

Abstracts

**National Academy of Neuropsychology  
Abstracts from the 26th Annual Meeting, San Antonio, Texas,  
October 25–28, 2006**

Convention Abstracts Accepted under the Guest Editorship of  
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## ADULT GRAND ROUNDS

**Moderator: Rick Naugle**

### AGR1

#### **Neuropsychological consultation in infectious diseases: Pathogenesis and neuropsychological sequelae in herpes simplex encephalitis**

*Pimental PA, Gregor MM*

**Objective:** Neuropsychologists can find new avenues of consultation-liaison in the area of infectious disease. Herpes simplex encephalitis is an acute or subacute sporadic encephalitic illness. It has a predilection for the medial temporal lobes, the orbital surface of the frontal lobes, and subcortical structures such as the hippocampus. **Method:** The present case study involved a left-handed, 66-year-old, white male with herpes simplex encephalitis whose EEG was abnormal with 4–5 Hz background and diffuse 1–3 Hz activity consistent with a generalized cerebral process of non-specific etiology. MRI of the brain revealed abnormal signal intensity in the left temporal lobe, extending into the left hippocampus and insular cortex. **Results:** Neuropsychological testing via the WASI revealed a FSIQ of 109, and a significant 24 point gap between the PIQ (124) and VIQ (96). The WMS-III revealed a significant 20 point gap between the visual immediate index (88) and the auditory immediate index (68). There was also a significant 24 point gap between the visual delayed index (88) and the auditory delayed index (64). The patient also demonstrated a language disorder, most like an anomic aphasia, characterized by circumlocutory language and word retrieval difficulties. **Conclusion:** In summary, the patient exhibited a predominance of amnesic and aphasic features. Lesions were localized to the left temporal lobe, left hippocampus, and left insular cortex, correlating with MRI findings. Neuropsychological testing proved to be of significant value in identifying important areas for neurocognitive rehabilitation in this case of herpes simplex encephalitis.

### AGR2

#### **A case of early-onset idiopathic Parkinson disease (PD)**

*Meersmans M, Puente A, Escamilla-Sevilla F, Lopez-Jimenez A, Santiago-Ramajo S, Katati M, Martin-Linares J, Minguez A, Arjona V, Perez-Garcia M*

**Objective:** To investigate neuropsychological profile of a woman with short history of early onset PD. **Method:** A 27-year-old woman reported a >1 year history of rigidity and motor slowness in lower extremities, mild dysarthria, insomnia, swallowing difficulties. She was referred to neurologist by company physician. She is right-handed and completed 12 years-education. She was under pharmacologic treatment with levodopa and dopaminergic agonists. Besides neurological, neuroimaging, and genetic studies, she underwent exhaustive complementary neuropsychological assessment. **Results:** She presented with right hemiparkinsonism with good response to levodopa and mild dysarthria. Brain SPECT study with ioflupane showed low uptake in left-putamen. Genetic study showed no mutations of Parkin gene. She showed mild depressive symptoms with apathy and non-pathological personality profile characterized by dependence, anxiety, histrionic traits. Her neurocognitive index indicated normal intelligence (IQ = 103; WAIS-III) and her performance was normal (%ile = 16) in basic perceptive, mnesic and attentional functions, and in language, fluency and subcomponents of executive functions. Her processing speed and working memory were above average (%ile = 84). However, performance in tests of other subcomponents of executive functions was below normal (%ile < 16). **Conclusions:** The detection and study of a patient with PD of rigid-akinetic predominance in Hoehn & Yahr stage 1 is uncommon. Her neuropsychological profile showed mild frontal dysfunction characterized by reduced planning capability, change in attentional set and greater impulsivity and apathy. This profile at the onset of PD is consistent with a pattern of fronto-subcortical involvement that is frequently observed in older patients with PD.

### AGR3

#### **A case study of adult Moyamoya disease: Pre-operative neuropsychological findings**

*Macias A, York MK*

**Objective:** First described in Japan, Moyamoya disease (MMD) is a rare, progressive cerebrovascular disorder caused by arterial blockage in the arteries that feed the Circle of Willis. Neurocognitive evaluations in adults with MMD are minimal, with most cases assessing intellectual abilities but not focal cognitive deficits. **Method:** A comprehensive

neuropsychological evaluation was conducted with a 53-year-old, right-handed, African-American male with 12 years of education who presented with acute onset of a right-sided hemiparesis and aphasia 2 months prior to evaluation. Arteriogram demonstrated occlusion of left-sided A1 and M1 vessels with right A1 collateralization and critical stenosis. SPECT images demonstrated reduced perfusion of the left frontal and parietal lobe and the right temporal lobe. The patient was scheduled to undergo an arterial bypass. Results: Intellectual functioning and academic achievement were in the borderline range. Neuropsychological testing results were within the deficient range across domains with the exception of letter fluency and set-shifting which were in the borderline range. A formal evaluation for aphasia was within the average range and non-verbal concept formation ranged from within the borderline to the below average range. Fine motor skills were deficient for his dominant hand and in the below average range for his non-dominant hand. Immediate and delayed recall of verbal and non-verbal material was deficient. Conclusion: While symptoms of aphasia appear to be improving, neuropsychological results demonstrate both global and focal cognitive dysfunction as a result of multiple cerebrovascular events. Post-operative evaluation of cognitive changes to follow.

## FORENSIC GRAND ROUNDS

**Moderator: Robert L. Denney**

### FGR1

#### **Validity of cognitive and somatic complaints in a case of mild TBI**

*Clement PF*

**Objective:** This presentation addresses the issue of validity of cognitive and somatic complaints in a case of mild TBI when symptoms have persisted past the typical length of time. A related issue is the possible dissociation of validity for cognitive versus somatic symptoms. **Method:** The patient was a 40-year-old female, who reported continuing cognitive symptoms and headaches 18 months post a mild TBI and who was involved in litigation. MRI findings indicated scattered areas of non-specific white matter signal abnormality. Neuropsychological evaluation of the patient included WAIS-III, HRB, Wisconsin CST, measures of attention/concentration and memory, the TOMM, MMPI-2 with special attention to the Lees-Haley FBS, PAI, and BDI-2. **Results:** The patient obtained a FSIQ score of 110. Evidence for clinically mild cognitive inefficiency was seen on measures in the battery that might be expected to be most sensitive to subtle impairment. Validity scales for the MMPI-2 and PAI were within normal limits, but the patient produced elevated scores on the Hs and Hy scales from the MMPI-2, raising issues of affective involvement. Her Lees-Haley FBS score of 24 raised the issue of the validity of somatic symptoms. **Conclusions:** The patient's findings on cognitive testing were very consistent with her self-report of cognitive symptoms, and were seen as valid. The neuropsychologist could not rule out the possibility of emotional factors, which might have played a role in sustaining somatic symptoms. The patient and the insurance company settled out of court.

### FGR2

#### **A competency evaluation of a deaf defendant with a history of TBI**

*Cohen BL*

**Objective:** This presentation examines strategies for evaluating the competency of deaf individuals. It uses the case of a 39-year-old man, charged with 14 sexually-related charges including rape and aggravated indecent assault against his two minor daughters. I was asked by his attorney to evaluate his overall cognitive abilities and whether he was competent to stand trial. **Method:** My evaluation of the defendant included a review of records (medical, educational, legal), an interview with the defendant and defendant's parents, 19.75 h of direct contact with the defendant, administration of a comprehensive battery of neuropsychological tests, and administration of the Georgia Court Competency Test-MSH Revision. **Results:** Results reveal a significant decline in global functioning since earlier evaluations, poor academic performance with generally impaired language-based performance and arithmetic in the low average range (a pattern consistent with what is typically seen in deaf individuals), impaired performance on tasks in nearly every cognitive domain, impaired performance on the GCCT, good performance on tasks of effort, and a lack of general knowledge regarding the role and function of the main individuals involved in a court proceeding including his ability to help his attorney in preparing his case. **Conclusion:** Based on this neuropsychological assessment, I determined that the defendant was not competent to stand trial, but offered multiple recommendations to help his attorney work with him.

**FGR3****Dementia, pseudodementia or malingering? Neuropsychological assessment of reported dementia in a criminal forensic case***Gourley EV*

**Objective:** The presentation addresses complex issues in a second opinion evaluation to address prior findings of dementia in a case addressing competency to stand trial. **Method:** The patient was a 67-year-old man who had been twice diagnosed with dementia, likely Alzheimer's type. Collateral medical records suggested onset of memory problems preceded his legal charges. He was administered a comprehensive neuropsychological battery including WAIS III, WMS III and symptom validity testing. Patient's IQ was 123, having improved 19 points from the prior evaluation. Memory testing also showed improvement in several areas from the prior evaluation. At the same time, results from validity testing using the TOMM and Victoria Symptom Validity Test were indicative of possible exaggeration. MMPI-2 (F scale *t*-score of 120) and the Neuropsychological Impairment Scale were also indicative of possible over-reporting of symptoms. **Conclusions:** The significant improvement in test results provided information inconsistent with progressive dementia. Factors such as depression and the effect of prescription drugs (e.g. valium and oxycontin) may have affected prior test results. The paradoxical findings of significant improvement in cognitive testing from prior evaluations coupled with symptom validity testing suggesting possible poor effort show the complexities of addressing motivation and effort in forensic cases.

**PEDIATRIC GRAND ROUNDS****Moderator: Philip Fastenau****PGR1****Alexia without agraphia in a left-handed adolescent male following TBI***Brady K, Cole W, Harder L, Speedie L, Zabel TA*

**Objective:** Alexia without agraphia, or acquired inability to read without a corresponding deficit in writing, is a rare disturbance, typically caused by infarction in the left posterior cerebral artery territory that affects both the left visual cortex and the posterior corpus callosum. This disconnection syndrome is uncommon in children/adolescents, and is described within the context of the adolescent's post-injury rehabilitation. **Method:** We present the neuropsychological functioning and brain imaging of a left-handed adolescent with a developmental history of language delay who experienced TBI secondary to motor vehicle crash. Early injury variables include an initial GCS score of 5, several days of extremely elevated intracranial pressure, and an extended period of PTA. **Results:** Initial CT indicated multiple intracranial contusions, SAH, and DAI. During rehabilitation, he presented with alexia without agraphia, color agnosia, and prosopagnosia. Clinical MRI scans obtained during rehabilitation 6 months post-injury revealed a large lesion within the splenium of the corpus callosum, and extensive diffuse white matter abnormality particularly in posterior regions. Surprisingly, ophthalmological evaluation revealed a left homonymous hemianopsia, suggesting right geniculocalcarine involvement. Moreover, dichotic listening revealed a right ear suppression, suggesting left ear/right hemisphere preference for language processing. **Conclusion:** This case study describes a disorder typically attributed to a localized insult that can also be seen in the more diffuse damage characteristic of TBI. The unusual combination of alexia without agraphia and right posterior injury were thought to be due to ischemia related to elevated intracranial pressure in an individual who was likely right-hemisphere dominant for language.

**PGR2****Neurocognitive and behavioral outcomes of childhood acute lymphoblastic leukemia: A longitudinal case study***Krull K*

**Objective:** Advances in medical treatments have lead to increased survival rates for childhood acute lymphoblastic leukemia (ALL). However, up to 40% of children who survive ALL suffer from neuropsychological impairment. Systemic and/or intrathecal Methotrexate (MTX) and corticosteroids have been associated with attention problems, slowed information processing speed, and visuomotor dysfunction. A longitudinal case study will be presented to illustrate common outcomes following chemotherapeutic treatment. Genetic risk factors for these outcomes will also be discussed. **Method:** A 7 year-old male was evaluated at four time points following diagnosis with ALL: induction,

consolidation, and maintenance therapy, and at long-term follow-up (i.e. 5 years post-diagnosis). Neurocognitive and behavioral data was collected and analyzed in reference to central nervous system (CNS) integrity and genetic predispositions. The potential role of Glutathione S-Transferase (GST) and Methylenetetrahydrofolate Reductase (MTHFR) polymorphisms was examined. Results: Initial evaluations revealed a pattern of acute neurotoxicity followed by a return to baseline functioning. Toward the end of maintenance therapy, slowed information processing and visuomotor declines became apparent. Furthermore, significant attention problems were reported on behavioral ratings. Changes were analyzed in reference to an oxidative stress model of CNS damage. Conclusions: This case demonstrates a relatively common pattern of late effect deficits in survivors of childhood leukemia. In addition, it illustrates the potential moderating role of genetic polymorphisms in explaining group outcome variability. Implications for interventions to rehabilitate and possibly prevent deficits are discussed.

### **PGR3**

#### **Neuropsychological deficits in a sleepy child**

*Beebe D*

Objective: This hypothetical case blends the history and course of several clinically-referred children to illustrate one structured method for assessing for pediatric sleep problems and to show the relevance of sleep in understanding and addressing neuropsychological deficits. Method: An 8 year-old boy with a history of febrile seizures was referred because of concerns about academic and behavioral difficulties. Prior MRI and EEG were normal. He was not taking any medications. He and his mother were interviewed and he underwent neuropsychological evaluation. Based upon the findings, he underwent medical treatment and was seen again for a consultation 6 months later. Results: During the baseline testing, he scored normally in all cognitive domains except sustained attention and impulse control. He was observed to be easily distracted, impulsive, and irritable during the testing, behaviors that were noted to be even more prominent in “real world” settings. A semi-structured sleep screening indicated that he had symptoms of sleep-disordered breathing, nocturnal restlessness, occasional bedwetting and night terrors. He was referred to a sleep specialist, who diagnosed obstructive sleep apnea. A subsequent ENT evaluation suggested enlarged adenoids and palatine tonsils. After recovery from an adenotonsillectomy, the patient was seen again for a brief consultation. Attention test scores had normalized. His mother indicated that his daytime behaviors had improved to the point that they were manageable through behavioral interventions. His nocturnal symptoms were also much improved. Conclusions: Daytime neuropsychological functioning is multiply-determined. Pediatric neuropsychologists should be aware of the multiple relationships between sleep, neurological, and neuropsychological functioning.

### **Poster Session A**

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

### **A1**

#### **Differential diagnosis of dementia: Examining the clinical utility of the 7-minute screen**

*Fowler SC, Stabb SD*

Objective: To assess the usefulness of the 7-min screen (7MS) as a tool for screening and differential diagnosis of dementia. Method: Two-hundred and forty memory clinic outpatients, predominantly female, roughly half Caucasian and half non-White, ages 37–95, from a large southwestern county hospital were sampled. Data from routine assessments of all patients with complete protocols for a 24-month period were assessed for the primary study variables; performance on the memory subscale of the 7MS and computed tomography scan (CT). Results: Alzheimer's participants had a negative CT (Nagelkerke  $r^2$  analogue = 0.037) and scored significantly poorer than vascular dementia patients on the 7MS memory subscale ( $p < 0.001$ ). After delay, Alzheimer's patients demonstrated a high number of uncued errors and little benefit from cuing. Two distinct patterns of recall emerged for Alzheimer's versus vascular dementias ( $p < 0.001$ ). Strong effect for un-cued recall was maintained across ethnicity and education. Cross-validation predicted 89.5% of vascular and 62.8% of Alzheimer's participants (Nagelkerke  $r^2$  analogue = 0.39). Conclusion: There are currently no reliable cognitive markers for Alzheimer's versus vascular dementias, as the often-used Mini Mental Status Exam has a number of significant limitations. Missed recognition of cognitive impairment may compromise medication compliance, patient safety and co-morbidity issues. The 7MS may fill a significant void in the diagnostic

process. The strong effect for uncued errors and the clear differences in patterns of scores may add diagnostic clarity to early detection of Alzheimer's dementia.

## A2

### **The effect of comorbid depression on the cognitive performance of patients with alzheimer-type dementia**

*Noggle CA, Hall JJ, Neal TJ, Hiller TR, Dean RS*

**Objective:** Studies have reported 40% of patients with Alzheimer-type dementia (DAT) have symptoms of depression (Holtzer et al., 2005) while others have reported numbers as high as 50% (Reifler, 1982). While the presence of comorbid depression in DAT has been outlined in the literature, the effect it has on patient's cognitive functioning is not clear. Research (e.g. Jorm, 2000) has proposed that DAT patients with comorbid depression demonstrate increased disability; however, the areas in which this increased decline occurs has rarely been discussed. The present study compared the performance of DAT patients with and without depression on the cognitive portion of the Dean-Woodcock Neuropsychological Assessment System. **Method:** The current sample consisted of 85 individuals, 55 of which had been diagnosed with Alzheimer-type dementia (DAT). Each participant received, as part of a comprehensive neuropsychological battery, seven cognitive tests that were selected from the Woodcock-Johnson III-Tests of Cognitive Abilities (WJ-III, Woodcock, McGrew, & Mather, 2001). **Results:** Results of a discriminant analysis found that indeed patients diagnosed with DAT differed significantly ( $p < 0.001$ ) from normals on the subtests of the WJ-III with the normals performing significantly better. However, when compared, DAT patients with comorbid depression were not significantly different then those patients without depressive symptoms. **Conclusions:** While research has proposed DAT patients with comorbid depression demonstrate increased disability the present study failed to support this. While comorbid depression is important to recognize in the treatment of DAT, the current study did not find evidence to indicate it increases cognitive impairment.

## A3

### **Assessment of dementia: The effect of acquiescence response bias and question content complexity on the logical memory recognition subtest of WMS-III**

*Serova SA, Hall JR, Franks SF, Kaiser KA*

**Objective:** Logical memory recognition (LMR) subtest of WMS-III is commonly used in neuropsychological assessment to distinguish between storage and retrieval memory problems, and to discriminate between Alzheimer's (AD) and vascular (VaD) dementias. We hypothesized that due to acquiescence response bias (ARB), individuals would give significantly more affirmative responses than negative responses on LMR. In addition, we explored effects of content complexity of questions on performance. **Method:** LMR was administered as part of the neuropsychological evaluation of dementia to the clinical sample of 223 geriatric patients that included five diagnostic categories: AD, VaD, cognitive disorder NOS, mixed dementia and other. We classified each question on LMR according to two criteria: correct answer ("Yes" or "No") and content complexity (simple or complex). Questions with "Yes" as the correct answer are subject to ARB. **Results:** ANOVA indicated a significant difference in total scores on LMR for five diagnostic categories. Analysis indicated presence of a strong ARB across all groups. Analysis of response patterns for four types of questions revealed differences between five diagnostic categories. **Conclusions:** Performance on questions with "Yes" as the correct answer, being affected in part by ARB, has lower diagnostic value for dementia than correct responses to questions with "No" as the correct answer. Despite the presence of ARB, total score on LMR still reflects differences between AD and VaD. Key components of LMR are correctly answered "No" items. Clinicians should be cognizant of ARB when assessing patients. Qualitative analysis of LMR responses is suggested to yield useful clinical information in dementia assessment.

## A4

### **A neuropsychological interpretation of differences on the Rorschach among patients with possible dementia of the Alzheimer's type**

*Silva DM, Webbe FM*

**Objective:** We hypothesized that the Rorschach can be interpreted using a neuropsychological approach by categorizing specific variables into domains that may indicate certain neuropsychological deficits, namely problems with: (1) language, (2) abstraction, (3) memory, and (4) visuospatial organization. **Method:** Volunteers aged 64–85 were

selected from recently screened clients at the East Central Florida Memory Disorder Clinic. Individuals with no evident cognitive impairment ( $n = 15$ ) formed a control group. Individuals with possible mild-to-moderate DAT formed the experimental group ( $n = 14$ ). The groups did not differ in gender, age, or education. The comprehensive system was employed in Rorschach administration, with one modification: the inquiry was given immediately after free-association for the experimental group. Results: Of 26 variables analyzed, 10 differed between groups ( $p = 0.05$ ): deviant verbalizations, number of different content categories used, SumShading, SumColor, Blends, movement responses, WSum6, Popular, X+%, and Zf. The Rorschach showed particular sensitivity to deficits in language and memory. Deficits in visuospatial organization and abstraction were not observed. Language domain variables WSum6 and Blends differentiated between mild ( $n = 7$ ) versus moderate ( $n = 7$ ) sages of DAT ( $p = 0.05$ ). Conclusions: Even between patients with mild cognitive impairment and probable DAT, differences on the Rorschach were evident, indicating that the Rorschach was sensitive to neuropsychological deficits. This study contributes to the literature new information that variables X+%, WSum6, and Blends are most strongly indicative of differences between normal and cognitively impaired individuals. These results also suggest the possibility that subtle language changes may occur in early stages of DAT.

