at the 90th percentile. Repeat testing 1 year later demonstrated a reversal of all cognitive deficits as exemplified by attainment of a WAIS III Full Scale IQ Score of 113 (81st percentile). In addition, her depression resolved as evidenced by a normal score on the Beck Depression Inventory. **Conclusions:** The commonly held view that hypothyroid dementia is a largely reversible condition is only partially supported by the medical literature. This case illustrates the profound cognitive and affective changes that can occur with hypothyroidism and the dramatic improvement that can occur with appropriate medical therapy.

#### **D56**

##### **The clinical significance of cognitive changes in Parkinson's disease**

*Higginson CI, Wheelock V, Sigvardt K*

**Objective:** Use a questionnaire to explore the clinical significance of neuropsychological deficits exhibited by a sample of Parkinson's disease (PD) patients. **Method:** Fifty-five non-demented PD patients [age = 62.0 (9.9) years] referred to a functional neurosurgery service completed clinical tests of attention, memory and executive function. Patients and caregivers also completed a 39-item questionnaire rating patients' ability to perform everyday cognitive tasks. Twenty-one healthy older adults [NC; age = 65.0 (10.5) years] completed the same tests and questionnaire. *t*-tests were calculated to compare: (1) PD and NC test performance, and (2) PD and NC questionnaire ratings. Correlation coefficients were calculated to measure the relationship between: (1) PD and caregiver questionnaire ratings, and (2) test performance and questionnaire ratings. **Results:** The PD group performed significantly worse than the NC group on tests of attention, abstraction, reasoning, problem solving, and immediate and delayed memory. The PD group also reported significantly more difficulty than the NC group with everyday tasks involving attention, executive function, and recent and prospective memory. Correlations between patient and caregiver questionnaires ranged in value between .37 for attention tasks

to .52 for prospective memory tasks. In general, patients' test performance was not highly correlated with questionnaire ratings. Conclusions: Results suggest that the cognitive changes experienced by non-demented PD patients impact their daily functioning; however, there is only marginal agreement between patients' neuropsychological test performance and ratings of their everyday cognitive difficulties.

#### **D57**

##### **Neuropsychological functioning in veterans with hepatitis C**

*Huckans MS, Nelligan J, Lisa M, Weniger R, Plowhead A, Williams E, Bjornson D, Linardatos E, Socherman R, Hauser P*

Objective: To evaluate cognition in veterans with hepatitis C (HCV). Method: Fourteen veterans with HCV were recruited from the Portland VA Medical Center as part of an on-going study (age =  $49.8 \pm 4.7$  years; 93% male; 93% Caucasian; education =  $13.5 \pm 2.4$ ). Participants were excluded for current substance abuse, severe mental illness, interferon therapy, traumatic brain injury or medical conditions causing cognitive impairment. Participants were administered: California Verbal Learning Test-II (CVLT-II); Rey Complex Figure (RCF)-Copy; Trails A and B; WAIS-III Digit-Span, Letter-Number Sequencing, Matrix Reasoning, and Digit-Symbol; Grooved Pegboard; Finger Tapping; D-KEFS Color-Word Interference, Categories, and Proverbs; and Letter/Category Fluency. Results: One-sample *t*-tests did not reveal differences between our sample's mean standard scores and that of normative samples on any tests ( $P > .05$ ). According to  $\chi^2$  analyses, relative to normative samples, a significantly higher percentage of veterans scored in the impaired range ( $z < -1.0$ ,  $P < .05$ ) on: CVLT-II delayed recall and recognition; RCF-Copy; Digit-Symbol; Finger Tapping; and Letter Fluency. According to Fisher's exact tests, a significantly higher percentage of veterans scored in the impaired range ( $z < -1.0$ ,  $P < .1$ ) on: CVLT-II delayed recall and recognition; Digit-Symbol; and Finger Tapping. Conclusions: Our data suggests that relative to normative samples a significantly higher percentage of veterans with HCV perform in the impaired range on certain neuropsychological tests. Future studies with larger sample sizes should determine which factors contribute to impairment.

#### **D58**

##### **Neuropsychological characteristics of nonverbal learning disabilities in an adult rehabilitation sample**

*Ferrari M*

Objective: Persons identified with learning disabilities are usually children with verbally-based disorders. However, nonverbal LD forms are recognized. Indeed an NVLD syndrome has been discussed, though it lacks firm diagnostic criteria, and prevalence remains unknown. This study examined neuropsychological characteristics of LD adults in a rehabilitation setting with attention to nonverbal learning disorders. Method: One thousand consecutive referrals in a Vocational Rehabilitation service were reviewed. Six hundred and fifty-six cases with sufficient neuropsychological test data were analyzed by disability type/diagnosis. Results: One hundred and twenty-five cases (19.1%) referred for evaluation already carried an LD diagnosis. No cases had a diagnosis of NVLD. Individual assessments confirmed LD in 111 cases (88%). Reasons



for diagnostic nonconfirmation related to generalized MR, absence of verbal-performance or IQ-achievement disparities, or salient psychological/physical impairments. Mean Full Scale IQ for the sample was 83.9 (S.D. = 10.7). 3.6% of LD adults were given diagnoses of nonverbal learning disorders. All had P > V disparities greater than 1.5S.D., high average vocabulary scores, deficient Block Design (mean 4.5), average reading and spelling, but low arithmetic (79.4). Visual-spatial deficits, poor Line Orientation, Hooper Test, and impaired complex visual-motor function (Trail Making) were frequent in adults with nonverbal disorders. All had social difficulties at work. Conclusion: In contrast to verbal LDs, disorders of nonverbal learning are rarely recognized in adults. Nonetheless, they have significant cognitive, vocational and social challenges. Appreciation of the multiple manifestations of LD and better utilization of neuropsychological data in meeting the needs of adults is discussed.