## A5

### **Educational and occupational attainment and their effect on cognitive impairment in Alzheimer's dementia**

*Renfrow S, Kohn L, Sindell D, Buddin H, Golden C*

**Objective:** Research has suggested that mental activity throughout the life span is correlated with recovery and compensation during brain damage later in life. Cognitive stimulation has been suggested to allow for better resistance to neurological disorders such as Alzheimer's dementia. The purpose of the current study is to assess any correlation between mental activity (i.e. educational and occupational attainment) and scores on the MMSE of AD outpatients. **Method:** This study's data was collected from the geriatric database of the Neuropsychological Assessment Center at Nova Southeastern University. Results of the MMSE of 93 Caucasian AD outpatients were reviewed and compared to their educational and occupational attainment. The mean age of the clients' was 82.70 with 32 males and 61 females. The mean education level was 11.92 years and the mean score on the MMSE was 18.96. Results: This results of the Pearson correlation revealed that education is not significantly correlated with scores on the MMSE ( $r = 0.135$ ,  $N = 93$ ). A deeper look into the occupational level of each client also revealed that while there is a significant correlation among occupation and education ( $r = 0.486$ ,  $N = 93$ ,  $p < 0.01$ ), there is no significant correlation among occupation and scores of AD outpatients on the MMSE ( $r = 0.141$ ,  $N = 93$ ). Conclusions: In conclusion, the idea that the level mental activity (i.e. educational and occupational attainment) throughout life has an impact on the MMSE scores of AD outpatients can not be supported by this study.

## **AGING AND DEMENTIA I: HEATHLY AGING AND COGNITION**

## A6

### **Progression determines benefits from the computer based brain fitness program in community dwelling elderly:**

#### **Analysis of 3 randomized controlled trials**

*Atkins SM, Belfor N, Wood RA, Joyce NM, Tinker DE, Chan SC, Mahncke HW, Merzenich MM*

**Objective:** We developed a brain-plasticity-based Brain Fitness Program (BFP) to enhance cognition in elderly. BFP is designed to exercises auditory and language systems, strengthen speech representation, improve signal-to-noise ratios, and drive neuromodulatory systems controlling learning and memory. Pilot trials of BFP in community-dwelling elderly identified a group of participants showing little training progress. We investigated demographic and neuropsychological differences between two groups, based on progression through the core training exercise (HOL). We hypothesized that high completers would improve on neuropsychological outcomes measures and low completers would not. **Methods:** BFP groups from three studies (108 participants) were divided into low completers, who completed  $<85\%$  of HOL ( $N = 22$ ), and high completers, who completed  $>84\%$  ( $N = 86$ ). Training was  $\sim 60$  min/day, 5 days/week, 40 sessions. Differences between the groups pre and post-training on the RBANS total score (RBANSt), RBANS Global Auditory Memory Score (AudMem), baselines on WTAR, MMSE, the composite mood scale (CMS) and demographics were analyzed. Results: High completers significantly improved on RBANSt and AudMem from pre- to post-training testing; low completers remained stable. There were no pre-training differences in age, education, gender, MMSE, WTAR, and

AudMem. High completers scored significantly higher on RBANSt, and lower on CMS. However both groups were not depressed, and were average on RBANSt. Conclusions: Generalized improvement on neuropsychological measures only occurs in high completers. This suggests that such improvement is driven by specific progression through the BFP and is not a non-specific consequence of exposure to a training program.

## A7

### **Gait and cognitive performance in older adults**

*Hall JJ, Noggle C, Hiller T, Neal T, Dean RS*

**Objective:** A recent study, Holtzer, Verghese, Xue, and Lipton (2006) found a relationship between cognitive factors and gait velocity in normal aging. One limitation noted by the authors was the need for replication with larger samples and using a wider spectrum of cognitive functions. Another problem noted was that clinical gait assessment was based upon clinical judgment rather than a standardized approach. The Dean-Woodcock Neuropsychological Battery (DWNb; Dean & Woodcock, 2003) includes a standardized measure of gait and station, as well as a detailed assessment of various cognitive processes based upon the CHC model of cognitive functioning. **Method:** The current study examined 413 individuals, ages 60 years and above, who were assessed using the D-WNB. Each participant received, as part of a comprehensive neuropsychological battery, 17 cognitive tests selected from the Woodcock-Johnson Tests of Cognitive Abilities-Third Edition (WJ-III) and the Gait with Station subtest from the Dean-Woodcock Sensory Motor Battery (D-WSMB). Multiple linear regression was utilized with Gait and Station (one score) acting as the dependent measure. **Results:** Results of multiple linear regression found that Gait and Station significantly explained 60% of the variance in the cognitive factors of the WJ-III. **Conclusions:** While other recent research has demonstrated a correlation between cognitive ability and gait in older patients, the measures relied heavily on clinical judgment. The current study demonstrates that gait with station, as measured on the Dean-Woodcock Sensory Motor Battery, is very effective in predicting cognitive performance in adults over the age of 60.

## A8

### **Improving memory and attention on two standardized tasks with auditory binaural beats**

*McMurray JC, Jetha SS, Katz GS, Kemtes KA*

**Objective:** This study tested whether auditory binaural beat stimulation (ABBS) could improve measures of working memory and attentional focus in healthy aging seniors. Previous research shows that ABBS elicits a frequency-following hemispheric normalization of deficient electroencephalographic (EEG)-measured alpha frequency brainwaves concurrent with healthy aging. **Methods:** Twenty healthy older adults aged 67–80 years were recruited from a university-based senior research participant pool. Participants had no hearing impairment, closed head injury, or seizure disorder, and were non-smokers. Digit span forward and backward tasks measured working memory, and a modified Conners' Continuous Performance Test 3.0 (CPT) measured attentional focus. 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 working memory ability, Wilks' Lambda = 0.395, 95% CI for the difference was  $-1.611$  to  $-0.689$ ,  $p < 0.001$ ; and significantly higher attentional focus, Wilks' Lambda = 0.451, 95% CI for the difference was  $-0.586$  to  $-0.180$ ,  $p = 0.001$ . Absolute alpha power was also significantly higher during the binaural beat phase, 95% CI for the difference was  $-11.739$  to  $-1.685$ , Wilks' Lambda = 0.291,  $p < 0.012$ . **Conclusions:** Significantly higher levels of working memory and attentional focus were associated with ABBS in the EEG alpha-frequency range. It is likely that ABBS may be effective in addressing age-related deficits in working memory and attentional focus in healthy seniors.

## A9

### **The relationship between fluid ability and sensory/motor functioning in older adults**

*Hall JJ, Noggle C, Hiller T, Neal T, Dean RS*

**Objective:** Past research has demonstrated that sensory and motor variables are related to the general factor of IQ (Lindenberger & Baltes, 1997). Indeed, Fleischmann (1994) argued that fluid ability is a key component of activities of daily living. It has also been shown that these activities of daily living are the first functions to decline in older adults (Holtzer, Verghese, Xue, & Lipton, 2006). The present study was designed to determine whether a specific factor of IQ, fluid ability, is related to sensory and motor functioning. **Method:** The sample consisted of 233 neurological and



psychiatric patients aged 65 years or older. Each participant received, as part of a comprehensive neuropsychological battery, the Woodcock-Johnson Tests of Cognitive Abilities-Third Edition (WJ-III COG), including a measure of fluid reasoning, and the Dean-Woodcock Sensory Motor Battery (D-WSMB). Results: Results of a multiple regression analysis produced an  $R=0.69$  which accounted for 47% of the variance in fluid reasoning and was explained by all 18 measures ( $R=0.690$ ) of the Dean-Woodcock Sensory Motor Battery (D-WSMB; Dean & Woodcock, 2003). Conclusions: The present study showed that fluid reasoning is related to sensory-motor factors. The results suggest that sensory-motor functioning may decline as fluid reasoning does. Therefore, deficits of sensory-motor functioning assessment can be predictors of deterioration of fluid ability and a decline in an older patient's ability to complete routine activities of daily living.

## A10

### **Correlates of self-reported cognitive complaints in adults with vascular disease**

*Hey CT, Moser D, Hynes S, Reese R, Haynes W*

Objective: To describe the relationships among cognitive test performance, psychological symptoms, and subjective cognitive complaints in older adults with atherosclerotic vascular disease. Method: Participants were 80 adults over the age of 55 with an unequivocal diagnosis of atherosclerotic vascular disease. Participants completed measures of neuropsychological functioning (repeatable battery for the assessment of neuropsychological status), psychological symptoms (Symptom Checklist 90-R), and two measures of subjective cognitive complaints (Cognitive Difficulties Scale, Cognitive Failures Questionnaire). Results: Bivariate correlations indicated that psychological symptoms (SCL-90-R Global Severity Index) were strongly associated with higher levels of cognitive complaints, while neuropsychological functioning (RBANS Total Scale Score) was only modestly associated. When entered together into a multiple regression analysis, psychological symptoms remained significantly associated with cognitive complaints (partial  $r=0.474$ ;  $p<0.001$ ) while neuropsychological functioning did not (partial  $r=-0.105$ ;  $p=0.369$ ). Conclusions: In this sample of older adults with atherosclerotic vascular disease, cognitive complaints were most strongly related to overall level of psychological distress and not to actual cognitive test scores. Therefore, psychological factors may play an important role in the phenomenon of self-perceived cognitive decline in geriatric populations.

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

## A11

### **Neuropsychological performance based on intensity of subarachnoid haemorrhage**

*Santiago-Ramajo S, Katati MJ, Verdejo-García A, Pérez-García M, Puente A, Meersmans M, Arjona-Moron V*

Objective: The main aim of this study was to examine possible differences on neuropsychological performance among patients with aneurysmal subarachnoid haemorrhage of different intensities. We investigated this intensity variable because, as far as we know, there are not consistent demonstrations of which variables do actually cause the neuropsychological deficits in these patients. Method: We administered a comprehensive neuropsychological battery to seventy inpatients from Hospital "Virgen de las Nieves" 4 months after having suffered aneurysmal subarachnoid haemorrhage. At the time of admission to the hospital we measured the intensity of the initial haemorrhage using the Fisher scale, based on computerized axial tomography (CAT). Twenty-four of these patients had a mild haemorrhage (Fisher  $\leq 2$ ), and 46 of them had a more severe haemorrhage (Fisher  $> 2$ ). Neuropsychological assessment included cognitive measures of language, visual memory, verbal memory, executive functions and visuo-spatial skills. To contrast performance of both groups we conducted independent-samples Student  $t$ -tests. Result: We found significant between-group differences on verbal memory [ $t(1, 68)=2.357$ ;  $p<0.021$ ], visuo-spatial skills [ $t(1, 68)=2.162$ ;  $p<0.034$ ] and language [ $t(1, 68)=2.172$ ;  $p<0.033$ ]. Conclusion: We can conclude that intensity of subarachnoid haemorrhage influences subsequent neurocognitive impairment, including impaired performance on verbal memory, perception and language skills. Patients with scores of 3 or 4 on the Fisher scale presented impaired neuropsychological performance. Very few studies had previously analyzed this intensity variable, what may contribute to the discrepancy of neuropsychological findings across different studies.

**A12****Neuropsychological sequela in a patient with a tumefactive demyelinating lesion***Raymond MJ*

**Objective:** This case study describes the neuropsychological sequela of a 34-year old, Caucasian, right-handed male who was eventually diagnosed with multiple sclerosis (tumefactive lesion). **Method:** Multiple sclerosis (MS) is a degenerative disease of the central nervous system which often presents with periventricular white matter lesions. In some instances, a form of MS (tumefactive demyelinating lesion) may be confused with a high-grade neoplasm (e.g. astrocytoma, glioblastoma) because of its presentation with a contrast-enhancing ring. Extensive background history, presenting symptomatology, and biopsy (pathology) will assist in determining a definitive diagnosis. Neuropsychological sequela in individuals with tumefactive demyelinating lesions might present with more focal neuropsychological involvement as opposed to other forms of MS. OK developed an acute onset of confusion and right hemiparesis on 1/16/03. A cerebral MRI identified a left parietal occipital mass lesion which initially was considered to be an anaplastic lesion (neoplasm). Following additional neurodiagnostics, he was diagnosed with a tumefactive demyelinating lesion. At 3 years post-onset, he was referred for baseline neuropsychological consultation. **Results:** Results of OK's neuropsychological evaluation (1/26/06) suggested globally reduced adaptive abilities as evidenced by scores on standardized neuropsychological indices (Halstead Impairment Index 1.0, Neuropsychological Deficit Scale 76). In conjunction with persistent dominant RUE sensorimotor alterations, OK also presented with mild disorientation and primary reductions in sustained attention/concentration, information processing speed, auditory perception, constructional praxis, and executive functions. **Conclusion:** This case underscores the importance of obtaining baseline neuropsychological data to assist in developing appropriate treatment recommendations.

**A13****Cognitive and mood sequelae associated with electrical injury and lightning strike***Boyd C, Drake AI*

**Objective:** Research suggests that survivors of electrical injury and lightning strike present with a spectrum of neuropsychological and psychological symptoms including memory impairment, attentional disturbances, conceptual difficulties, and mood disorders. Physical symptoms often include chronic pain and nerve damage. Evidence of entrance and exit wounds are not a consistent finding. **Method:** This case describes a 25-year-old active duty Marine who presented with a documented history of five electrical injury events and one documented episode of lightning strike. None of these incidents resulted in a loss of consciousness or entry/exit burns. He was diagnosed with chronic pain and somatoform disorder, two common misdiagnoses indicated in the literature since patients often present with vague physical complaints. Following the lightning strike, EMG and nerve conduction studies confirmed benign fasciculation syndrome. A brain MRI was normal. Since the first electrical injury in 2000, he reported migraine headaches, tinnitus bilaterally, and a decline in cognitive functioning. **Results:** Neuropsychological and psychological evaluations revealed attentional deficits and a diagnosis of PTSD, which are both consistent with the literature. Contrary to the literature, memory functions were intact; no conceptual difficulties were noted; and all other neuropsychological test scores were within the normal range. **Conclusions:** This rare case of multiple electrical exposures revealed mild attentional deficits and a mood disorder. However, it is difficult to determine if the mild deficits found are the direct result of multiple electrical injuries or if they have manifested from the symptoms of PTSD associated with these injuries.

**A14****Evaluating the presence of graphesthesia in patients with multiple sclerosis***Davis AS, Pass LA, Williams RN, Whited AR, Dean RS, Hudson B*

**Objective:** Sensory and motor disturbances are among the most prevalent and earliest reported symptoms of multiple sclerosis (MS). However, a review of the literature reveals a paucity of studies that employ a standardized approach in the assessment of sensory-motor skills in patients with MS. Tests for graphesthesia are classic measures of tactile discrimination, and graphesthesia has been related to clumsiness and problems with dexterity. The purpose of this current study was to compare a group of patients with MS with normal controls for the presence of graphesthesia. **Data selection:** This sample consisted of 35 individuals diagnosed with MS (mean age 44.56 years, S.D. = 8.46 years) and 207 individuals with no history of neurological or psychiatric impairment (mean age = 45.15 years, S.D. = 9.28 years). Each participant received, as part of a comprehensive battery, the Palm Writing subtests from the Dean-Woodcock Sensory

Motor Battery (DWSMB, Dean & Woodcock, 2003). Data synthesis: The MANOVA revealed that the change in the combined dependent variable of the tests for participants was significantly related to diagnosis, Wilks' Lambda = 0.922,  $F(2, 239) = 10.17$ ,  $p > 0.000$ . Subsequent univariate tests indicated that individuals with MS performed significantly worse on measures of right and left hand palm writing. Conclusions: The group of patients with MS demonstrated incidences of bilateral graphesthesia significantly greater than normal age-matched controls. This is a significant finding since the prevalence of graphesthesia in patients with MS is underreported in the literature. The implications will be reviewed for practitioners and researchers.

#### A15

##### **Evaluating the presence of astereognosis in patients with multiple sclerosis**

*Davis AS, Whited AR, Williams RN, Pass LA, Dean RS, Hudson B*

Objective: Difficulty in identifying simple objects by touch in the absence of visual stimuli (astereognosis) is a sensitive measure of tactile perception. Indeed, even one error on this task may be pathognomic of dysfunction. Individuals with multiple sclerosis (MS) commonly present with sensory and motor deficits. However, a review of the literature reveals little, if any, research on the presence of astereognosis in this patient population. This is a significant oversight since tests for astereognosis are commonly employed in a neuropsychological and neurological examinations and are powerful predictors of cerebral impairment. Data selection: This sample consisted of 35 individuals diagnosed with MS (mean age 44.56 years, S.D. = 8.46 years) and 207 individuals with no history of neurological or psychiatric impairment (mean age = 45.15 years, S.D. = 9.28 years). Each participant received, as part of a comprehensive battery, the object identification subtests from the Dean-Woodcock Sensory Motor Battery (DWSMB, Dean & Woodcock, 2003). Data synthesis: The results of the MANOVA, showed that the change in the combined dependent variable of the tests for participants was significantly related to diagnosis, Wilks' Lambda = 0.760,  $F(2, 239) = 37.76$ ,  $p > 0.000$ . Subsequent univariate tests indicated that individuals with MS performed significantly worse on measures of right and left hand object identification. Conclusions: In this study, patients with MS demonstrated significantly greater rates of astereognosis than a group of normal controls. The findings were more significant for the left hand (right hemisphere). The implications will be discussed in regards to practitioners and researchers.

#### A16

##### **Clock drawing impairment in patients with multiple sclerosis**

*Davis AS, Whited AR, Williams RN, Pass LA, Gupta AS, Hudson B*

Objective: Clock drawing tasks are powerful predictors of neurological impairment due to the diversity of skills that must be intact for successful completion. This includes visual-motor integration, visual-spatial analysis, and executive functions. Indeed, clock drawing tasks are often used as screeners in isolation by neurologists, neuropsychologists, and occupational and physical therapists. Some research has indicated that clock drawing may be an early predictor of impairment in patients with multiple sclerosis, although the literature is lacking in this area. Data selection: This sample consisted of 35 individuals diagnosed with multiple sclerosis (mean age 44.56 years, S.D. = 8.46 years) and 207 individuals with no history of neurological or psychiatric impairment (mean age = 45.15 years, S.D. = 9.28 years). Each participant received, as part of a comprehensive battery, the clock construction subtest from the Dean-Woodcock Sensory Motor Battery (DWSMB, Dean & Woodcock, 2003). Data synthesis: By analyzing the results for an ANOVA, the change in the dependent variable of the clock drawing subtest for group participants was significantly related to diagnosis,  $F(1, 240) = 5.479$ ,  $p = 0.020$ . Conclusions: In this study, patients with MS demonstrated a significantly poorer ability to complete the clock drawing subtest of the DWSMB. The results of this study and the implications will be discussed in regards to practitioners and researchers.

#### A17

##### **Evaluating the intercorrelations of the delayed memory subtests on the RBANS for patients with multiple sclerosis**

*Davis AS, Williams RN, Pass LA, Whited AR, Hudson B*

Objective: Multiple sclerosis is a demyelinating disorder which has been linked to a variety of neuropsychological deficits, including impairment in sensory-motor skills, executive functioning, processing speed, and recent memory. Although several studies have also revealed long-term memory deficits, there is still debate about the etiology and types

of these deficits. The purpose of the current study was to evaluate the intercorrelations for patients with MS on the delayed memory subtests of the repeatable battery for the assessment of neuropsychological status (RBANS, Randolph, 1998) a widely used neuropsychology measure that assesses a wide range of abilities with a short administration time. Data selection: This sample consisted of 51 individuals diagnosed with multiple sclerosis (mean age 45.70 years, S.D. = 9.17 years). Each participant received, as part of a comprehensive battery, the delayed memory subtests from the RBANS. Data synthesis: Only one of the Pearson correlation coefficients was not significant at the 0.01 level for the combinations of the four delayed memory subtests. The non-significant correlation was between List Recognition and Figure Recall. The correlation coefficients ranged from 0.156 and 0.550. Conclusions: The pattern of correlations provides evidence of adequate validity of these subtests for patients with MS. The results of this study will be discussed in relation to the use of the RBANS for patients with MS, as well as implications for practitioners and researchers.

## A18

### **Utilization of self-report depression measures in multiple sclerosis (MS): Are we getting it right?**

*Strober LB, Arnett PA*

Objective: Self-reports of depression are frequently utilized in primary care despite frequent debate regarding their validity in multiple sclerosis (MS) patients. Certain measures have been examined in MS resulting in recommended cutoffs specific to MS. The present investigation examined the discriminative power of such cutoffs of the Beck Depression Inventory-II (BDI-II) and Chicago Multiscale Depression Inventory (CMDI). Method: Ninety-seven MS patients completed the CMDI and BDI-II. 11% were identified as depressed per DSM-IV major depressive episode criteria. ROC analyses were conducted to examine the extent to which suggested cutoffs accurately identify depression in this sample. Results: The recommended cutoff of 13 on the BDI-II accurately identified 91% of the depressed sample (sensitivity = 0.91) and obtained a specificity of 0.67. The recommended cutoff of 1.5 S.D. above the mean of non-depressed controls (19.7) on the CMDI Mood subscale resulted in only a sensitivity of 0.55 (specificity = 0.86). However, ROC curves revealed that a cutoff of 25 on the CMDI Mood scale yielded comparable performance to the BDI-II (sensitivity = 0.91, specificity = 0.71). Conclusions: The present investigation provides further support of the recommended cutoff of 13 on the BDI-II for use with MS patients. However, the suggestion to use 1.5 S.D. above the mean on the CMDI Mood subscale was not supported. A cutoff of 25 on the latter yielded optimal sensitivity and specificity, however. Further studies examining the sensitivity and specificity of various measures of depression in MS is warranted.

## A19

### **Neuropsychological effects of bilateral subthalamic nucleus deep brain stimulation for Parkinson's disease**

*Higginson CI, Wheelock VL, Levine D, King DS, Pappas CT, Sigvardt KA*

Objective: This study describes the cognitive changes observed in a sample of Parkinson's disease (PD) patients who underwent subthalamic nucleus (STN) deep brain stimulation (DBS). We hope to further knowledge in this area through the inclusion of a number of measures not commonly reported in previous studies and a consideration of the clinical significance of statistically significant changes. Method: Twenty-four PD patients completed neuropsychological testing in the on-medication state an average of 35 weeks before surgery, and in the on-stimulation, on-medication state an average of 29 weeks following surgery. Prior to STN DBS implantation none of the participants had undergone neurosurgical intervention, had any other medical condition that could impact cognitive function, nor did any meet DSM-IV criteria for dementia or major depressive disorder. The clinical significance of post-operative changes was assessed through change scores reflecting the degree of decline or improvement on each test for each participant. Results: Statistically significant declines were noted on only two measures, both involving verbal fluency. Large effects indicating decline were also observed on measures of inhibition and list learning. The most widespread decline was experienced by one patient whose performance deteriorated on two-thirds of the measures; three others declined on over 20% of the measures. Interestingly, there was evidence that all four of them were experiencing mild symptoms of depression before surgery. Conclusion: These results are consistent with a growing body of evidence generally supporting the neurocognitive safety of bilateral STN DBS for the treatment of PD.

**A20****Recurring brain tumors and the sensitivity of neuropsychological assessment in early detection: A case study***Horwitz JL, Davis AS, Peabody SR, Hudson B, Estes BW*

**Objective:** This proposed case study will present the neuropsychological and neurobehavioral data of a young female whose atypical post-surgical neuropsychological profile led to the identification of a post-status cerebral tumor. Her post-operative neuropsychological results were inconsistent with expected recovery and prompted further immediate radiological inquiry. Imaging confirmed the neuropsychological testing results and revealed a left frontal mass and evidence of residual tumor with leptomeningeal involvement. **Data selection:** Neuropsychological testing of cognitive and behavioral functioning was conducted on four separate occasions. A comprehensive battery of neuropsychological tests was administered, including the Luria Nebraska Neuropsychological Battery-Second Edition, Stroop Color and Word Test, Trail Making Test A and B and the Wide Range Intelligence Test. **Data synthesis:** Following a shunt placement, the patient's assessment revealed diminished functioning associated with the dominant prefrontal and frontal-temporal zones (i.e. orbital and dorsal-lateral and inferior frontal) affecting executive functions and aspects of memory. Dominant parietal involvement was indicated, which was not apparent during her pre-surgical or first post-surgical assessment. These findings prompted concern that led to immediate follow-up radiographical studies confirming tumor regrowth, specifically a meningioma. **Conclusions:** This case study is an example of the utility of the neurobehavioral assessment and neuropsychological testing as a clinically sensitive measure for early detection of brain tumors. This poster will present the results of the neuropsychological assessment and discuss implications for practitioners and researchers.

**A21****The neuropsychological effects of hepatitis C in the absence of substance use disorder***Huckans MS, Mull L, Parcel T, Bjornson D, Nelligan J, Loftis J, Morasco B, Sasaki A, Hauser P*

**Objective:** To assess cognition in veterans with hepatitis C (HCV) but no history of substance use disorder (SUD). **Method:** Veterans were recruited through the Portland VA Medical Center (age =  $54 \pm 9$  years; 91% male; 87% Caucasian; education =  $15 \pm 2$  years). Veterans with HCV ( $n = 14$ ) were compared with veterans without HCV ( $n = 9$ ). Participants were excluded for any history of SUD, psychotic disorder, liver cirrhosis, traumatic brain injury, medical conditions that could affect cognition, or interferon therapy. Tests administered were the: California Verbal Learning Test-II (CVLT-II); Rey Complex Figure Test (RCF); Brief Visuospatial Memory Test, Revised (BVM-T-R); Grooved Pegboard; Finger Tapping; Trails A & B; WAIS-III Digit Symbol, Digit Span, Letter Number Sequencing, and Matrix Reasoning; D-KEFS Color-Word Interference, Sorting, and Proverbs; Letter/Category Fluency. **Results:** No significant differences were evident between groups in terms of demographic characteristics, current depression, fatigue, pain, or other psychiatric/medical factors that could affect cognition. Compared with the control group, there was a trend for the HCV group to perform significantly worse ( $p < 0.10$ ) on CVLT-II Recognition; BVM-T-R Immediate and Delayed Recall; Matrix Reasoning and Digits Backward. **Conclusions:** This data suggests that HCV may be associated with memory, visual-spatial reasoning, and attention deficits not otherwise explained by a history of SUD, depression, fatigue, pain, or other psychiatric/medical comorbidities. Future studies with larger sample sizes are needed to confirm these results and to explore disease mechanisms (e.g. immune activation) that could account for cognitive problems associated with HCV.

**A22****Dentatorubral-pallidolusian atrophy: A cognitive profile***Lang JA, Austin B*

**Objective:** To familiarize neuropsychologists with dentatorubral-pallidolusian atrophy (DRPLA) also known as Haw River syndrome which is an autosomal dominant neurodegenerative disorder characterized by progressive ataxia, choreoathetosis, epilepsy and myoclonus. In adults with DRPLA, dementia or character changes are evident and neuropsychological data are often similar to that found in individuals with other subcortical dementing processes. However, in children progressive intellectual deterioration is common. Onset of symptoms ranges from 1 to 60-year old. **Method:** Single patient tested with a flexible standardized battery that included selected subtests from the repeatable battery for the assessment of neuropsychological status (RBANS), Wechsler Scales (WAIS-WMS-III) and Delis-Kaplan Executive Function System (D-KEFS). We report the neuropsychological findings of this single adult case of DRPLA and describe subsequent behavioral problems. **Results:** Our findings included slow information processing, memory

deficits, impaired initiation, disinhibition, perseveration, reduced mental flexibility, decreased visual construction abilities, difficulty maintaining mental set and impaired motor function. Conclusion: Neuropsychological evaluation of patients with DRPLA is helpful to healthcare teams struggling with issues of behavior management, level of supervision required for maintenance of safety and disposition (placement).

### A23

#### **WAIS-III cognitive profiles for workers exposed to 1,2-dichloroethane**

*Marceaux J, Dilks LS, White R, Bourgeois M, Ashworth B, Mayeaux B*

**Objective:** There is a history of profile analysis with psychological tests relating to pathological conditions. Profile analysis for distinct clinical groups allows for an increase in knowledge of specific disorders, the formulation of efficient diagnostic, and treatment protocols. It was the purpose of this study to investigate the procedure of profile analysis for WAIS-III involving individuals exposed to 1,2-dichloroethane. **Method:** Forty-five individuals with a mean age of 39 and a mean education level of 12.4 were exposed to 1,2-dichloroethane were referred for evaluation. Pre-screening revealed no history of drug and alcohol dependency, neurocognitive impairments, or prior history of exposure. A clinical neuropsychologist administered the WAIS-III at a private clinic. After completing consent forms, participants were evaluated and tests scored according to publisher's instructions. **Results:** Cluster analysis of the sample across the 3 IQ scales of the WAIS-III identified four profiles in this sample. Profile 1 ( $n = 6$ ) included higher scores on all IQ scales, with participants scoring in the average range of intelligence. Profile 2 ( $n = 3$ ) included lower scores on all IQ scores, scoring in the mildly impaired realm. Profile 3 ( $n = 22$ ) included individuals with scores consistent with low-average intelligence and Profile 4 ( $n = 14$ ) in the borderline level of intelligence. **Conclusion:** The results of the study suggest the overall influence on intelligence as an influence of 1,2-dichloroethane. Considering the premorbid level of education, the data are indicative of a general loss of intelligence as a consequence of exposure.

### A24

#### **Memory functions in patients with advanced Parkinson disease**

*Meersmans M, Puente A, Escamilla-Sevilla F, Lopez-Jimenez A, Santiago-Ramajo S, Katati M, Martin-Linares J, Minguez A, Arjona V, Perez-Garcia M*

**Objective:** To determine any differences in the performance of memory function tests between a group of patients with advanced idiopathic Parkinson disease (PD) and a normal control group. **Method:** The cases group comprised 55 consecutive candidates for surgery for advanced PD (29 females) with mean age of  $61.13 \pm 6.02$  years, history of  $13.6 \pm 4.82$  years with PD, and  $5.20 \pm 5.03$  years of education, treated with  $1161.76$  mg/day levodopa-equivalent dose. The control group comprised 13 healthy individuals (10 females) married to patients in the cases group. The groups were matched for age and years of education. Assessment were conducted of verbal (Rey Auditory Verbal Learning Test), visual (Benton Visual Retention Test), and working (WAIS-III Index) memory as part of a wider neuropsychological assessment. Nine Student's *t*-tests were performed using the group variable (patients versus controls) as independent variable and neurological performance in memory as dependent variable. **Results:** The PD patients showed a significantly worse performance in verbal memory (except for delayed recall) and visual memory. A clear trend to a worse performance in working memory was also observed. **Conclusions:** According to the literature, performance in memory tests is strongly influenced by age and years of education. After matching the two groups, the patients with advanced PD were found to have a worse performance in tests of acquisition and verbal episodic memory, with a slowed learning curve, difficulties in primacy effect, deficit in figurative episodic recognition, and a trend to working memory problems.

### A25

#### **Short-term outcomes of bilateral DBS of the subthalamic nucleus in Parkinson's disease using the RBANS**

*Jewell G, Scott J, Merker B, Pastorek N, Bharucha K, Francel P*

**Objective:** To examine neurocognitive outcomes of bilateral subthalamic nucleus stimulation (DBS) in participants with advanced Parkinson's disease (PD) using the repeatable battery for the assessment of neuropsychological status (RBANS). **Methods:** DBS participants ( $n = 58$ ) were evaluated using the RBANS both pre and post-stimulator implantation. A control group with PD who did not receive DBS ( $n = 23$ ) were evaluated at similar time intervals ( $M = 6.4$  months). The two groups were equivalent in terms of age ( $M = 64$ ), education ( $M = 12$ ), MMSE ( $M = 26$ ), disease

severity, self-reported depression, and dopamine equivalents. Participants were recruited from a University Medical Center. Results: RBANS index and individual subtest scores were analyzed using  $2 \times 2$  (pre/post  $\times$  DBS/no DBS) mixed model ANOVAs. Pre-post main effects were noted for tasks of attention, processing speed, immediate memory, language, visual perception, and construction, suggesting that both groups declined over the course of the study in these areas. No significant interactions were observed, suggesting that DBS did not significantly alter the course of cognitive change. Conclusions: The findings of neurocognitive outcome studies of DBS are often contradictory. Many studies utilize an ABA design in which participants are evaluated on and off stimulation, as opposed to a control group design such as the current study. A control group design has the advantage of controlling for history effects such as the natural course of cognitive change in PD. The current study suggests that DBS does not significantly alter the natural course of cognitive decline in patients with advanced PD.

## A26

### Neurocognitive functioning in patients with essential tremor

Merker B, Jewell G, Pastorek N, Scott J, Francel P, Bharucha K

Objective: The purpose of this study is to further examine the neuropsychological functioning among essential tremor (ET) patients in order to gain a better understanding of their cognitive deficits. Method: Participants (ET = 16, CTL = 14) completed a pre-determined neuropsychological battery consisting of both screening measures and more specific measures of cognitive and emotional functioning. Emphasis was placed on measures of executive functioning. Groups were equated based on age and education level. Results: Statistical analysis was carried out using independent sample *t*-tests. ET patients performed significantly poorer than normal controls on two general screening measures (MMSE,  $P = 0.001$ ; RBANS total score,  $P = 0.005$ ); and tests of emotional functioning (STAI,  $P = 0.005$ ; GDS,  $P = 0.00$ ), immediate and delayed list recall (RBANS list learning and recall,  $p = 0.002$ , respectively), line discrimination (RBANS line orientation,  $P = 0.001$ ), executive functioning (California Card Sorting Task,  $P$ 's  $\leq 0.002$ ), and a test requiring psychomotor speed and conceptual set shifting (RBANS coding,  $P = 0.000$ ). In contrast, ET patients performed similar to equated controls on two other measures of frontal lobe functioning (Gambling Task and FRSBE). Conclusions: Consistent with previous research, ET patients demonstrate poorer performance on measures of executive functioning, visual-spatial abilities and list learning. Furthermore, extending previous research, patients performed more poorly on measures known to be associated with the dorsolateral prefrontal cortex rather than the orbitofrontal cortex.

## A27

### Cognition and discounting of delayed rewards in patients with hepatitis C

Mull L, Huckans MS, Parcel T, Bjornson D, Hauser P, Wilson V, Schwartz D, Hoffman W

Objective: The delay discounting task (DDT) measures the tendency to choose smaller immediate rewards over larger delayed rewards (delay discounting). This study examined DDT performance in patients with hepatitis C (HCV). Method: This study compared three groups of veterans (age =  $54 \pm 7$  years; 96% male; 88% Caucasian; education =  $14 \pm 2$  years) recruited through the Portland VA Medical Center: veterans with HCV and a history of substance use disorder (SUD) (HCV+/SUD+) ( $n = 25$ ), veterans with HCV but no history of SUD (HCV+/SUD-) ( $n = 12$ ), and veterans with no history of HCV or SUD (HCV-/SUD-) ( $n = 9$ ). Participants were administered a comprehensive battery of psychometrically valid neuropsychological measures as well as the DDT. Results: Compared with the HCV-/SUD- group, the HCV+/SUD+ ( $p = 0.045$ ) and HCV+/SUD- ( $p = 0.111$ ) groups evidenced trends toward delay discounting. Within the total sample, there were trends ( $p < 0.10$ ) toward correlations between delay discounting and poorer performance on these cognitive tests: D-KEFS Sorting; CPT Omissions; WAIS-III Digit Span and Matrix Reasoning. Conclusions: These data suggest that patients with HCV are more likely to choose smaller immediate rewards over larger delayed rewards, and this tendency toward delay discounting is associated with decrements in attention, visual-spatial reasoning, and executive functioning. Larger studies could explore whether HCV induces cognitive changes that cause this association, or whether delay discounting and cognitive deficits are primary and increase risk taking behaviors that lead to HCV.

**A28****Neuropsychological profile of welders occupationally-exposed to manganese***Rohling ML, Demakis GJ*

**Objective:** This study focused on the neurotoxicity of manganese in welders. We examined published data to determine the nature of deficits associated with exposure and the diagnostic utility of a test score pattern analysis. This issue is of particular import, as current litigation is underway involving thousands of welders who have alleged work-related impairment caused by welding fumes. **Data selection:** We examined two published samples of welders by Bowler and colleagues (Bowler et al., 2003; Bowler et al., 2006). They claim their results demonstrate a specific pattern of impairment due to exposure to welding fumes. **Data synthesis:** Meta-analytic techniques were used to calculate effect sizes for each test reported. Glass's delta was generated for each set of scores; delta is defined as the difference between exposed and control group means divided by the control group's standard deviation. Effect sizes were grouped into domains of functioning as defined by Bowler et al. Domains were compared to examine the authors' claim that exposed welders demonstrate a unique impairment pattern. **Conclusions:** The two welders groups showed deficits compared to controls (i.e.  $\delta = 0.62$  for the 2003 study and 1.16 for 2006 study). However, the pattern of impairment in the two groups across domains was dissimilar,  $F(1, 18) = 15.0, p = 0.001$ . These two articles do not support the Bowler et al. claim that manganese exposure caused by welding fumes results in a specific pattern of impairment.

**A29****Comorbidity profiles for epilepsy***Neal TJ, Hiller TR, Hall JJ, Noggle CA, Dean RS*

**Objective:** Individuals with epilepsy with comorbid diagnoses have increased seizure frequency, poorer compliance, greater unemployment, and higher medical use. Importance of accurate diagnosis increased with emphasis on empirically-validated treatments. Prevalence rates are unclear due to methodological considerations. This study investigates and identifies prevalence rates of comorbid psychiatric disorders among a population of neuropsychological referrals. This will provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within an epilepsy population. **Method:** The current study examined secondary and tertiary diagnoses of 99 individuals with a primary diagnosis of epilepsy as the result of a comprehensive neuropsychological evaluation. Subtype analysis examines prevalence rates among seizure subtypes. An odds ratio calculates percentages for prevalence rates among groups. **Results:** Results of odds ratio analyses indicated high prevalence rates of comorbid psychiatric diagnoses for individuals diagnosed with epilepsy. Overall, 66% of individuals had secondary psychiatric diagnoses, 42% had tertiary diagnoses, and 5% had fourth diagnoses. Depression was the most common comorbid diagnosis (17.2%) followed by attention-deficit/hyperactivity disorder (ADHD; 16.2%) and anxiety (16.2%). Learning disorders (11.1%), language disorders (4.0%), pervasive developmental disorders (4.0%), and head injury (4.0%) were also common comorbid diagnoses for individuals with epilepsy. Subtype analyses revealed salient differences in prevalence rates among seizure subtypes. **Conclusion:** Results indicated individuals have comorbid psychiatric disorders at a greater rate than is demonstrated in the general population (APA, 2000).

**A30****Pre-surgical neuropsychological functioning of selected right and left temporal lobe epilepsy patients***Schoenberg MR, Reese L, Dawson K, Werz M, Maciunas R*

**Objective:** Epilepsy is a common neurological disorder with cognitive and psychological impacts. Neurosurgical treatment for medically refractory temporal lobe epilepsy (TLE) can result in seizure reduction or cessation, although there are cognitive and psychological risks. Patients with left TLE (LTLE) are often regarded as at greater risk of exhibiting language problems (dysnomia) and verbal memory loss. Alternatively, reports of language and memory impairment in right TLE (RTLE) has been inconsistent. This study compares the pre-surgical performance of LTLE and RTLE patients across memory and language tests. **Method:** Between groups analysis of patients undergoing comprehensive pre-surgical evaluations for medically refractory epilepsy. **Participants:** Fifty two patients (17 left TLE and 35 right TLE) met study inclusion and exclusion criteria. **Variables/measure(s):** Participants completed a comprehensive evaluation. **Results:** There was no significant difference between right and left TLE groups in age (left TLE = 41, S.D. = 12.4; right TLE = 38, S.D. = 14.8), gender, or ethnicity ( $p > 0.05$ ). Years of education significantly differed (left TLE = 12.4 years education; right TLE = 14.6), and education was used as a covariate in subsequent analyses. ANCOVA revealed



LTLE patients scored significantly worse than RTLE patients on the BNT and COWAT. The WMS-III auditory memory indexes differed between LTLE and RTLE groups ( $p < 0.01$ ), while there was no difference in WMS-III visual memory index scores ( $p > 0.10$ ). Conclusion(s): These data further support observations that language scores can be helpful indices in lateralized epilepsy. Material specific memory impairment was less often found for right TLE patients.

### A31

#### **Inconclusive findings during the intracarotid sodium amobarbital procedure (Wada) in children taking carbonic-anhydrase inhibiting medications**

*Van Winkle AN, Burns TG, Luton L, Flamini RJ*

**Objective:** The intracarotid sodium amobarbital procedure is routinely conducted as part of a pre-surgical evaluation for epilepsy. Complications, including inconclusive findings, are rare. Recently, anesthetization failures have occurred with the adult epileptic populations undergoing this procedure. Bookheimer and colleagues (2005) found a potential interaction between the sodium amobarbital and carbonic-anhydrase inhibiting medications (CAIs), including topiramate and zonisamide, which could account for the anesthetization failures. **Methodology:** The current study sought to investigate the association between inconclusive findings and a potential interaction between the sodium amobarbital and CAIs in children. An archival review of 43 cases conducted between 1999 and 2006 was performed. A one-sample  $\chi^2$  analysis was utilized to assess whether CAI medications interfered with the outcome from these procedures. **Results:** The results of the chi-square analysis were significant ( $p < 0.05$ ). Of the 43 patients, 90% had conclusive findings. For the 9% with inconclusive results, 75% of those patients were taking CAI medications at the time of the examination, with 66% taking topiramate and 33% taking zonisamide. **Conclusions:** The results from this study, utilizing a pediatric sample, supports the findings noted in Bookheimer and colleagues research with adults. These results indicate that for those children taking CAIs medications as part of their medication regimen, there is a potential interaction between these medications and inconclusive findings on this procedure, with a majority of the patients taking CAIs demonstrating inconclusive results. The possibilities for increasing clinical dosage versus changing to a non-CAI medication before surgery will be discussed.