### **D59**

#### **Predictors of Trails B and phonemic fluency performance in intractable epilepsy**

*Sachs BC, Seignourel P, Bauer R*

Objective: We sought to determine the factor structure of a battery of neuropsychological tests in a group of pre-surgical epilepsy patients. We were particularly interested in the factor structure of so-called “executive functions” in this population. Method: Neuropsychological data were collected from 150 patients with intractable non-lesional epilepsy undergoing a routine pre-surgical evaluation at the Comprehensive Epilepsy Center at the University of Florida. A structural equation model including 18 variables grouped into five factors (language, verbal and visual memory, visuomotor speed, and executive functioning) was tested, with performance on Trails B and phonemic fluency as two additional, single-variable dependent factors. Results: The structural equation model yielded an acceptable fit to the data,  $\chi^2(149, N = 150) = 177.26, P > .05, RMSEA = 0.035, NFI = 0.96, RFI = 0.95, RMR = 0.053$ . Verbal fluency was significantly predicted only by language ( $b = 0.34$ ) and visuomotor speed ( $b = 0.21$ ), and Trails B was significantly predicted only by visuomotor speed ( $b = 0.81$ ). Neither was significantly predicted by the executive factor. Conclusions: For patients with intractable epilepsy, performance on Trails B and phonemic fluency do not seem to represent what is traditionally thought of as skills of “executive functioning”, but load on speed and, for phonemic fluency, on language factors. Caution is urged in interpreting deficits in these measures as indicative of frontal-executive dysfunction in surgical epilepsy candidates.

### **D60**

#### **Neuropsychological effects of low-grade brain tumors**

*Lowry J, Shera D, Armstrong C, Giovannetti T, Chute D*

Objective: The neuropsychological effects of low-grade brain tumors (LGBTs) are not well known. Although focal damage may occur, studies more often report diffuse cognitive deficits. Nonetheless, few studies differentiate between tumor grades. In this study, we sought to better understand the neuropsychological profile of persons with LGBTs. Method: Subjects with histologically confirmed LGBTs ( $n = 81$ ) were recruited from the Hospital of the University of Pennsylvania Brain Tumor Clinic following diagnosis and surgery. Each subject underwent a comprehensive battery including the following domains: attention, processing speed,

language, memory, sensory and motor functions, visuospatial and intellectual processing. An exploratory principal component factor analysis (PCA) with extraction was used to generate components with an eigenvalue of at least 1. Cognitive variables were excluded if there was non-ignorable missing data, resulting in 37 total variables included in the analysis. Results: The PCA revealed only one emerging factor (eigenvalue = 9.22; 25.6%), and appeared to represent more than one domain of functioning, comprising visual and verbal memory (acquisition and retention), attention/working memory, and aspects of word fluency measuring disinhibition (i.e., perseverative responses). Conclusion: The single factor that emerged in this study evidences the strength in the relationship of the measures shown in the literature to represent the pattern of mild diffuse cognitive deficits. This lends support to the notion that LGBTs affect networks that are widespread, rather than focal, and that functions involving multiple systems, such as memory or executive functions, may be particularly sensitive to tumors in any location.

## **D61**

### **Personality characteristics and drug recovery**

*Rosselli M, Simmers C, Shehadeh N, Osorio K, Sadkin B*

**Problem:** Psychoactive substance use has been associated with mood, conduct and personality disorders. Antisocial personality and depression symptoms have been commonly found in this population. However, little is known about the association of these personality characteristics and the treatment outcome. **Objectives:** (1) To compare the personality characteristics of cocaine-dependent participants who successfully completed a drug treatment program with chronic cocaine-dependent participants who quit the rehabilitation program or relapsed before finishing it. (2) To analyze the potential value of personality test scores in predicting treatment outcome. **Method:** Scores on the Personality Assessment Inventory (PAI) were collected on 21 male chronic cocaine users who had successfully completed a 3-month residential substance rehabilitation treatment program and compared to 23 chronic cocaine users who quit the program before completion. The two groups did not significantly differ in age ( $F=0.37$ ;  $P=.85$ ) or education ( $F=0.07$ ;  $P=.78$ ). The two groups had a similar substance use background. **Results:** Analysis demonstrated lower mean  $T$  scores for “schizophrenia” and “depression” PAI scales in those participants who successfully completed the program. These scales significantly ( $P<.05$ ) predicted the treatment outcome. **Conclusions:** Findings supported the possibility that personality measures may be used to identify chronic cocaine users who are at risk for unsuccessful treatment outcome.