### A32

#### **Physical disability and perfectionistic concern over mistakes predict depression in an MS population: Replication and extension**

*Smith MM, Arnett PA*

**Objective:** Discrepancies between standards and actual achievement are especially damaging for people high in perfectionism, which has been shown to be consistently correlated with depression. Depression has a lifetime prevalence rate of 50% in MS populations. Applying Beck's cognitive theory of depression to MS, we have previously demonstrated that individuals with MS who have perfectionistic cognitive schemata may be at greater risk for developing depression when they experience MS-related physical disability. The aim of this study was to replicate these findings in another sample and to better examine the interaction of physical disability and perfectionism by using a measure specifically designed to measure perfectionistic concern over mistakes. **Method:** Fifty MS patients were administered the frost multidimensional perfectionism scale (FMPS), the Chicago Multiscale Depression Inventory (CMDI) combined Mood and Evaluative subscales, and the Kurtzke Extended Disability Status Scale (EDSS). **Results:** Hierarchical regression revealed that the FMPS Concern over Mistakes (CM) subscale  $\times$  EDSS interaction predicted depression symptoms over and above what was predicted by FMPS CM and EDSS scores alone [ $F(3, 46) = 4.50$ ;  $p < 0.01$ , adjusted  $r^2 = 0.18$ ,  $r^2$  change = 0.08]. The interaction indicated that high CM scores predicted depression at high, but not low, levels of physical disability. **Conclusion:** Our results offer further support for the concept that individuals high in perfectionistic concern over mistakes and MS-related physical disability are highly susceptible to depression. Physical limitations may make it difficult for self-critical individuals to maintain a positive sense of self, thus perpetuating negative self-schema and leading to depression.

**A33****Impact of anxiety and cognitive dysfunction on social support in MS***Barwick F*

**Objective:** The prevalence of depression in multiple sclerosis (MS) is high. Poor social support is an important risk factor for depression in MS, but the variables that influence patients' social support, and their satisfaction with it, are poorly understood. Anxiety and cognitive dysfunction are also common in MS and may influence patients' perceptions of their social support. The current study evaluated the extent to which these factors predicted satisfaction with social support in MS. **Method:** Sixty-eight MS patients completed the STAI-Trait scale and the Social Support Questionnaire. Patients' level of cognitive functioning was assessed for those domains most frequently affected in MS using the mean z-score for the Symbol Digit, Visual Elevator, the Selective Reminding Test, 10/36 Spatial Recall, COWA, Animal Fluency, and a Reading Span test of working memory. **Results:** Anxiety and cognitive functioning both significantly and independently predicted social support satisfaction in the regression analysis ( $p < 0.05$  for both  $r^2$  change values). Higher anxiety was associated with less satisfaction with social support but, surprisingly, better cognitive functioning was associated with less satisfaction with social support. **Conclusions:** One interpretation of our results is that MS patients with better cognitive functioning may be more aware of their social support needs and thus have greater expectations for support, expectations that may put them at risk for depression. Such perceptions, along with patients' anxiety, could be targeted for treatment in the process of helping patients increase their satisfaction with their social support, and ultimately reduce their risk for depression.

**NEUROLOGIC AND NEUROPSYCHIATRIC DISORDERS: PSYCHIATRIC ILLNESS****A34****Cognitive function and insight in bipolar disorder***Goldstein G, Jacoby AM, Cornelius J, Goldstein G, Shad M, Haas GL*

**Objective:** The purpose of the study was to evaluate awareness of illness in relation to cognitive function in individuals with bipolar disorder meeting DSM-IV, predominantly associated with alcoholism. **Method:** Seventeen subjects were administered the Scale to Assess Unawareness of Mental Disorder (SUMD) and a neurocognitive assessment including the Behavioural Assessment of Dysexecutive Syndrome (BADs), the Wechsler Abbreviated Scale of Intelligence (WASI), and the Wisconsin Card Sorting Test (WCST) **Results:** On the SUMD, 67% of the subjects demonstrated full current awareness of illness; 61% were aware of the effects of medication. However when asked about past awareness only 17% of the subjects were full aware of illness and 17% were fully aware of medication effects. A differentiated cognitive profile was obtained characterized by average level intelligence (mean IQ = 95.3 + 12.95) lower verbal than performance IQ scores, intact conceptual abilities (mean perseverative errors WCST = 17.67 + 9.91) but significantly impaired time perception and planning abilities as assessed by the BADs. There were several statistically significant correlations between the BADs total profile score and several individual SUMD items (e.g.  $-0.52$ ,  $p < 0.05$  with awareness of asociality). **Conclusion:** Individuals with bipolar disorder compounded with alcoholism receiving medication have awareness of their illnesses and the effects of medication on it, but may report lack of such awareness in the past. Their cognitive function is characterized by average intelligence and good conceptual abilities, but substantially impaired time sense and planning abilities. A global BADs measure of dysexecutive behavior is significantly associated with several aspects of unawareness.

**A35****Relative risk of depression following neurological impairment***Hiller TR, Noggle CA, Neal TJ, Hall JJ, Dean RS*

**Objective:** Research has demonstrated that the prevalence for a psychiatric disorder increases following neurological impairment and exceeds the prevalence found in other disorders. Furthermore, one of the most common occurring psychiatric disturbances, in general, is depression. Considering the two aforementioned findings, one may propose the risk of developing depression following neurological impairment would be significant. The present study considered this hypothesis and assessed the relative risk of depression following specific neurological impairments. **Method:** Participants ( $n = 367$ ) included 246 individuals diagnosed with a neurological disorder and no diagnosed comorbid psychiatric disorder and 121 individuals diagnosed with both a neurological disorder and a psychiatric disorder.

Neurological diagnoses were made by a board certified neurologist. Psychiatric symptoms were diagnosed using the MMPI-2 and the DMS-IV criteria. The control group ( $n = 19,640$ ) was derived from Robins and Reiger's (1991) Epidemiological Catchment Area Study (ECA). Results: Statistical analyses of relative risk indicated patients with neurological disorders are more likely to present with depression compared to the general population. Specifically, results indicated all neurology patients were over 1.5 times more likely to have depression than normals or patients with other medical disorders. Relative risk of depression for specific neurological impairments will be discussed. Conclusions: This study demonstrated a relationship between neurological impairments and the presence of depression which, in turn, provides implications to direct practitioners. Establishing such a relationship illustrates the importance of assessing and monitoring the emotional functioning of individuals with neurological impairment.

### A36

#### **Auditory evoked potentials in unmedicated first episode schizophrenia patients**

*Leavitt VM, Yeap S, Foxe JJ*

Objective: Early sensory processing deficits are ubiquitous in patients with schizophrenia. There is growing electrophysiological evidence for auditory dysfunction in patients from very early time points in processing. We wanted to address the question of whether medication accounts for these early processing deficits in schizophrenia. Data selection: We examined the event related potentials (ERPs) of first-episode unmedicated patients ( $n = 11$ ) in response to a simple auditory stimulus, a 250 ms standard tone. We compared the auditory evoked potentials of these patients to control subjects ( $n = 7$ ), with specific consideration of the mid latency components (prior to 50 ms). Data synthesis: Significant differences in the AEPs of unmedicated patients and controls begin to emerge between 50 and 100 ms post-stimulus. Conclusions: The implication of this finding is that medication may not solely account for compromised sensory processing seen in chronic schizophrenia patients. Rather, a fundamental dysfunction of primary auditory processing may underlie the disease from its onset.

### A37

#### **Discrepancies in the cognitive profiles of patients diagnosed with depression, anxiety, and bipolar**

*Noggle CA, Hall JJ, Neal TJ, Hiller TR, Dean RS*

Objective: Research has found that individuals with mood disturbances such as depression, anxiety, and/or Bipolar disorder may well experience cognitive impairments. Such research has at times shown impairment of memory, attention, executive functioning, etc. for patients with underlying mood disorder. Although the occurrence of such impairments have been noted, few studies have investigated whether the cognitive deficits one experiences differs depending on what diagnoses they have. The present study investigated whether patients with depression, anxiety, and bipolar disorder presented with significant differences in their cognitive profiles. Method: The current sample consisted of 60 patients with depression, 60 anxiety, 56 bipolar, and 48 normals. Each participant was administered the first seven subtests of the Woodcock-Johnson III-Tests of Cognitive Abilities (WJ-III, Woodcock, McGrew, & Mather, 2001). Results: Statistical analyses revealed the groups differed in a variety of ways. Depressed and bipolar groups performed significantly ( $p < 0.01$ ) worse than the other two groups on visual-auditory learning. The bipolar group also did significantly worse than the other three on concept formation and numbers reversed. The depressed group did significantly worse on sound blending. The anxiety group performed significantly worse than the depressed and normal groups on concept formation, yet better than the bipolar. Finally, all three clinical groups performed significantly worse than normals on verbal comprehension. Conclusions: Results are similar to past research in that mood disorders were related to cognitive deficits. Differences found between groups is powerful information for practitioners who are involved in treatment planning, accommodations, and interventions.

### A38

#### **Cortical and subcortical memory profiles differentiate individuals with complete mental health and mental illness**

*Strauss GP, Allen DN, Randall C, Jetha S*

Objective: The current study attempted to determine whether cortical and subcortical memory profiles differentiate individuals with varying degrees of psychopathology and mental health. Method: Participants included 101 undergraduate students. Cluster analysis using Ward's method and squared Euclidean distance was used to divide the sample

into distinct mental health and illness clusters. Several mental health and psychopathology measures were submitted to cluster analysis. External validation was accomplished using the California Verbal Learning Test and Emotional Verbal Learning Test. Cluster analysis suggested that a four cluster solution was optimal. The four groups represented: complete psychopathology, incomplete psychopathology (psychopathology + protective factors), moderate mental health, and optimal mental health. Discriminant function analysis indicated that these groups were adequately separated in discriminant function space. Results: When the four groups were compared on memory measures, results indicated that complete psychopathology was characterized by high rates of intrusions and a memory bias for anger. Incomplete psychopathology was associated with recall deficits and elevated intrusions for positive words. Individuals with moderate mental health had a memory bias for happiness and highest overall recall. Optimal mental health was predicted by accurate recall and the fewest repetitions and intrusions. Conclusions: Overall findings suggest that states of mental health and illness are differentiated by neurological processes that regulate emotional and non-emotional memory. The current results have important implications for treatment and rehabilitation, as they suggest that cortical and subcortical networks governing emotional and non-emotional memory may influence type and degree of psychopathology, as well as whether individuals develop protective factors that buffer against psychopathology.

## NEUROLOGIC AND NEUROPSYCHIATRIC DISORDERS I: TRAUMATIC BRAIN INJURY

### A39

#### **Neurobehavioral and psychological consequences of a prefrontal lobectomy: A case study**

*Ashworth B, Dilks LS, Marceaux J, White R, Bourgeois M, Mayeaux B*

**Objective:** AM is a 23-year-old male who sustained a traumatic brain injury (TBI) secondary to an accident. His edema intensified and resulted in a prefrontal lobectomy. The client achieved positive findings on neuropsychological measures and demonstrated significant personality changes. The purpose of this study was to investigate the client's neuropsychological impairments and document features of his personality change. **Method:** A neuropsychological evaluation was conducted on an outpatient basis. The client's wife and mother accompanied him and remained in the waiting room during testing but were later interviewed. After signing consent and release forms, the client was administered 27 instruments over 2 days. Tests were administered, scored and interpreted according to standard practice. **Results:** The results of the evaluation suggest declines in overall cognitive ability with a 2 S.D. drop from premorbid status with deficiencies in memory, executive functions, and language processing. Disinhibition was significant with hypersexuality, compulsive eating, and verbal outbursts. Depression and anxiety were also elevated. The test of memory malingering was within normal limits. **Conclusion:** The most notable impairments were in the realms of general intelligence, language, and executive functions. The most impressive information was rendered by the client's family who noted a dramatic personality changes describing him as a "different person". Before, the client was a fastidious dresser, watched mainly sports, and enjoyed exercising. Following discharge, AM was disheveled in his attire, preferred movies, and lost interest in exercise. He was hypersensitive to criticism, socially isolated, and acquired new food preferences. The client remains in therapy.

### A40

#### **WTAR versus demographic formulas: The accuracy of estimated baseline MTBI neuropsychological performance**

*Bailey CM, Arnett PA*

**Objective:** The current study examined the accuracy of estimating baseline neuropsychological performance using the Wechsler Test of Adult Reading (WTAR) and demographic estimates. **Methods:** One-hundred and three collegiate athletes (71 male, 32 female) were administered baseline neuropsychological batteries as a part of the Penn State Concussion Program. In addition to the WTAR, tests included: BVMT-R, Comprehensive Trail Making Test (CTMT), Digit Span Test (DST), HVLt-R, SDMT, Stroop, and Vigil/W. Standard scores were calculated using values from baseline athlete data. IQ estimates were developed according to demographics [WTAR demographics-only and Barona et al. (1984) methods], WTAR reading performance (WTAR-P), and WTAR performance and demographics (WTAR-PD). Separate repeated measures ANOVAs were conducted using the within-subject factors of observed baseline performance and each estimation method. Significant demographic groups were also entered as between-subject factors. **Results:** No significant within-subject effects were observed on the BVMT-R, HVLt-R, and CTMT trial 1. Significant

within-subject effects were observed on all other ANOVAs ( $F$ 's  $> 3$ ,  $p < 0.05$ ). Contrasts comparing each IQ estimate to the baseline neuropsychological measure revealed that the WTAR demographics-only estimate differed from the Vigil, SDMT, CTMT trial 2, DST, and both Stroop trials. The Barona estimate differed from the SDMT, CTMT trial 2, and Stroop 1. The WTAR-PD differed from the SDMT and Stroop 1, while the WTAR-P did not differ from any of the baseline measures. Conclusions: These results suggest that the WTAR may more accurately estimate collegiate athlete baseline measures than demographic methods.

#### A41

##### **Frontal lobe dysfunction and brain impairment in TBI: Sensitivity of the letter alternation test (LAT)**

*Brikman A, Drane D, Prosje M, DeFilippis NA, Horne-Moyer L*

**Objective:** The Letter Alternation Test (LAT) has been presented as a measure of executive functioning sensitive to the constructs of complex attention and response inhibition. The current investigation explored the ability of the LAT to accurately distinguish between patients experiencing moderate or severe TBI and healthy adults. **Method:** Archival data from 27 TBI patients and 27 age and education matched controls was utilized. A Mann–Whitney test compared the performances the two groups on the LAT and other measures. Correlational analyses examined performance on the LAT conflict tasks in relation to performances on measures of executive functioning: Trail Making Test, Parts A & B, Controlled Oral Word Association Test, Five-Point Design Fluency, and Semantic Fluency Paradigm (animal naming). **Results:** Results indicated that acute and subacute TBI patients experiencing head traumas of at least moderate severity performed significantly worse than healthy adults on all LAT scores ( $p < 0.001$ ). Sensitivity and specificity calculations based upon accurate impairment classification all exceeded 80%. Injury severity, as estimated by duration of PTA and a measure of global cognitive functioning (Cognistat Composite Score), appeared significantly correlated with performance on the LAT conflict tasks ( $r = 0.39$ ,  $p < 0.05$ ;  $r = -0.58$ ,  $p = 0.003$ , respectively). **Conclusions:** The findings indicate the various LAT indices can be used effectively to distinguish between healthy adults and TBI patients with at least moderate neurocognitive dysfunction. The LAT holds promise as a measure of general brain impairment and an instrument sensitive to deficits in executive control processes.

#### A42

##### **An fMRI investigation of visual information processing speed in TBI**

*Chiou K, Fitzpatrick N, Wu R, Hillary F*

**Objective:** Information processing speed, or the ability to rapidly process incoming information, has been shown to be fundamental to a variety of cognitive functions including perception, visuospatial processing, learning and memory. Importantly, a primary deficit observed following traumatic brain injury (TBI) is slowed processing speed which has implications for other forms of cognitive deficit. To date there has been no investigation of the neural substrate representing the processing speed deficits often observed following TBI. The present study uses fMRI and an event related task to examine processing speed deficits in TBI and make determinations in regards to the basic relationships between deficits in speeded information processing and brain activation. **Method:** Data was collected from eight healthy controls and seven participants with TBI while performing a modified Digit Symbol Search Task. **Results:** Compared to healthy adults, individuals with TBI exhibit recruitment of additional prefrontal cortical areas during this task of speeded processing. Furthermore, a negative correlation was noted between task performance and activation in the prefrontal cortex. **Conclusion:** These findings suggest that, as performance diminishes, individuals with TBI require neural resources beyond the neural network typically represented in healthy adults. Explanations for these findings are discussed.

#### A43

##### **Confirmatory factor analysis of the CHC theory with individuals with TBI**

*Davis AS, Shunk AW, Finch WH, Dean RS, Woodcock R*

**Objective:** It is common for individuals with a traumatic brain injury (TBI) to demonstrate variations in their cognitive profiles. The use of ipsative, or intraindividual, analysis is critical for these patients when using compensatory strength-based interventions to compensate for processing weaknesses. The Cattell-Horn-Carroll (CHC) theory of cognitive abilities is the foundation for several widely used measures of cognitive processing. The purpose of the current study was to assess the utility of the CHC theory for a group of individuals with a TBI. **Data selection:** The current sample

consisted of 143 individuals diagnosed with TBI (mean = 31.7 years, S.D. = 14.6 years). Each participant received, as part of a comprehensive battery, 14 cognitive tests that were selected from the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R, Woodcock & Johnson, 1989). Data synthesis: Results of the confirmatory factor analysis (CFA), used to assess the theoretical model for the CHC theory, suggested a good model fit. The CFI for the CHC model was 0.964, the TLI was .941, the RMSEA was 0.075, and the ratio of the  $\chi^2$  goodness of fit test to degrees of freedom was 1.808. Despite the strong goodness of fit statistics, the covariance matrix was not positive definite. Conclusions: The CHC theory was a good fit for the data, although the results should be viewed cautiously due to the lack of the positive definite covariance matrix. The CHC theory and utility of these results will be reviewed for clinicians and researchers.

#### A44

##### **Self-reported “postconcussion-like” symptoms in a healthy community sample**

*Dawes S, Lange RT, Senior GJ*

**Objective:** Following a mild head injury (MHI), clinicians typically evaluate the presence of post-concussion disorder based on self-reported symptoms. However, post-concussion symptoms are not specific to MHI and are often reported in a variety of other non-MHI populations. The purpose of this study was to examine the prevalence of postconcussion-like symptoms in a healthy sample. **Method:** Participants were 191 healthy community volunteers who completed the problem checklist (PCL). Thirteen symptoms were selected corresponding to DSM-IV Category-C symptom criteria for post-concussion disorder/syndrome. **Results:** Specific endorsement rates of postconcussion-like symptoms ranged from 7.9% to 56.0% for any experience of the symptoms, 5.2–49.7% for symptoms rated as mild or higher, and 1.5–15.1% for symptoms rated as moderate or higher. The most commonly reported symptoms were headache, fatigue, irritability, anxiety, and forgetfulness. Three or more symptoms were reported by 62.8% of the sample, 50.8% rated three or more symptoms as mild or higher, and 12.0% as moderate or higher. When applying the DSM-IV criteria, 54.5% of the sample met Category-C criteria for post-concussion disorder based on the simple endorsement of symptoms, 41.4% for symptoms rated as mild or higher, and 8.3% for symptoms rated as moderate or higher. **Conclusion:** This study illustrates that post-concussion symptoms are not unique to MHI and are commonly found in individual's free from neurologic and/or psychiatric disorder.

#### A45

##### **Predictors of depression after traumatic brain injury**

*Donders J, Bay E*

**Objective:** The purpose of this investigation was to determine the prevalence of depression after mild-moderate traumatic brain injury (TBI) and to identify which premorbid and concurrent factors predicted such depression. **Method:** Sixty community-dwelling adult patients (52% male, 85% Caucasian; all hospitalized for TBI, with Glasgow Coma Scale scores ranging from 9 to 15) were recruited from various outpatient treatment programs. They completed the Neurobehavioral Function Inventory (NFI), Perceived Stress Scale (PSS), Impact of Events Scale (IES), Fatigue Impact Scale (FIS), McGill Pain Questionnaire (MPQ), and the IMPACT computerized cognitive battery within 1–3 years after injury. **Results:** Sixty percent of the sample was identified as meeting NFI criteria for depression. Hierarchical regression analyses indicated that fatigue (FIS), pain (MPQ), and longstanding chronic stress (PSS) were statistically significant predictors of depression after TBI ( $p < 0.01$  for all three variables). However, the total amount of variance accounted for was modest ( $R^2 = 0.16$ ). In contrast, neither stress selectively related to the event of the TBI (IES), nor current cognitive status (IMPACT), were statistically significant predictors ( $p > 0.10$ ). **Conclusion:** Depression is common after TBI and is predicted at least in part by a combination of premorbid psychosocial stressors and post-morbid pain and fatigue. The superimposition of mild-moderate TBI on chronic, pre-existing stress appears to be the relatively biggest risk factor in this regard.

#### A46

##### **Prediction of impaired self-awareness at 1 year post-traumatic brain injury**

*Evans CC, Sherer M, Hart T, Yablon S, Richardson RN*

**Objective:** This investigation examined factors that determine degree of impaired self-awareness (ISA) in persons with traumatic brain injury (TBI) at 1 year post-injury. **Method:** Participants ( $N = 96$ ) were predominantly male (83%) and

Caucasian (65%), with moderate to severe TBI (86%). Median age was 30 (range 16–73) and median education level was 12. Median time to follow commands (TFC) was 10 days. ISA was measured by patient–family discrepancy scores on the awareness questionnaire (AQ). Data was collected during inpatient rehabilitation after patients had emerged from post-traumatic amnesia, and at 1-year follow-up. Results: Results of linear regression analysis revealed that early ISA made significant contributions to the prediction of ISA at 1-year follow up ( $p=0.01$ ) after adjusting for other predictors: TFC, GCS, FIM admit scores, age, sex, and education. The model accounted for 18% ( $R^2$ ) of the variability in ISA at 1 year. Correlational analyses demonstrated that ISA at follow-up was positively correlated with initial ISA ( $r=0.21$ ,  $p<0.05$ ) and TFC ( $r=0.27$ ,  $p<0.01$ ). Mean discrepancy scores decreased from 9.7 to 3.8 at follow-up. On average, patients rated themselves as more impaired at 1-year follow-up than they had at acute rehabilitation, while family members rated them better at one-year post-injury. Women showed better awareness of deficits than men at 1-year follow-up only ( $p<0.05$ ). Conclusion: Results indicate that ISA decreases over time but is predicted by ISA in acute inpatient rehabilitation.

#### A47

##### **Sensitivity of D-KEFS design and verbal fluency measures in pediatric TBI versus ability and demographically matched controls**

*Holdnack J, Drozdick L, Lane A, Sichi M, Chelune G*

Objective: Previous studies show lower fluency performance in individuals suffering a traumatic brain injury (TBI). The current study evaluates performance of the D-KEFS versions of these tasks in a pediatric TBI sample versus ability and demographically matched controls. Method: Age-corrected scaled-scores for the core and supplemental Verbal and Design Fluency tests of the D-KEFS were obtained with permission of Harcourt Assessment Inc. The clinical sample of 31 children and adolescents, ages 8–16, had a history of moderate to severe TBI. The control sample was matched to the clinical sample on age, sex, parent education level, ethnicity and IQ. Results: Multivariate between-group effects were found for design ( $F=12.47$ ,  $p<0.001$ ;  $\text{ETA}=0.66$ ) but not verbal ( $F=1.26$ ,  $p>0.05$ ;  $\text{ETA}=0.16$ ) fluency. Univariate effects for, design fluency empty dots and percent accuracy scores and verbal fluency category and category switching scores were present. Discriminant analysis yielded 93.3% classification accuracy for design fluency scores. Correlations between ability and Fluency were higher in the controls. The lowest mean scaled-scores in the TBI sample were observed on the design fluency switching (8.1) and percent accuracy (7.3) and letter fluency (7.8) trials. Conclusions: Results validate the sensitivity of D-KEFS fluency measures in pediatric TBI, particularly for design fluency. Matching on ability shows the differences exist beyond the effects of TBI on general problem solving.

#### A48

##### **Sensitivity of D-KEFS sorting, trail-making test and color-word interference measures in pediatric TBI versus ability and demographically matched controls**

*Holdnack J, Drozdick L, Sichi M, Lane A, Chelune G*

Objective: Deficits in executive-functioning and processing-speed among individuals with traumatic brain injury (TBI) are well documented. The current study evaluates the sensitivity of the D-KEFS sorting, trail-making and color-word interference in a pediatric TBI sample. Method: The D-KEFS sorting, trail-making and color-word Interference data were obtained with permission of Harcourt Assessment Inc. The clinical sample of 31 children and adolescents, ages 8–16, had a history of moderate to severe TBI. The clinical sample was matched to the control sample on age, sex, parent education level, ethnicity and IQ. Results: Multivariate between-group effects were found for trail-making ( $F=4.06$ ,  $p<0.01$ ;  $\text{ETA}=0.31$ ) sorting ( $F=7.50$ ,  $p<0.001$ ;  $\text{ETA}=0.64$ ) and color-word interference ( $F=4.51$ ,  $p<0.001$ ;  $\text{ETA}=0.34$ ). Univariate effects were present for trail-making number, letter and number-letter sequencing; sorting confirmed correct, unconfirmed correct, free-sort description, sort-recognition description, sort-recognition errors and don't know responses, and color-word interference color-naming, word-naming, switching, inhibition errors and switching errors. Discriminant analysis yielded 96.5% classification accuracy for combined sorting and color-word interference scores. The lowest mean scaled-scores in the TBI sample were trail-making letter-sequencing (6.7), sorting sort-recognition description (6.9) and color-word switching (7.1). Conclusions: Results confirm both processing speed and executive functioning deficits in TBI as measured by D-KEFS. Impairments in executive functioning can be identified beyond the impact of TBI on general intellectual functioning.

**A49****Personality assessment inventory profiles in mild vs. moderate to severe TBI in a sample without suspect effort***Keiski MA, Shore DL, Hamilton JM*

**Objective:** The purpose of this study was to compare personality assessment inventory (PAI) profiles following mild traumatic brain injury (mTBI) and moderate to severe traumatic brain injury (sTBI) in a litigating/compensation-seeking sample after excluding subjects with suspect effort. **Method:** Data were collected via retrospective review of consecutive referrals to a private practice. Subjects with invalid PAI profiles, or suspect effort on the TOMM, reliable digit span, or the CVLT-II, were excluded. Remaining subjects were grouped according to injury severity (mTBI = 61; sTBI = 38). **Results:** Profile analysis showed that the PAI profiles of the severity groups were not parallel,  $F(17, 81) = 2.531$ ,  $p = 0.003$ , with the mTBI group producing higher overall elevations than the sTBI group,  $F(1, 97) = 5.113$ ,  $p = 0.026$ . A second profile analysis using the clinical subscales as dependent variables revealed significant deviations from parallelism,  $F(30, 68) = 3.074$ ,  $p = 0.000$ . The levels test was also significant,  $F(1, 97) = 9.077$ ,  $p = 0.003$ . ANCOVA analyses showed increased elevations reflecting somatic complaints, symptoms of anxiety, and cognitive complaints with lesser injury severity, even after accounting for mean clinical elevation ( $p < 0.005$ ). **Conclusion:** The results suggest that individuals who present for neuropsychological evaluation following mTBI produce higher elevations on PAI scales reflecting somatic dysfunction, anxiety, and cognitive disturbance than do individuals post-sTBI. The prevalence of chronic pain and trauma-related anxiety disorders in mTBI litigants and limited awareness of cognitive deficits in sTBI may contribute to observed profile discrepancies.

**A50****Simulated traumatic brain injury on the personality assessment inventory***Keiski MA, Shore DL, Hamilton JM*

**Objective:** This analogue study provides preliminary data regarding clinical profiles associated with simulation of TBI on the PAI, as well as sensitivity of PAI negative response bias indicators to this type of simulation. **Method:** Undergraduates minimally informed about common somatic, cognitive, and psychiatric symptoms in TBI were asked to simulate TBI on the PAI, but were warned to evade detection ( $n = 41$ ). PAI scores were then compared to those of clinical TBI outpatients who sustained either mild ( $n = 63$ ) or moderate to severe ( $n = 40$ ) TBI and whose performance on measures of effort did not appear suspect. **Results:** Compared to the clinical TBI subjects, the simulators produced higher elevations on a wide variety of PAI scales, including somatic complaints, anxiety, depression, schizophrenia, and borderline features, but lower elevations on the positive impression, dominance and warmth scales (all  $p < 0.0025$ ). ROC analysis showed statistically significant ( $p = 0.000$ ) AUC for NIM (95% CI = 0.842–0.965) and MAL (95% CI = 0.783–0.928). In a small sample of TBI litigants with suspect effort ( $n = 12$ ), seven demonstrated scores of at least 70T on NIM, but only three demonstrated scores of 2 or more on MAL. **Conclusion:** Analogue simulators produced PAI profiles with substantial elevations on a broad range of clinical scales. Response bias indicators on the PAI demonstrated sensitivity to this type of simulation and showed promise in discriminating between simulators and non-simulators. Further research is required to determine sensitivity in real-world settings and specificity in a variety of clinical populations.

**A51****Long-term neuropsychological functioning after moderate-severe TBI***Kennedy JE, Clement PF, Calulot JE, Mercado JM, Cooper DB*

**Objective:** Examine long-term neuropsychological outcome of adult military service members after moderate-to-severe traumatic brain injury (TBI). **Method:** A sample of 25 individuals was selected from outpatients with moderate-to-severe TBI who received a comprehensive neuropsychological evaluation at Brooke Army Medical Center between 22 and 156 months after injury. Outcome variables included measures of general intellectual and neuropsychological functioning, attention, reasoning, verbal learning and memory, non-verbal memory and affective symptoms. **Results:** Approximately half of the patients in this sample continued to exhibit verbal learning and memory difficulties on a word-list memory test. Slightly less than half of the sample received a Halstead Reitan Impairment index score indicating moderate or greater generalized neuropsychological impairment. Reasoning skills, as measured by the category test were impaired in over 40% of patients. In contrast, overall intellectual ability and perceptual organization skills appeared well recovered in most patients. No significant associations were found between scores on a self-rating



scale of depression and neuropsychological test scores. Of 15 patients receiving a measure sensitive to effort/motivation (CVLT forced choice), four scored in the range to suggest suboptimal effort. Conclusions: Post-TBI changes in some aspects of neuropsychological function can persist, even after lengthy recovery times. Cognitive function at 2 or more years after moderate to severe TBI does not correlate with level of depressive symptoms. Suboptimal effort and motivation during cognitive assessment affect a subgroup of patients and need further study.

## A52

### **Differentiating the effects of acute versus chronic alcohol consumption following uncomplicated mild traumatic brain injury: A profile analysis approach**

*Lange RT, Iverson G, Franzen MD*

**Objective:** There is some evidence to suggest that individuals who are intoxicated at the time of traumatic brain injury (TBI) have poorer cognitive recovery compared to those who are sober. However, it is unclear whether these effects are the result of acute (i.e. day-of-injury intoxication status) or chronic (i.e. alcohol history) alcohol factors. The purpose of this study was to attempt to differentiate between the relative contribution of acute versus chronic alcohol factors in the short-term cognitive recovery of 169 (65% male) patients with uncomplicated mild TBIs using an ipsative profile analysis approach. **Method:** Participants were assessed within 7 days post-injury on 12 common cognitive measures. Participants were classified into two acute (intoxicated versus sober TBI) and two chronic (positive versus negative ETOH abuse history) alcohol groups. **Results:** A two-step cluster analysis procedure identified three common cognitive profiles in the sample. These profiles were characterized by (a) high verbal memory/low processing speed and executive functioning, (b) high attention, working memory, and verbal fluency/low verbal memory, and (c) high visual memory/low verbal memory. There were no significant differences in the proportion of participants belonging to the three profiles across the acute ( $p = 0.551$ ), chronic ( $p = 0.177$ ), and acute/chronic alcohol factor groups ( $p = 0.288$ ). **Conclusions:** These findings suggest that neither day-of-injury intoxication nor chronic alcohol abuse history was influential in determining a patient's pattern of cognitive strength or weakness in the first 7 days post-injury in this sample of uncomplicated MTBI.

## A53

### **Comparison of ipsative neuropsychological test profiles in chronic substance abuse versus mild traumatic brain injury**

*Lange RT, Iverson G, Franzen MD*

**Objective:** Patients involved in litigation relating to mild traumatic brain injury (MTBI) typically undergo a forensic neuropsychological evaluation. However, it is difficult to determine whether any identified deficits are related to the MTBI or to other factors, such as pre- and/or post-injury substance abuse. The purpose of this study was to compare 104 patients with acute uncomplicated MTBIs to a sample of 104 patients from an inpatient substance abuse program to determine whether these patients could be differentiated by their pattern of relative cognitive strengths and weaknesses. **Method:** Patients were matched on age, education, and gender. Eight cognitive measures were used that included tests of attention, memory, and processing speed. **Results:** Using a two-step cluster analysis procedure (i.e. hierarchical and  $k$ -means analyses), six profiles were identified in each group separately. The six profiles from the MTBI group correlated significantly with six corresponding profiles from the substance abuse group (range:  $r = 0.72$ – $0.91$ ). A subsequent cluster analysis identified seven common profiles when both samples were combined. There was no significant difference in the proportion of patients from the mild TBI or substance abuse group in each of the seven profiles ( $\chi^2[1, 6] = 1.61, p = 0.952$ ). **Conclusions:** These results show that patients with uncomplicated MTBIs could not be reliably differentiated from patients with substance abuse problems on these cognitive measures. This is of particular concern for clinicians evaluating the neuropsychological effects of mild head injury in individuals with a comorbid history of substance abuse.

## A54

### **Further support for the validity of the test of memory and learning (TOMAL) in children with traumatic brain injury and attention-deficit/hyperactivity disorder**

*Leany BD, Allen DN, Mayfield J*

**Objective:** The TOMAL (Reynolds & Bigler, 1994) is a comprehensive memory battery designed to assess memory functioning in children and adolescents. It assesses aspects of attention and memory function, although there is rela-

tively little information available on performance profiles in various clinical populations. The current study examined the sensitivity of the TOMAL to brain dysfunction in two clinical samples, one with attention-deficit/hyperactivity disorder (ADHD), and another with traumatic brain injury (TBI). Method: Seventy children with TBI and 76 children with ADHD were administered the TOMAL as part of a neuropsychological test battery. The TOMAL assesses memory for verbal and non-verbal information, immediate and delayed recall, as well as attention/concentration. The mean scores of each TOMAL sub-scale for ADHD and TBI samples were compared to a standardized sample that was matched for age and gender. Results: Significant differences were found when comparing the performance of control and clinical groups on the TOMAL indexes. Performance for the TBI sample was significantly lower than that of the normalized sample on all memory and attention indexes. Performance for the ADHD sample was also somewhat below the population mean on the memory indexes, although the worst performance occurred on the attention/concentration index. Additionally differences were present between the ADHD and TBI samples on some of the memory indexes. Conclusions: The present study provides support for the validity of the TOMAL, as differential patterns of performance were evident when comparing children with ADHD or TBI to an age and gender matched group selected from the standardization sample.

## A55

### **Helmet use among pennsylvania motorcyclists: Cognitive dissonance among non-helmet wearers?**

Jay K, Schatz P

Objective: In light of the 2003 repeal of mandatory motorcycle helmet laws in Pennsylvania, we sought to identify factors influencing why Pennsylvania motorcyclists chose to wear or not wear helmets. Method: Pennsylvanian motorcyclists completed an online survey assessing attitudes and beliefs regarding helmet usage, and were assigned to independent groups: those wearing ( $N=65$ ) and those not wearing ( $N=65$ ) a helmet when riding. Results: Helmet wearers were significantly older than non-wearers (39 versus 29), were more likely to use seatbelts when riding in a car ( $p<0.0001$ ; 86% versus 42%), and were significantly more likely to endorse the effectiveness of helmets in preventing head injury ( $p<0.0001$ ; 97% versus 56%). Only 14% of non-wearers required a passenger to wear a helmet, as compared to 98% of wearers ( $p<0.0001$ ). ANOVA revealed helmet wearers provided significantly higher ratings of the safety benefit of helmets, the importance of preventing head injury, and general feeling of safety while riding ( $p<0.006$ ). In contrast, non-helmet wearers provided significantly higher ratings of discomfort, looking foolish to other riders, and looking less adventurous while riding ( $p<0.008$ ). Conclusion: These results support traditional views of motorcyclists who do not wear helmets as younger, high-risk individuals. However, by rating helmets as less effective in preventing head injury, as well as endorsing low ratings of the importance of preventing head injury, while simultaneously promoting comfort and appearance, the attitudes of non-wearers appear to be reflective of cognitive dissonance.

## A56

### **A comparison of intelligence in children with pure epilepsy versus normal controls**

Luton LM, Burns TG, Van Winkle AN

Objective: Included in the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV) Technical and Interpretative Manual is comparative analyses of the normative standardization sample to special group populations; however, an examination of the intellectual profiles of children diagnosed with epilepsy is not provided. In general, the effects of pediatric epilepsy on intellectual functioning are not well known, as prior research has produced inconsistent findings. Methodology: The purpose of this project was to compare the intellectual functioning of children diagnosed with epilepsy to that of the standardization sample for the WISC-IV. Children included in the study were those diagnosed with pure epilepsy who achieved Full Scale IQ, Verbal Comprehension, and Perceptual Reasoning scores  $>70$ . Thirty-one children with epilepsy (aged 6–16 years) were age and gender matched with 31 participants from the normative WISC-IV sample ( $N=62$ ). Results: An independent samples  $t$ -test revealed that children with epilepsy performed significantly below controls on the perceptual reasoning, processing speed ( $p<0.05$ ), and working memory ( $p<0.01$ ) indices and on the comprehension, digit span, digit symbol coding, symbol search ( $p<0.05$ ), block design, and letter-number sequencing ( $p<0.01$ ) subtests. Conclusions: These findings suggest that children with epilepsy consistently perform lower than the normal population on the WISC-IV. Future research should explore differences in epileptic seizure type, age of seizure onset, and medication utilization as mitigating factors of intellectual functioning in children

with epilepsy. Ideally, these future studies will help facilitate elucidation and clarification of the effect of epilepsy on cognitive functioning.

#### A57

##### **Screening for response bias with WAIS-III measures of incidental learning**

*Miller LJ, Mittenberg W, Ryan JJ, Stanczak SR, Russ RS, Glass LA*

**Objective:** Numerous methods are available to detect malingering in TBI. One approach uses profile analysis of WAIS-III scores. This study attempts to enhance the usefulness of the WAIS-III for detecting response bias. The digit symbol-coding subtest free and pairing recall scores of non-litigating TBI patients ( $n=45$ ) were compared to those of litigating TBI patients ( $n=43$ ) suspected of symptom exaggeration. **Method:** Participants completed free and paired recall tests, Portland digit recognition test, and test of memory malingering. Persons in the litigating group scoring below the cut offs on PDRT and/or TOMM were identified as malingerers. Correct responses were calculated for free and pairing recall, and individual items. **Results:** Mean free recall scores were similar across groups, whereas the pairing mean was 6.4 for TBIs and 4.9 for malingerers. The malingerers were more likely to score higher on pairing than on free recall. This pattern had high specificity and low sensitivity for identifying group membership. Ideal cutoffs for response bias were  $\leq 4$  on pairing and  $\leq 5$  on free recall. Failure to recall the symbol associated with “2” was observed in 70% of malingerers, but only 44% of TBIs. The overall hit rate was 68%. **Conclusions:** When identifying symptom exaggeration, several measures must be used. Results of free and pairing recall tests may be useful to alert the clinician to the need for further assessment, particularly when the initial data is limited.

#### A58

##### **Discriminant function analysis using the test of memory and learning: Comparisons between groups of TBI, ADHD, and control youth**

*Morrison JR, Mayfield JW, Lowther JL, Miller DC, Bentz BB*

**Objective:** Memory performance was analyzed between groups with dichotomous performance; TBI youth, who show deficits in complex memory function, and those with ADHD, who display dysfunction in simple memory functioning. **Methods:** Participants ( $n=212$ ) included TBI ( $n=66$ ), ADHD ( $n=40$ ), and control groups matched by age and gender. Participants were gathered from an outpatient clinic at a children’s hospital. Variables of interest included in the TOMAL index and subtest scores. **Results:** Discriminant function analysis was used to describe differences. Results indicated statistically significant differences between TBI and control groups across all variables with adequate differentiation (73.5% and 85.6%). The ADHD group exhibited significant differences on a majority of the variables and adequate discrimination (75% and 73.5%). When the TBI and ADHD groups were compared, significant differences were seen on a majority of the variables with adequate classification (70.8% and 74.5%). **Conclusion:** Results supported some but not all of the hypotheses. Specifically, analyses revealed that those in the TBI and ADHD groups evidenced overall differences that were clinically but not necessarily practically significant. The comparisons revealed that there were memory deficits in the ADHD group but also supported an additional level of memory deficits seen in the TBI group accounted for by affects associated with executive dysfunction plus organic brain damage.

#### A59

##### **Self-report symptoms in MTBI, chronic pain, and normal subjects**

*Mrazik M, Paniak C, Kunzle E*

**Objective:** Comparison of self-report symptoms in acutely injured MTBI subjects, chronic pain patients, and normal controls. **Method:** Patients with mild traumatic brain injuries (MTBI) within 1 month of injury ( $M=12$  days), chronic pain (CP), and normals completed the post-concussion checklist (PCL), 2nd Edition. MTBI patients were recruited from two emergency wards. CP patients were recruited from a multi-disciplinary rehabilitation program. Control patients consisted of staff and students recruited from university, hospital, and a municipal government office. The PCL, 2nd Edition (Kay et al., 1995) consists of 43 items, each reportedly common TBI complaints. The checklist measures three factors including affective/behavioral, cognitive, and physical/dependency. **Results:** Statistically significant differences (ANOVA,  $p<0.001$ ) were found among the three groups for all three factors. Specific contrasts indicated CP patients reported experience of more symptoms than other groups on all three domains with exception of cognitive disturbance. Here CP patients reported a similar experience of cognitive difficulties and similar severity of symptoms to MTBI

patients. However, chronic pain patients report greater affective/behavioral difficulties and physical/dependency difficulties than MTBI patients. MTBI patients report similar experience and severity of affective/behavioral concerns to control subjects. MTBI patients reported greater experience and severity of physical/dependency symptoms than control group. Conclusion: CP and normal controls may report similar or greater “post-concussion” symptoms than MTBI patients (average 12 days post-injury). Results corroborate other findings that suggest self-reported symptoms of post-concussion syndrome are not unique to MTBI, even within a month post-MTBI.

## A60

### Comparison of symptoms in chronic pain and MTBI subjects

*Mrazik M, Paniak C, Kunzle E*

**Objective:** Compare subjective symptoms in chronic pain and MTBI subjects with/out litigation/benefits. **Method:** Subjects with mild traumatic brain injuries who were not receiving benefits for litigation (MTBI, non;  $n = 76$ ), those receiving compensation benefits or in litigation (MTBI, lit;  $n = 34$ ), chronic pain (CP;  $n = 81$ ), completed the post-concussion checklist (PCL), 2nd Edition. MTBI subjects were recruited from two emergency wards and followed up at 3 months post-injury. CP subjects were recruited during participation in a multi-disciplinary program. Control subjects consisted of staff and students recruited from university, hospital, and a municipal government office. The PCL, 2nd Edition (Kay, 1996) consists of 43 items, each reportedly common TBI complaints. The checklist measures three factors including affective/behavioral, cognitive, and physical/dependency. Each factor is divided into the experience of a given symptom and its severity. **Results:** Statistically significant differences (ANOVA,  $p < 0.05$ ) were found among the three groups for all three factors. Specific contrasts suggested CP subjects and MTBI with litigation/benefits reported higher levels of experience with cognitive difficulties and severity of cognitive difficulties than MTBI subjects without litigation/benefits. CP presented with highest experience and severity of affective/behavioral concerns as well as experience and severity of physical/dependency concerns followed by MTBI subjects with litigation/benefits who in turn demonstrated higher reports on all four variables compared with MTBI subjects without litigation/benefits. **Conclusions:** Results suggested that other populations may report similar symptoms as subjects with MTBI although litigation/benefits impact self-report of subjective concerns.

## A61

### Validity of the orientation and cognitive logs relative to the mini mental status exam

*Penna S, Novack TA, Parkinson R*

**Objective:** The aim of the study was to further evaluate the construct validity of a bedside screening measure of cognition (the cognitive-log; Alderson and Novack, 2003) and orientation (orientation log; Jackson et al., 1998), by comparing these measures with the mini mental status exam (Folstein & McHugh, 1975). **Method:** Forty participants (aged 17–70) were receiving inpatient rehabilitation for brain disorders, such as TBI, brain tumor, and aneurysm. Correlation coefficients were employed to assess the degree of overlapping variance among the O-Log, Cog-Log and MMSE. Further qualitative item analysis was employed to assess the relative strengths and weaknesses of each measure. **Results:** The MMSE was significantly correlated to both measures,  $r = 0.62$ ,  $p < 0.01$  for the O-Log, and  $r = 0.70$ ,  $p < 0.01$  for the C-Log. The O-Log and C-Log were also significantly related to each other,  $r = 0.73$ . **Conclusions:** The O-Log and C-Log were highly correlated with the MMSE, indicating good construct validity. The O-Log and C-Log may be better suited for a moderate to severely brain injured population in a rehabilitation setting compared to the MMSE. The scales were developed to give partial credit based on responsiveness to cueing or partially correct answers. Further, the O-Log and C-Log do not have a written component, which is problematic for individuals with hemiparesis or weakness.

## A62

### Use of the neuropsychological assessment battery (NAB) screening module with post-acute traumatic brain injury patients

*Temple RO, Zgaljardic DJ*

**Objective:** The screening module of the neuropsychological assessment battery (NAB) provides a brief assessment of an individual's cognitive functioning, and provides recommendations for the need for further assessment in each cognitive domain. The aim of the present study was to test the utility of the screening module from the NAB in individuals with

traumatic brain injury admitted to a residential post-acute rehabilitation facility. Method: The study sample included 30 individuals (90% male) who had sustained a severe traumatic brain injury (GCS 3–8). Mean age of the sample was 31.8 years, and mean educational attainment was 12.5 years. Participants were administered the NAB screening module an average of 14.4 months post-injury. Results: The mean standard score for the overall NAB screening battery was 69.6 (S.D. = 16.4). The lowest mean scores were observed on the attention (mean = 67.6, S.D. = 18.2) and executive functioning (mean = 75.1, S.D. = 19.0) subscales. In 25 out of 30 cases, NAB criteria suggested not proceeding with at least one corresponding full domain module, and in 19 out of 30 cases NAB criteria recommended not to proceed in two or more modules. Conclusions: Our preliminary findings provides evidence for the clinical utility of the NAB screening module in assessing cognitive functioning in post-acute severe traumatic brain injured patients across multiple domains. Use of this brief instrument may help rehabilitation neuropsychologists obtain a quicker understanding of an individual's cognitive strengths and weaknesses in order to facilitate treatment planning.

## A63

### Comorbidity profiles for head injury

Neal TJ, Hall JJ, Hiller TR, Noggle CA, Dean RS

Objective: A significant minority of patients who sustain head injury seek treatment for associated symptoms. Comorbid disorders exacerbate and maintain symptoms thereby increasing risk for subsequent trauma. Treatment outcomes rely upon accurate diagnosis. This study investigates and identifies prevalence rates of comorbid psychiatric disorders among a population of neuropsychological referrals. This will provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within a head injury population. Method: The current study examined secondary and tertiary diagnoses of 517 individuals with a primary diagnosis of head injury as the result of a comprehensive neuropsychological evaluation. Subtype analysis examines prevalence rates among head injury subtypes. An odds ratio calculates percentages for prevalence rates among groups. Results: Results of odds ratio analyses indicated high prevalence rates of comorbid psychiatric diagnoses for individuals diagnosed with head injury. Overall, 77% of individuals had secondary diagnoses, 45% had tertiary diagnoses, and 8% had fourth diagnoses. Depression was the most common comorbid diagnosis (20.5%) followed by anxiety (16.6%). learning disorders (5.8%), attention-deficit/hyperactivity disorder (adhd; 4.6%), and epilepsy (3.5%) were also common comorbid diagnoses. Also, 38% of individuals incurred additional head trauma following a head injury. Subtype analyses revealed salient differences in prevalence rates among subtypes. Conclusion: Results indicated individuals have comorbid psychiatric disorders at a greater rate than demonstrated in the general population indicative of treatment recommendations (APA, 2000).

## NEUROLOGIC AND NEUROPSYCHIATRIC DISORDERS I: TREATMENT AND REHABILITATION

## A64

### Identification of judgment and safety concerns for persons with disabling neurological disorders

Kreutzer J, Williams K, West D

Objective: Referral sources often express concern about patients' abilities to live independently, drive, manage finances, and make other important decisions. Because of uncertainties about neuropsychological tests' ecological validity, clinicians often interview caregivers to obtain information. Using a newly developed assessment tool, this investigation identified caregivers' primary concerns for outpatients with severe neurological disorders (57% TBI). Method: Judgment and safety screening inventory responses of 106 family caregivers were examined using a cross-sectional design. The JASSI is a 55-item structured inventory which identifies caregivers' concerns in nine critical daily living domains: travel; financial; interpersonal; food and kitchen; appliances, tools and utensils; household; medications and alcohol; fire safety; firearms. Respondents rate concern levels for each item on a scale ranging from 0 ("none") to 3 ("very"). Means for each item and domain were calculated. Results: Family caregivers greatest concerns were in the travel (mean = 1.32, S.D. = 0.93) and financial (mean = 1.28, S.D. = 0.99) domains. Most prominent travel concerns related to driving (slow reacting, 62%; easily distracted, 58%; not alert or having accidents, 56%). Most prominent financial concerns related to forgetting bills (57%), checkbook management (54%), and losing money (40%). Forgetting to shut off appliances (39%), leaving cooking food unattended (39%), and being careless with flammable items (21%) were also major concerns. Conclusions: Clinicians often rely heavily on neuropsychological testing to make recommenda-

tions about living independently, power of attorney, guardianship, and driving. The present investigation indicates that the JASSI helps identify caregivers' concerns and can serve as a useful complement to neuropsychological tests.

## A65

### **Predicting cognitive outcomes in children with brain tumors**

*Micklewright JL, King TZ, Papazoglou A, Mumaw MA, Morris RD*

**Objective:** The influence of treatment and medical variables on cognitive abilities in children with brain tumors has rarely been examined in a cumulative and interactive manner. The neurological risk scale was developed to quantify these interactive effects, and was hypothesized to significantly predict cognitive functioning 3–6 years post-diagnosis, and to demonstrate superior predictive utility compared to individually examined medical variables. **Method:** Twenty-eight children diagnosed with cerebellar ( $N=10$ ), third ventricle ( $N=10$ ), and cortical tumors ( $N=8$ ) completed the Stanford-Binet IT-IV. Mean age was 10.3. The sample was 57% male, 71% Caucasian and 29% African-American. To calculate NRS scores, medical records were examined for hormone deficiency, epilepsy, hydrocephalus, neurosurgery, radiation, and chemotherapy. **Results:** Regression analyses indicated that the NRS was a significant predictor of short-term memory abilities ( $r^2=0.16$ ,  $p=0.04$ ), and demonstrated a strong trend to significantly predict full-scale IQ ( $r^2=0.13$ ,  $p=0.06$ ), abstract visual ( $r^2=0.13$ ,  $p=0.06$ ) and quantitative ( $r^2=0.11$ ,  $p=0.09$ ) reasoning abilities. Furthermore, hierarchical analyses indicated that the NRS accounted for a substantial proportion of the variance in IQ above and beyond individually examined medical variables. **Conclusion:** Previous attempts to examine the influence of medical variables on cognitive outcomes have neglected to consider the interactive effects of multiple neurological insults. Our results demonstrate the NRS's superior predictive utility in a sample of children with brain tumors. Implications for the use of the NRS in clinical research and practice, and in the development of compensatory strategies will be discussed.

## A66

### **Acute changes in cognitive function during substance use disorder treatment**

*Schrimsher GW, Parker JD*

**Objective:** To determine the pattern of acute cognitive function in individuals entering substance use disorder (SUD) treatment and its change over 24 days of treatment sobriety. **Method:** Participants were 63 consecutively admitted adults to a 24 day residential/day SUD treatment in a Veterans Administration Medical Center with 58 completing treatment (age  $47.8 \pm 8.6$  years, 54 male, 44 African American, 14 Caucasian, education  $12.2 \pm 2.3$  years, North American Adult Reading Test Score of  $19.2 \pm 9.4$ ). Participants were assessed at entry with the repeatable battery for the assessment of neuropsychological status (RBANS) Form A and at treatment conclusion with the RBANS Form B. **Results:** There was significant ( $p < 0.002$ ) improvement in immediate memory index score (entry  $88.4 \pm 15.9$ , end  $94.8 \pm 11.9$ ), attention index (entry  $85.6 \pm 16.6$ , end  $91.1 \pm 14.0$ ), and total score index (entry  $81.4 \pm 9.5$ , end  $85.4 \pm 8.0$ ), while there was no improvement in visuospatial/constructional index score (entry  $75.4 \pm 12.0$ , end  $76.7 \pm 12.0$ ), language index (entry  $92.4 \pm 7.6$ , end  $94.7 \pm 7.0$ ), or delayed memory index (entry  $87.8 \pm 12.5$ , end  $89.1 \pm 13.5$ ). **Conclusions:** There is an acute improvement in immediate memory and attention abilities as measured by the RBANS over 3.5 weeks of abstinence. This finding has potential importance with regard to timing and maximizing efficacy of cognitive-behaviorally based SUD treatments.

## A67

### **An exploratory study at an educationally based cognitive retraining program: Assessment of individuals with acquired brain injury**

*Kuechle R*

**Objective:** Individuals with acquired brain injury often struggle with recovery from their injuries. This empirical study examined the effectiveness of the Acquired Brain Injury Program at Coastline Community College, an educationally based cognitive rehabilitation program in Costa Mesa, CA. **Method:** The research design was a one-group pretest–post-test design. Archival data were used for data analyses. A total of 102 participants, ranging in brain injury from mild to severe, were selected. The MicroCog test was administered during pretest and post-test in order to explore change in overall cognitive functioning. The most important variables in this study were general cognitive proficiency, change in general cognitive proficiency, severity of brain injury, combined injury code and change in performance

on MicroCog subscales, information processing accuracy, time between injury and pretest, and premorbid education category. Results: An exploratory factor analysis revealed six latent variables contributing to comprising change in cognitive functioning measured by MicroCog. Severity of brain injury was negatively correlated to general cognitive proficiency,  $r(681) = -0.081$ ,  $p = 0.038$ . The change in information processing accuracy between pretest and post-test was significantly related to the type of injury, Wilks'  $L = 0.742$ ,  $F(16, 174) = 1.753$ ,  $p = 0.041$ . The multivariate Eta Squared based on Wilks'  $L$  was 0.139. Conclusions: These findings suggest that the Acquired Brain Injury Program at Coastline Community College is effective and may contribute to the development of efficient and affordable cognitive rehabilitation programs.

## Poster Session B

### NEUROLOGIC AND NEUROPSYCHIATRIC DISORDERS II: TRAUMATIC BRAIN INJURY

#### B1

#### **Predicting slow recovery from sport-related concussion: The new simple-complex distinction**

*Iverson GL*

**Objective:** A summary agreement statement introducing new terminology for sport-related concussions was published in 2005. This new classification system is binary (i.e. “simple” versus “complex” concussions). The purpose of this study was to determine if high school football players, classified as having simple or complex concussions, could be differentiated in the first 72 h post-injury on the basis of symptom reporting or neuropsychological testing. **Method:** One hundred and fourteen concussed athletes completed a computerized neuropsychological screening evaluation within 72 h of injury. They were followed clinically until they were recovered and cleared to return to play, and retrospectively classified as having a simple ( $n = 55$ ) or complex ( $n = 59$ ) concussion based on their recovery times. **Results:** The groups were compared on four neuropsychological composite scores using MANOVA followed by univariate ANOVAs. There was a significant multivariate effect [Wilks'  $\Lambda = 0.79$ ;  $F(4, 109) = 7.2$ ,  $p < 0.001$ , eta squared = 0.21]. Univariate ANOVA results revealed significantly better test scores for athletes with simple concussions compared to those with complex concussions on the visual memory, reaction time, and processing speed composites. The groups did not differ on the verbal memory composite. Athletes with complex concussions also had significantly greater total scores on the post-concussion scale. The effect sizes associated with all of these differences were large. Athletes who performed poorly on all three neuropsychological composites were 18 times more likely (95% CI = 2.3–144.9) to recover slowly. **Conclusion:** Neuropsychological testing in the first 72 h is related to poor outcome in some athletes.

#### B2

#### **Discriminative validity of neurocognitive measures in the detection of concussion in high risk athletes**

*Alfano D, Nicholls M*

**Objective:** Athletes in high risk sports are a group where the potential for concussion is substantial. Recent estimates indicate the risk of concussion to be as high as 20% annually depending on the sport and level of play. An important issue in the field of sport neuropsychology is the identification of objective measures with sufficient sensitivity and specificity to be of clinical value in detecting concussion. The objective of this study was to examine the discriminative validity of neurocognitive measures in the detection of concussion. **Method:** Seventeen university athletes (nine male football players, six male hockey players, and two female hockey players) were assessed within 5 days of sustaining a concussion. The control group consisted of 12 non-concussed non-athlete undergraduates matched for age, education, and sex. Assessment consisted of individual administration of a set of standardized measures examining a range of neurocognitive domains. **Results:** Multivariate analysis of variance comparing the groups on the neurocognitive measures was significant, with the univariate analyses indicating significantly poorer performance of the concussed athletes specifically on: digit span (forward and backward), Hopkins verbal learning test (total learning, delayed recall), Trails B, digit symbol substitution, and oral symbol digit modalities; discriminant function analysis using these seven measures correctly classified 28 out of 29 (96.6%) of the participants, with sensitivity of 94.4%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 91.7%. **Conclusions:** These findings provide clear evidence for the utility of neurocognitive measures in the detection of concussion in high risk athletes.

**B3****A survey of concussion knowledge and management among New England high school football coaches***Guilmette TJ, Malia LA, McQuiggan MD*

**Objective:** Concussions in high school football players are most often evaluated and managed by the team's athletic trainer (AT). At schools without an AT or without one present at practice, the coach is solely responsible for concussion management. Our objective was to survey high school football coaches' understanding, management, and sources of knowledge of concussion at schools without ATs present at practices. **Method:** Surveys were mailed to 254 head football coaches at New England high schools. Forty-three percent of the surveys were returned ( $n = 109$ ). Sixty-two respondents indicated there was no athletic trainer at practice. Returned questionnaires suggest that 57% of the surveyed high schools have no AT present at practice, which resulted in approximately 144 of the initial 254 coaches eligible to participate. Among those schools, we received 62 responses (43% return rate). **Results:** Coaching associations and conferences were the two most common and helpful sources of information about concussion. Players infrequently report having sustained a concussion to their coach. Participants believed that disorientation/confusion is the most common sign of concussion. A smaller percentage of coaches held misconceptions about concussions than the general public. When given potential symptoms of concussion, 70–95% of coaches reported that they would consult a health care professional before allowing a player to return to play. **Conclusions:** Participants demonstrated greater knowledge about concussions than the general public and most, but not all, coaches appear to take a conservative approach to concussion management. Further details and ramifications of the results will be presented.

**B4****Concussion and magnitude of neurobehavioural symptoms in university wrestlers***Kesten S, Alfano D, Nicholls M*

**Objective:** Athletes who participate in high risk sports represent a group where the potential for multiple concussions is high. A critical issue in sport neuropsychology is the idea that multiple concussions may have long-term neurobehavioural consequences. Wrestling has been identified as a sport that places athletes at high risk for concussion. The objective of this study was to determine the prevalence of multiple concussions in university wrestlers and to examine the relationship between concussion history and magnitude of neurobehavioural symptoms. **Method:** Twenty-four university wrestlers and a control group of 24 non-athlete undergraduates matched for age, education, and sex underwent pre-season baseline neuropsychological assessment that included administration of the Neurobehavioural Symptom Inventory, a recently developed self-report measure specifically designed to assess neurobehavioural symptoms associated with mild traumatic brain injury. Concussion history was obtained from each participant via clinical interview. **Results:** Results revealed that 70.8% ( $n = 17$ ) of the wrestlers had sustained at least one concussion compared to 16.7% ( $n = 4$ ) of the control group; the prevalence of multiple (two or more) concussions was 50% ( $n = 12$ ) and 8.3% ( $n = 2$ ) for the wrestling and control groups, respectively. Concussion history was significantly correlated with higher self-reported ratings of dizziness, blurred or double vision, and problems with balance. **Conclusions:** These results indicate a high prevalence of multiple concussions in university wrestlers. Concussion history was also significantly correlated with somatic-based neurobehavioural symptoms. These findings have important implications for the relationship between concussion and the magnitude of neurobehavioural symptoms.

**B5****The relation between acute symptom presentation and cognitive functioning in concussed amateur athletes***Schnakenberg-Ott S, Fazio V, Pardini J, Stovall C, Lovell M, Collins M*

**Objective:** The acute presence of symptoms following a concussive event may be related to decreased neurocognitive performance. The purpose of the present study was to examine the relation between individual symptoms and performance on specific measures of cognitive functioning in a sample of concussed athletes. **Method:** Participants were 99 amateur athletes with a mean age of 15.86 (S.D. = 1.26) who had completed 9.52 years of education (S.D. = 1.32). All athletes had received a concussion through sport participation, and were assessed using the 22 item Post-Concussion Symptom Scale (PCSS) and the Immediate Post-concussion Assessment and Cognitive Testing battery (ImPACT) within 14 days of injury. **Results:** Of four composite scores that ImPACT calculates, verbal memory had a significant correlation with symptoms in all four symptom factors: sleep, neurocognitive, emotional, and physical. Specifically,



verbal memory was highly correlated with the symptom of hyposomnia ( $r = -0.26$ ,  $p = 0.01$ ), irritability ( $r = -0.23$ ,  $p = 0.02$ ), memory problems ( $r = -0.39$ ,  $p = 0.00$ ), fogginess ( $r = -0.25$ ,  $p = 0.01$ ), and numerous physical symptoms including headache and nausea. Conclusions: This study suggests that specific symptoms following a concussion are related to deficits in verbal memory. While some symptoms are highly related to deficits in neurocognitive domains, the individualized presentation of concussion warrants careful inquiry regarding all symptoms and assessment of cognitive functioning using standardized means.

## B6

### **Relation of post-concussion symptom presentation and eventual return to play in amateur athletes**

*Schnakenberg-Ott S, Stovall C, Lovell M, Fazio V, Pardini J, Collins M*

**Objective:** Studies have suggested that collegiate and professional athletes recover rather quickly from concussion and often within a week of their injury. Little is known about the recovery process in younger athletes. This study evaluated the relation between individual post-concussion symptoms and recovery rates in acutely concussed younger athletes. **Method:** Participants included 108 amateur athletes with a mean age of 15.67 (S.D. = 1.82). Mean education completed was 9.32 (S.D. = 1.81) years. All athletes had received a concussion through athletic sport participation and were assessed using the Post-Concussion Symptom Scale (PCSS) within 14 days of their injury. Athletes were returned to play only when they were asymptomatic at rest and with non-contact physical exertion, and cognitive scores were within expected limits based on normative information. **Results:** The mean number of days to recover and return to play was 33.13 days (S.D. = 30.51). Only 20% of athletes were recovered within 2 weeks and 34% had not meet return to play criteria within 1 month post-injury. A stepwise regression designed to evaluate the relationship between subjective symptoms and days to recovery indicated that phonophobia, sadness, drowsiness, feeling slowed down, emotionality, and sleep-related deficits were related to protracted recovery. **Conclusions:** This study suggests that the presence of specific symptoms at the time of initial evaluation may signal a longer recovery rate in some athletes. This study also provides further evidence to support that sport related concussions in younger athletes often do not resolve in 1 week of injury.

## B7

### **The use of memory constructs as indicators of cognitive dysfunction in concussed athletes**

*Stovall C, Schnakenberg-Ott S, Pardini J, Fazio V, Lovell M, Collins M*

**Objective:** Memory is affected following traumatic brain injury. Prior studies of memory processes in concussed athletes have found a decrease even in mildly injured athletes. ImPACT is a computerized neuropsychological test battery used to evaluate cognitive functioning in concussed athletes. The working memory (WMI), immediate memory (IMI), and delayed memory indices (DMI) are ImPACT supplemental composite scores developed to provide additional markers of injury and recovery. The purpose of the current study is to determine if scores on these indices are sensitive to concussion. **Method:** Participants included 75 athletes, all of whom had received baseline and post-injury testing on ImPACT. The sample included predominantly male athletes (74.7%). Average age was 16.58 with an average of 10 years education. **Results:** Baseline ImPACT scores on the WMI were compared to post-injury scores on the same index using a dependent measures  $t$ -test. Results indicated a statistically significant decline in WMI following injury,  $t(74) = 3.02$ ,  $p < 0.01$ . In addition, a statistically significant decline on post-injury testing (when compared to baseline) was found in the IMI,  $t(73) = 4.78$ ,  $p < 0.001$ , and the DMI,  $t(73) = 5.81$ ,  $p < 0.001$ . **Conclusions:** This study suggests that the WMI, IMI, and DMI ImPACT scores are useful in determining cognitive difficulties in concussed athletes. It appears that all three of these indices were significantly lower in concussed athletes when compared to these athletes' own pre-injury test scores.

## B8

### **Assessing reliable change in “return to play” status for persons with sports related concussion**

*Parsons TD, Robertson KR, Notebaert A, Guskiewicz K*

**Objective:** Assessment of intra-individual change is important for determining significance of changes in test scores across serial assessments of athletes with sport-related concussion. Reliable change indices (RCI) may aid athletic trainers make more informed decisions when using neurocognitive measures. We aimed to demonstrate the usefulness of RCIs on three different measures of concussion assessment. **Method:** Forty collegiate athletes suffering sport-

related concussion received follow-up neurocognitive assessments. Athletes were grouped as either cleared or not cleared based on their performance on these measures. We calculated RCIs for all athletes and then for the cleared and not cleared groups. Results: An average decrease existed in simple reaction time (SRT1) and matching to sample (MTS) performances, and for composite SOT performance and all sensory ratios. Athletes reported an average increase in post-injury symptoms. For the cleared group, SRT1 and MTS showed a decrease in performance. Symptom scores were still increased but less than the entire group. The somatosensory (SOTsom) ratio decreased. The not cleared group showed decreases in performance for all SMCA measures excluding the Math, procedural reaction time, and code substitution. Average symptom score reported was higher than both the whole group and the cleared group. There were significant differences in proportion of athletes in the not cleared and cleared groups classified as improved or declined for math, code substitution, SOTsom, and SOT visual. Conclusions: Application of RCI on SMCA may help the clinicians make more informed decisions on return to play for athletes that have sustained a concussion.

## B9

### **Toward objective sideline neurophysiological detection of mild TBI: Reliability of pupillometry**

*Livingston SC, Kennedy CH, Freeman J, Broshek DK, Barth J*

**Objective:** Development of non-invasive, portable technologies capable of detecting acute neurocognitive change is needed for rapid identification and management of mild traumatic brain injury (mTBI) sequelae. This is especially true in high-risk environments such as combat and sports. Current methods utilize subjective assessment of pupillary dynamics using pen light reflex. We investigated the interrater reliability of the ForeSight Pupillometer in assessing pupillary dynamics. **Method:** We assessed 18 healthy undergraduate and graduate students (50% female, mean age 23.8, S.D. = 4) with no neurological or eye trauma history. Participants were assessed indoors and in an outdoor shaded condition by two independent examiners using the ForeSite Pupillometer. Lighting condition, tester order, and eye order were randomized. Dilation velocity, historically the most sensitive indicator of change in intracranial pressure, was the primary variable of interest. The Pupillometer measures the speed of pupil dilation velocity, measured in mm/s, via administration of brief photostimulation. **Results:** Interrater measurements of dilation velocity were significantly correlated ( $r = 0.769$ ,  $p < 0.001$ , Examiner 1 mean = 0.807, Examiner 2 mean = 0.817). A  $t$ -test revealed no significance between the two examiners (a certified athletic trainer and a neuropsychology post-doctoral fellow). **Conclusions:** Preliminary data suggest that the Pupillometer is feasible for indoor or shaded outdoor assessment of pupillary dynamics with potential utility for detecting neurophysiological changes after mTBI. This will have applications for objective and early sports concussion and battlefield military assessments to guide further neuropsychological testing and return to play/duty decisions.

## B10

### **Pain and emotional problems best predict early post-concussion symptoms**

*Paniak C*

**Objective:** To investigate correlates of patient and significant other (SO) ratings of the patients' post-concussion symptoms (PCS) within the first month ( $M = 12$  days) after a mild traumatic brain injury (MTBI). **Method:** Ninety-nine adults who agreed to take part in a MTBI treatment study, and who were diagnosed using the 1993 American Congress of Rehabilitation Medicine MTBI criteria, were recruited from consecutive admissions to two urban hospital emergency wards. The patients were assessed prior to commencing treatment and they completed the problem checklist (PCL; a measure of PCS) from the New York Family Head Injury Interview and the Short Form-36 Health Survey (SF-36; a more general health questionnaire). Their SO completed the relative's version of the PCL. The relationships of PCS, primarily with variables that the 2004 World Health Organization MTBI Task Force Report identified as being potentially important correlates of poor outcome after MTBI, were investigated. **Results:** SF-36 Bodily Pain and Mental Health scores were the variables most consistently correlated with patient and SO PCS ratings. Brain injury-related variables such as presence/absence of unconsciousness, post-traumatic amnesia duration, and number of days from injury to PCL assessment were unrelated to PCS findings. Other factors had variable relationships with PCL scores. **Conclusions:** Even within 1 month after MTBI, emotional distress and pain problems correlate much more strongly with PCS complaints than do brain injury variables. In conjunction with previous research, this casts even more serious doubt on the specificity of so-called post-concussion complaints to MTBI.

**B11****Assessing effort on baseline testing by athletes and normal controls using WMT and ImPACT***Sucharski N, Schatz P*

**Objective:** To identify the number of athletes and normal controls who display poor effort on baseline neurocognitive testing performance on ImPACT, as measured by performance on the Word Memory Test (WMT). **Methods:** Participants were 77 athletes completing mandatory baseline evaluations, as required for participation in athletic activities, and 78 age-matched undergraduate students volunteering as normal controls through the Psychology Department human subjects pool. All participants completed the immediate and delayed recall subscales of the WMT, as well as the ImPACT test battery. **Results:** Using a WMT cutoff of 95%, 38% of athletes and 45% of controls showed poor effort. Participants were assigned to independent groups on the basis of passing or failing the WMT. MANOVA revealed a significant effect of effort on baseline test performance [ $F(6, 148) = 4.51; p < 0.0001$ ]. Univariate analyses revealed that participants showing poor effort on WMT scored significantly lower on all ImPACT indices (verbal and visual memory, processing speed, reaction time, total symptoms), except for impulse control. **Conclusions:** Given the wide-spread use of computer-based tests for the purpose of documenting baseline cognitive function in athletes, neuropsychologists and sports-medicine professionals should utilize external measures of athletes' effort. Further, employing normal controls from human subjects pools may provide less accurate comparisons than desired.

**PROFESSIONAL ISSUES: EFFORT AND MOTIVATION****B12****Examining the test of memory malingering Trial 1 and word memory test immediate recognition as screening tools for insufficient effort***Bauer L, O'Bryant SE, Lynch JK, Fisher JM, McCaffrey RJ*

**Objective:** For various reasons, instruments that measure effort are reportedly underutilized in neuropsychological assessment. This study examines the use of the TOMM Trial 1 and the WMT Immediate Recognition (WMT IR) trial as brief screening tools to assess effort in order to provide additional options to researchers and clinicians. **Method:** Archival data were combined from two forensic settings. 105 litigants completed the TOMM, and 64 litigants completed the WMT. For analysis of TOMM Trial 1 scores, sensitivity, specificity, PPV and NPV were calculated compared to Trial 2 and the Retention Trial for three base rates. The same procedure was followed for those who took the WMT. **Results:** Based on TOMM Trial 2 and/or Retention trial scores, 29% of litigants were classified as putting forth insufficient effort. Sensitivity of TOMM Trial 1 scores as a screening tool was greatest using cut-scores ranging from 44 to 50 and specificity was greatest using cut-scores ranging from 25 to 31. Based on WMT IR, DR, and/or CNS scores, 66% of litigants were classified as putting forth insufficient effort. Sensitivity of the WMT IR was greatest using the cut-scores 39 and 40 and specificity was greatest using cut-scores ranging from 20 to 34. **Conclusion(s):** Results support the utility of both TOMM Trial 1 and WMT IR as screening measures for insufficient effort at varying base rates and findings are particularly promising for the WMT. This research offers clinicians and researchers additional options in terms of utilization of these symptom validity measures.

**B13****Malingering is more than a poor effort***Celinski MJ, Allen III LM, Gilman J*

**Objective:** Validation of "PsychoAssistant" (PA), a novel non-verbal computerized malingering test intended to measure deliberate effort to represent cognitive impairment. The PA test employs 25 commonly "known" versus 25 "unknown" stimuli in a recognition and learning paradigm. Known stimuli include famous faces, landmarks and monuments (such as the late Pope, pyramids of Egypt and the Eiffel Tower). Suppression of such remote knowledge cannot be erased by serious brain injury or easily affected by interference. After the first block, corrective feedback is provided along with retesting for improvement, as needed. Subsequent blocks are represented as "difficult" conditions and employ image distortion and interference distraction in the form of random performance feedback. Reaction times and errors are recorded in each trial, and various measures of response consistency are calculated across blocks. **Method:** A total of 208 head and/or bodily injured compensation patients were given a wide range of cognitive and emotional measures that were examined for the effects PA failure. The sensitivity of PA was also assessed relative to exaggeration

determined by CARB, WMT and TOMM. Results: Errors of omission and commission, poor “learning”, inconsistent responding and deterioration with random feedback were strongly correlated with suppressed results from ability and effort measures. Cross-validation with the TOMM, WMT and CARB produced acceptable overall classification rates ranging from 70% to 94%. Conclusions: PsychoAssistant is a promising new non-verbal test of symptom validity containing a number of measures closely associated with deliberate efforts to portray cognitive impairment.

#### B14

##### **Social intelligence test-R as a neuropsychological instrument**

*Celinski MJ, Salmon Jr. JD, Allen III LM, Palucka A, Antczak E*

Objective: Previous research employing the 1955 version of the social intelligence test (revised form, 2nd Edition; SIT-R2) developed by Moss, Hunt, Omwake and Woodward, using 97 head injured patients found the SIT-R2 significantly more accurate than WAIS-R results in differentiating mild from more severe impairment. The SIT-R2 assesses social interactions, basic rules of conduct, attribution of emotion and motives, and sense of humor. The present study re-standardized the SIT-R2 on 340 students from three sites, and used it to identify specific social deficits among head injured patients. Method: Data from 93 head injured patients were used in correlation and multiple regression analyses of SIT-R2, WAIS-R, Category Test (CAT), WCST, MCMI-II, and the LNNB Frontal Test Series to investigate the utility of the SIT-R2 in neuropsychological assessment. Results: Significant correlations were found between overall social intelligence and measures of head injury severity, WAIS-R Verbal IQ and Comprehension ( $p < 0.001$ ), and WAIS-R Similarities ( $p < 0.01$ ). Selected social intelligence measures were mildly correlated with WCST perseverations and WAIS-R FSIQ ( $p < 0.01$ ), but not with WCST categories ( $p > 0.02$ ). No correlations were found with MCMI-II scales, CAT or Frontal Test results. The strongest SIT-R2 relationships with cognitive measures were with the Sense of Humor scale and the weakest with judgment in social situations. Conclusions: Social intelligence test is a useful measure of post-head injury verbally mediated social adaptation. The degree of deficit is related to severity of head injury.

#### B15

##### **Predicting pain treatment program dropout with the word memory test**

*Clark TS, Allen III LM*

Objective: Previous research demonstrates that CARB and the WMT can identify symptom exaggeration in patients claiming disability due to pain-related conditions such as fibromyalgia, back pain and DSM-IV pain disorder. The present investigation was undertaken to determine whether the WMT could predict compliance with a comprehensive pain treatment program. Method: Multiple regression and univariate analyses of treatment-related data for 49 chronic pain patients who began an outpatient treatment program were conducted on self-report and objective outcome measures. Results: Six patients (12%) failed to complete the treatment program. Compared with graduates, univariate analyses revealed only weak differences on measures of distress and one WMT validity measure ( $p < 0.07$ ) and no differences in any demographic, diagnosis or any compensation-related variables. However, multiple regression utilizing variables in combination produced a significant model ( $r = 0.48$ ,  $p < 0.04$ ) in which dropouts were characterized by higher initial self-reported depression, anxiety, pain interference and scores on the Oswestry Pain Questionnaire, and lower WMT effort scores. Conclusions: Although WMT and CARB have been partially validated in the assessment of depression and pain-related disability claims, this preliminary study suggests that at least the WMT could be useful in predicting compliance with treatment. However, failure on symptom validity tests is associated with elevated psychopathology, and without studying a larger sample of dropouts it is unclear whether use of the WMT can improve patient selection for comprehensive pain treatment programs.

#### B16

##### **Attention and memory dysfunction in pain patients while controlling for effort on the California Verbal Learning Test-II**

*Curtis KL, Greve KW, Bianchini KJ*

Objective: Attention and memory impairment are common complaints in individuals suffering from pain. However, little research exists examining specific attention and memory problems encountered by pain patients while controlling for effort. This study examined attention and memory performance in chronic pain and mild traumatic brain injury patients using the California Verbal Learning Test-II (CVLT-II) while controlling for effort using the Word Memory

Test. Method: Data were obtained retrospectively from pain ( $n=40$ ) and mild traumatic brain injury ( $n=20$ ) patients. Groups were divided into good or poor effort groups based on performance on the Word Memory Test (WMT). A demographically-matched group ( $n=20$ ) was obtained using the normative sample of the CVLT-II. Attention and memory processes were examined using fifteen selected variables from the CVLT-II and formulas adapted from Curtiss et al. (2001). Results: The good effort clinical patients scored lower than the normative sample on CVLT variables associated with attention and concentration but not memory processes. The poor effort pain patients performed poorly on all CVLT variables. Secondary analyses examining the potential influence of psychological factors in good effort patients/poor attention patients were also conducted. Conclusions: Controlling for effort led to different explanations of poor performance on variables associated with attention and memory. While mild deficits were expected and could be attributed to psychological factors, extremely poor performance was more indicative of poor effort. The findings of this study strongly support the necessity of measuring effort during neuropsychological and pain psychological evaluations.

## B17

### Use of the rarely missed index to identify learning disability malingering

*Domboski K, Nigl G, Marsello C, Buddin H, Stack M, Golden C*

Objective: Previous research derived a Rarely Missed Index (RMI) for identifying individuals malingering a traumatic brain injury from the Logical Memory-Recognition (LMR) subtest. The purpose of this study is to explore the RMI items to detect malingering among individuals being evaluated for a learning disability. Methods: Subjects were 24 college students who received minimal course credit for participation. Ninety-two percent of subjects were female, with mean age of 22.38 (S.D. = 5.87) and mean education of 13.4 years (S.D. = 1.25). Subjects were alternately assigned to a control group instructed to perform their best, or an experimental group instructed to feign a learning disability severe enough to receive accommodations on a professional board exam. All subjects were administered a 3 h neuropsychological test battery in a university mental health services setting. Due to limitations of sample size and score distributions, a non-parametric approach was used for data analysis. Results: Results from a binary logistic regression found the RMI items correctly classified 85.7% of control group participants and 60% of experimental group participants, however, no variables in the equation were found to be significant predictors of group membership. Conclusions: Results suggest RMI items were less useful for detection of individuals malingering a learning disability than for detection of individuals malingering traumatic brain injury. Implications for future research include exploring the RMI items for learning disability malingering using a parametric approach, such as discriminant functions analysis, which would yield additional useful data about the influence of individual items.

## B18

### Experience trumps academic knowledge in faking a head injury

*Erdal K*

Objective: This study assessed which was more effective in producing believable head injury on neuropsychological tests: head injury experience (in self or family member), knowledge of academic neuroscience, or neither. Method: Two-hundred and thirty undergraduates were asked to fake a mild head injury on the California Verbal Learning Test (CVLT) and Trail-Making Test (TMT) as a member of one of three groups; students with previous mild head injury experience in self or family (experienced,  $n=29$ ), advanced neuroscience students (academic,  $n=42$ ), introductory psychology students (naive,  $n=159$ ). Results: MANOVAs revealed that there were significant differences between the groups on CVLT recall and intrusion measures,  $p < 0.05$ , as well as TMT Form A time and error measures,  $p < 0.05$ , with the Academic group consistently scoring more impaired than the naive group,  $p < 0.05$ , and the naive group consistently scoring more impaired than the experienced group,  $p < 0.05$ . The only exception to this pattern was TMT Form B, where the experienced group scored more impaired than the naive group. Overall, the academic group portrayed scores of those with severe head injuries or flagrant malingerers. Conclusion: Consistent with previous studies (Erdal, 2004; Schwartz et al., 1998), the academic knowledge of head injury group portrayed mild head injury as more severe than warranted. Those with real-world head injury experience performed more realistically, but appeared to pick TMT Form B to demonstrate impairment, indicating that they perceived the executive assessment of TMT Form B to be a more face valid measure of head injury.

**B19****Self-report pain/symptom ratings and WMT performance***Gervais RO*

**Objective:** Self-report pain/symptom indices are vulnerable to response bias characterized by over-reporting/exaggeration. We examined the relationship between the Word Memory Test (WMT; Green, 2003; Green, Allen, & Astner, 1996; Green & Astner, 1995) and self-report pain/symptom indices to determine if cognitive response bias is associated with over-reporting on self-report pain/symptom indices. **Method:** We used five separate pain/symptom indices and WMT data from 1212 consecutive non-head injury disability-related referrals. Cases that did not have at least one of the pain rating indices and the WMT were excluded. Chronic pain (39%) and anxiety-related disorders (23%) were the primary diagnoses. This resulted in a final sample of 1075 cases (51% male). The sample was divided into WMT pass (68%) or fail (32%) groups. **Results:** The fail WMT group scored significantly higher than the pass WMT group on all self-report pain and symptom rating indices ( $p < 0.0005$ ). ANOVA results indicated significant increases in pain and symptom rating scores across decreasing WMT score ranges ( $p < 0.0005$ ). Multiple regression analyses found that mean WMT score was predicted by MHI extreme responses, PCI symptom magnification, and 0–5 pain rating, but not MPI pain severity or number of pain sites. **Conclusions:** Poor performance on the WMT was associated with increasing scores on self-report pain and symptom rating indices. This suggests that cognitive response bias, as measured by the WMT, is also associated with overreporting of pain or other physical symptoms.

**B20****The response bias scale and self-report pain/symptom indices***Gervais RO, Ben-Porath YS*

**Objective:** The MMPI-2 Response Bias Scale (RBS; Gervais, 2005; Gervais, Ben-Porath, Wygant, & Green, 2006) is designed to detect response bias in forensic neuropsychological and disability assessment settings. Validation studies have demonstrated that the scale is sensitive to cognitive response bias as determined by failure on the WMT (Green, Allen, & Astner, 1996; Green, 2003) and other SVTs. This study examined the relationship between performance on the RBS and self-report pain/symptom indices. **Method:** This archival study used MMPI-2 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. Exclusion criteria were CNS > 30, or VRIN/TRIN > 80. Final sample  $N = 775$  (51% male). The sample was divided into three RBS percentile ranges, <10th, 50th, >90th for the analyses. **Results:** ANOVA results indicated significant increases in pain/symptom rating indices across increasing RBS score ranges ( $p < 0.0005$ ), with effect sizes ( $h^2$ ) ranging from 0.13 to 0.30.  $t$ -Tests comparing the indices across the three levels produced large effect sizes ( $d$ ) of 0.90–1.24. On regression, RBS was predicted by number of pain sites, symptom magnification, and extreme responses, but not pain severity/rating. **Conclusions:** Increasing RBS scores were associated with higher pain/symptom rating scores on all indices. The strongest effect sizes were observed for the PCI Symptom Magnification and the MHI Extreme Responses-Physical Symptoms scales. These findings suggest that elevated scores on the RBS are associated with overreporting/exaggeration of physical symptoms.

**B21****Rates of insufficient effort & neuropsychological functioning among men evaluated for suspected occupational lead exposure***Gfeller JD, Capps AN, Allen BJ*

**Objective:** This study examined rates of insufficient effort from 125 male litigants seen for neuropsychological evaluation for suspected occupational exposure to lead. The neurobehavioral abilities of examinees that provided adequate effort during testing were also examined. **Method:** A group ( $N = 125$ ) of male litigants (mean age = 52) were seen for evaluation due to suspected occupational lead exposure. The evaluation consisted of the following measures: Test of Memory Malingering (TOMM), WTAR, WASI, WMS-III, Booklet Category Test (BCT), Trail Making Test, Stroop Color Word Test, Rey Complex Figure Test (RCFT), COWA, Grip Strength, Finger Tapping, and Grooved Pegboard (GPB). Subsequent to receiving IRB approval, the archival data was analyzed to achieve the study objectives. **Results:** Analyses indicated that only 6 (5%) of the examinees exhibited insufficient effort on the TOMM. Similarly low rates of insufficient effort occurred on embedded validity indicators (e.g. BCT, WMS-III). Mean test scores for the remaining 119 examinees indicated the group was not impaired in most neurobehavioral domains. However, disproportionate

percentages of examinees were impaired ( $T < 40$ ) in several areas, including: executive abilities (BCT = 41%), mental processing speed (Stroop = 30–38%), verbal fluency (COWA = 35%), fine motor dexterity (GPB = 36–40%), and constructional ability (RCFT = 42%). Conclusions: The low rate of insufficient effort in this sample may reflect the impact of informed consent regarding the consequences of giving poor effort. Additionally, approximately one-third of examinees exhibited neurobehavioral deficits in several domains consistent with research findings (e.g. Schwartz et al., 2000) regarding adult exposure to lead.

## B22

### **Detection of malingering in chronic pain: A known-groups comparison of three forced-choice symptom validity tests**

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

**Objective:** To compare Portland Digit Recognition Test (PDRT), Test of Memory Malingering (TOMM), and Word Memory Test (WMT) in the detection of Malingered Pain-Related Disability (MPRD). This study reports the classification accuracy of each test individually and in combination. **Methods:** Two-hundred and thirty-nine chronic pain patients with incentive was examined on the basis of Bianchini et al.'s (2005) criteria for MPRD. Sixty-two met criteria for probable MPRD and 54 met criteria for the non-MPRD group. One-hundred and twenty-three could not be reliably classified into either group and were excluded from analyses. The two groups did not differ in age; the MPRD group was less educated. **Results:** MANOVA demonstrated significant group effects for each SVT subtest; education was not a significant covariate. FP error rate was 2% for PDRT, TOMM, and 11% for WMT at the published cutoffs. When 5% FP cutoffs were derived from the current data, the TOMM and WMT performed identically (7% FP, 58–60% sensitivity); PDRT was less sensitivity (47%). Overall inter-test agreement was about 80%. Failure on two or more SVTs at the cutoff from this study resulted in an overall FP rate of 4% and sensitivity of 55%. **Conclusion:** Each SVT accurately detected MPRD at all cutoffs; WMT was less accurate at published cutoffs. The TOMM and WMT performed identically at the pain cutoffs and each uniquely identified 8% of MPRD. These SVTs can be validly used in patients with pain.

## B23

### **Challenging current assumptions in effort testing in the TBI population**

*Keckler WT*

**Objective:** This purpose of this study was to compare TBI data to normative data on TBI from the TOMM, and explore possible relationships between the TOMM and other measures. **Method:** Assessments were performed on 21 individuals residing in an adult inpatient residential TBI unit. An ANOVA compared TOMM scores with the sample of 45 TBI patients published in the TOMM manual. Additionally, regression equations were used to explore the ability of age, years post-injury, and scores on the Ranchos Los Amigos Cognitive Scale, the Cognitive Estimation Scale, and the Temporal Orientation Scale to predict TOMM scores. **Results:** Group means on the TOMM for our sample were 36.33 (S.D.: 6.49) for trial 1, 41.05 (6.29) for trial 2, and 40.57 (5.92) for the retention trial. Results of an ANOVA indicated that our sample differed significantly from the normative group on trial 1 ( $F(1, 64) = 48.61, p < 0.001$ ), trial 2 ( $F(1, 64) = 72.07, p < 0.001$ ), and the retention trial ( $F(1, 60) = 87.69, p < 0.001$ ). Furthermore, on trial 1 of the TOMM, a significant regression equation was found for Temporal Orientation scores ( $F(1, 15) = 10.522, p = 0.005$ ) with an  $R^2$  of 0.412. No other regression equations were significant ( $p > 0.05$ ). **Conclusions:** Our results challenge current assumptions that recommend cut off scores of 45 on the TOMM can be used reliably in TBI populations to detect effort.

## B24

### **Validity of the test of memory malingering in a highly motivated, cognitively impaired medical population**

*Kennedy CH, Shaver G, Aucone EJ, Bender S, Broshek DK, Freeman J, Barth J*

**Objective:** The test of memory malingering (TOMM) is a standardized procedure for evaluations of symptom validity, which has been shown to be relatively insensitive to cognitive impairment. While the TOMM has been validated for use in multiple populations, its use in medically compromised individuals has not been studied. **Method:** This study evaluated the utility of the TOMM in a population seeking organ transplant. This population was chosen both due to advanced stages of disease, and high motivation to do well on testing. Subjects were 50 consecutive individuals referred for neuropsychological assessment as part of liver ( $N = 35$ ) and kidney ( $N = 15$ ) transplant evaluations (mean age = 48,

S.D. = 10.7, 64% male). Results: Negative correlations were revealed between TOMM Trial 1 and Trail Making Test A and B ( $p < 0.01$ ) and positive correlations between TOMM Trial 1, and the repeatable battery for the assessment of neuropsychological status (RBANS) immediate memory, visuospatial/constructional, attention, delayed memory, and total scale indices ( $p < 0.01$ ). Despite a wide variety of performance on TOMM Trial 1, all but one subject (e.g. RBANS attention index SS = 46) were able to pass TOMM Trial 2 per the cutoff score specified in the manual. Conclusions: Findings from this sample suggest that individuals experiencing a significant decline from premorbid functioning are able to pass the TOMM. Only profound neurocognitive impairment resulted in a failing TOMM score.

## B25

### Updating WMS-III memory-WMI discrepancy score base rates tables for detecting poor effort

*Lange RT, Iverson G, Tulskey D*

**Objective:** The identification of rare or unusual performance patterns on neuropsychological tests is one method for determining whether an individual might be providing poor effort. The relationship between memory and attention-concentration abilities on the WMS-R has received some support in this regard. Following the publication of the WMS-III, Iverson and Tulskey (2000) developed base rate tables for determining unusually large memory-working memory (WMI) difference scores using four of the original memory indexes (i.e. IMI, GMI, AII, ADI). Since then, three new memory indexes have been developed: (a) delayed memory index [DMI], (b) alternate delayed memory index (DMIalt), and (c) alternate immediate memory index (IMIalt). The purpose of this study was to develop memory-WMI base rate tables for these three new memory indexes. **Method:** Participants were the WMS-III standardization sample ( $N = 1250$ ) and clinical group sample ( $N = 170$ ). WMI scores were subtracted from the three memory indexes. **Results:** There was a linear relationship between WMI and memory-WMI difference scores (i.e. DMI/DWI,  $r = 0.54$ ; DMIalt/DWIalt,  $r = 0.53$ ; IMIalt/IMIalt-WMI,  $r = 0.49$ ). As the level of memory ability increased, the magnitude of discrepancy between WMI and memory scores also increased. Base rate tables for IMIalt-WMI, DMI-WMI, and DMIalt-WMI difference scores, stratified by memory ability level, are presented using the standardization and clinical samples separately. **Conclusion:** These tables are a first step for determining whether memory-working memory difference scores might be useful for identifying poor effort in forensic evaluations.

## B26

### Comparison of MMPI-2 and PAI validity scales to detect feigned responding: An analogue malingering study

*Lange RT, Sullivan K, Scott C*

**Objective:** The MMPI-2 and PAI are two popular personality inventories for evaluating psychological symptoms. In personal injury litigation, the identification of feigned or exaggerated response styles is critical. Clinicians do not typically administer both inventories and must decide which measure to use. The purpose of this study was to compare the clinical utility of the PAI and the MMPI-2 to detect exaggeration of symptoms using an analogue malingering study. **Method:** Participants were 49 (75.5% female) university students who completed the MMPI-2 and PAI under one of three conditions: honest responding ( $n = 20$ ), feign PTSD ( $n = 15$ ), or feign depression ( $n = 14$ ). Measures included the standard clinical scales from the PAI and MMPI-2, and four PAI and nine MMPI-2 validity scales. **Results:** Participants instructed to feign depression or PTSD had significantly higher scores on the majority of MMPI-2 and PAI clinical ( $p < 0.001$ ) and validity scales ( $p < 0.001$ ) compared to controls. The validity index (cutoff  $\geq 5$ ) and the obvious-subtle index (cutoff  $\geq 100$ ) were the most accurate validity measures, with a very high rate of detecting feigned versus genuine responding on the MMPI-2 (sensitivity = 0.86, specificity = 0.95, PPP = 0.88, NPP = 0.94 for both). For the PAI, the most accurate validity measure was the MAL index; however, detection rates were modest at best (cutoff score  $\geq 2$ : sensitivity = 0.76, specificity = 0.90, PPP = 0.76, NPP = 0.90). **Conclusion:** The validity scales on the MMPI-2 were clearly superior to the PAI validity scales at identifying feigned versus honest responding in this sample.

## B27

### Can measures of executive functioning predict malingering?

*Marsello C, Nigl G, Domboski K, Shaw L, Golden C*

**Objective:** Neuropsychological measures can be useful tools to detect malingering of head injury symptoms, but have not been explored in relation to detecting malingering among individuals seeking accommodations for LD. This study sought to determine if there was a combination of executive functioning measures that would significantly



discriminate between instructed malingerers and non-malingering controls in the context of being evaluated for a learning disability. Method: Subjects were 24 students (14 controls and 10 instructed malingerers) enrolled in undergraduate college courses (92% female, mean age = 22.38, S.D. = 5.87; mean education = 13.4 years, S.D. = 1.25) who were administered a 3 h neuropsychological battery in a university mental health center setting. Subjects were assigned on an alternating basis to either a control group instructed to perform to the best of their ability, or a simulated malingering group instructed to convincingly feign a learning disability in order to receive special accommodations on a professional board exam. Results: *T*-scores from the Trail Making Test-A&B, The Stroop Color and Word test, and the Category test were entered into a step-wise discriminant analysis functions. It was found that only the Category Test *t*-score significantly predicted group membership ( $X^2 = 13.73$ , d.f. = 1,  $p < 0.001$ ), correctly classifying control and malingering participants 83.3% of the time. Conclusions: The findings suggest the category test may be a useful tool for detecting malingering among individuals faking a learning disability in hopes of falsely receiving special accommodations.

## B28

### **Can malingering detection strategies for head injuries be applied to detecting feigned learning disabilities?**

*Nigl G, Domboski K, Marsello C, Korman B, Golden C*

Objective: This pilot study explored the effectiveness of using three commonly used malingering detection strategies when applied to the detection of individuals faking a learning disability. Method: Subjects were 24 students (14 controls and 10 instructed malingerers) enrolled in undergraduate courses (92% female, age = 22.38, S.D. = 5.87; education = 13.4 years, S.D. = 1.25) who were administered a 3 h neuropsychological battery in a university mental health center. Subjects were assigned on an alternating basis to either a control group instructed to perform to the best of their ability, or a simulated malingering group instructed to convincingly feign a learning disability in order to receive special accommodations on a professional board exam. Results: It was found that a significantly higher proportion of malingerers scored below the recommended cutoff score of 45 on Trial 2 of the TOMM than individuals in the control group ( $X^2 = 6.72$ , d.f. = 1,  $p < 0.01$ ). The results from two discriminant functions analyses revealed that the difference score between the Digit Span and Vocabulary scaled scores of the WAIS-III significantly predicted group membership ( $X^2 = 8.12$ , d.f. = 1,  $p = 0.004$ ) and correctly classified control and malingering participants 70.8% of the time. The auditory delayed and auditory recognition delayed difference score on the WMS-III did not significantly discriminate between the groups. Conclusions: The use of the TOMM and the vocabulary-digit span discrepancy may be effective ways to identify individuals faking a learning disability in hopes of falsely gaining accommodations.

## B29

### **The utility of the Rey word recognition test in the detection of suspect effort**

*Nitch S, Boone K, Wen J, Arnold G, Warner-Chacon K*

Objective: The purpose of the present research was to examine the diagnostic utility of the standard administration of the Rey word recognition test in isolation (i.e. without the first trial of the RAVLT) as a measure of non-credible memory complaints. Method: The study examined the predictive accuracy of the test by examining the performance of three groups of participants: (a) 92 non-credible patients (as determined by failed psychometric and behavioral criteria and external motive to feign), (b) 51 general clinical patients with no motive to feign, and (c) 31 learning disabled college students. Results: Results demonstrated gender differences in performance that necessitated separate cutoff scores for men and women. Use of a cutoff score of  $\leq 7$  words correctly recognized identified 80.5% of non-credible female patients while maintaining specificity of  $>90\%$ . However, to achieve this level of specificity in male non-credible patients, the cutoff score had to be lowered to  $\leq 5$ , with resultant sensitivity of only 62.7%. A combination variable (recognition correct minus false positive errors + number of words recognized from the first eight words) showed enhanced sensitivity in identifying suspect effort in a subset of the non-credible sample who were claiming cognitive symptoms secondary to traumatic brain injury (i.e. cutoff score of  $\leq 9 = 81.6\%$  sensitivity with 90% specificity). Conclusions: The results indicate that the Rey word recognition test is an accurate and cost-effective method for the detection of non-credible cognitive performance, particularly in certain subgroups of examinees.

**B30****Detection of malingering in traumatic brain injury with the Wechsler Memory Scale-III***Ord J, Greve KW, Bianchini KJ*

**Objective:** The present study uses a known groups design to examine the specificity and sensitivity of the eight primary indexes of the Wechsler Memory Scale-3rd Edition (WMS-III) in detecting malingered neurocognitive dysfunction (MND). **Method:** Traumatic brain injury (TBI) patients ( $N=111$ ) were classified according to injury severity (mild versus moderate/severe) and assigned to one of four groups based on slick criteria: No incentive (not MND), incentive only (not MND), probable (MND), and definite (MND). A general clinical sample (e.g. CVA, memory disorder, psychiatric disorder) of 116 patients without incentive was also included for comparison. **Results:** Within the overall TBI sample, specificities of at least 94% (6% false positive error rate) resulted in sensitivities to MND ranging from 20% (visual immediate) to 57% (general memory). Specificities of at least 97% resulted in sensitivities up to 36% (auditory recognition). Patterns of scores were different across TBI severity groups, with auditory indexes generally being more sensitive in the moderate/severe group. Sensitivity rates obtained in the entire sample (TBI and general clinical) were only moderately lower, mostly due to the inclusion of dementia patients. **Conclusions:** This study demonstrates that the WMS-III provides good sensitivity and specificity in well-defined MND. These results support the use of the WMS-III as a reliable indicator in the detection and diagnosis of malingering in TBI.

**B31****Differential effects of malingering and performance apathy in neuropsychological testing***Pella R*

**Objective:** Detection of effort to acquire secondary gain (i.e. disability, lucrative legal settlements, etc.) in neuropsychological assessment has become a necessary industry in clinical and forensic settings. Inducing cognitive sets via specific malingering instructions in non-clinical samples for research purposes and to “coach” prospective litigants has been validated previously (Brennan, 2003). Disinterest in the testing process has not been examined as an effect of on testing. Those who are not interested in the testing setting may fail common malingering measures, thereby increasing the likelihood of being mislabeled a malingerer. Therefore, it is essential to explore the nature of performance apathy as a potential contributor to failing malingering measures. **Data selection:** This study employed three groups: (1) a standard simulated malingering group, (2) a performance apathy group, and (3) a normal test-taking control group. Specific measures include the Test of Memory Malingering, the Word Memory Test, Rey-Fifteen Item Test, and the Dot Counting Test. **Data synthesis:** Group performance were explored through mean comparisons and frequency of falling below cutoff scores. Both control and apathy groups performed similarly and scored significantly above the simulated malingering group on most measures. **Conclusions:** Current results do not suggest a significant detrimental effect of simulated apathy on commonly utilized malingering measures. Suggestions for future research in this area and theoretical implications of current results are provided.

**B32****The utility of a memory test as a malingering test in a Spanish population***Vilar-López R, Puente A, Bellón-Guardia M, Gómez-Río M, Horcajadas Á, Llamas-Elvira J, Pérez-García M*

**Objective:** The aim of this study was to prove the utility of the TAVEC (Spanish equivalent to CVLT) in malingering detection. **Method:** Participants: Two groups were studied: Ten individuals suspected of malingering (SM) based on scores indicative of poor effort on two or more malingering tests (VSVT, TOMM, the b test, Dot Counting and Rey 15-item) that were involved in litigation, with a median age of 33.57 years ( $S.D.=12.38$ ) and a median of 9.02 years of schooling ( $S.D.=3.33$ ); and 45 patients with post-concussive syndrome (PCS), with a median age of 32.60 years ( $S.D.=11.33$ ) and a median of 8.60 years of schooling ( $S.D.=1.34$ ). All of them underwent an extensive neuropsychological assessment that also included the TAVEC in the “Hospital Virgen de las Nieves”. **Variables:** The selected variables of the TAVEC were: total learned words (trials 1–5), immediate recall, delayed recall, recognition and discriminability. **Results:** Statistical significant differences among the groups were found in Total learned words [ $F(1, 51)=14.47$ ;  $p<0.000$ ], immediate recall [ $F(1, 51)=16.74$ ;  $p<0.000$ ], delayed recall [ $F(1, 51)=20.74$ ;  $p<0.000$ ], recognition [ $F(1, 51)=17.84$ ;  $p<0.000$ ] and discriminability [ $F(1, 51)=40.57$ ;  $p<0.000$ ]. **Conclusions:** This is the first time it is demonstrated the possibility of using the TAVEC as a malingering test. Further studies are necessary to establish the optimal cutoff points for this test.

**B33****Effort testing in older adults: Poor effort or poor memory?***Frenchs R*

**Objective:** The Medical Symptom Validity Test (MSVT) is an effort measure that to date has been used little with older adults. The purpose of this study was to examine the utility of the MSVT in a sample of older adults with known or suspected cognitive impairment. **Method:** The MSVT was administered to 59 adults (range 53–89 years) referred to a hospital-based geriatric unit as part of a neuropsychological assessment. The sample included 33 individuals diagnosed with dementia, 16 with mild cognitive impairment (MCI), 7 with a primarily psychiatric presentation, and 3 cognitively healthy individuals. Test failure was defined as performance 85% or lower on one or more of the immediate recognition, delayed recognition, and consistency indices. **Results:** Approximately 40% of individuals in this sample obtained “failing” scores on the MSVT. The highest failure rate (65%) was found among persons diagnosed with Alzheimer’s disease, mixed dementia, or amnesic MCI though elevated failure rates (47%) were also found among individuals with other types of cognitive impairment including dementia with lewy bodies. The vascular cognitive impairment/dementia group, notably, fared relatively well with a 20% failure rate. Individuals with no cognitive impairment and all but one with psychiatric difficulties passed the MSVT. The use of an equation to identify “plausible failure” was useful in classifying poor MSVT performance. **Conclusion:** The MSVT should be interpreted cautiously with older adults who may have dementia or MCI given the risk of false-positive errors though this risk may be reduced through the use of a simple calculation.

**PROFESSIONAL ISSUES: FORENSIC PRACTICE****B34****White matter hyperintensities in adolescents & adults: Implications for forensic neuropsychology***Ashton V, Iverson GL, Bernardo JL*

**Objective:** Neuropsychologists frequently evaluate adolescents and adults with mild traumatic brain injuries (MTBI) who have one or more white matter hyperintensities (WMH) identified on magnetic resonance imaging. These hyperintensities are often described as “non-specific” and the etiology is unclear. Without question, there is a large literature suggesting that the presence of WMHs increases with age and is associated with a variety of medical conditions (e.g. hypertension, multiple sclerosis, and stroke). However, when WMHs are seen in adolescents or young adults with a remote history of MTBI, the non-specific etiology might be de-emphasized. The purpose of this review is to provide clinicians with prevalence rates of WMHs in healthy individuals and various clinical populations. **Data selection:** Pubmed databases were searched using keywords such as white matter hyperintensities, adults, adolescents, children, depression, psychosis, bipolar, and psychiatry. Thirty-two articles published between 1997 and 2005 were reviewed and the percentages of participants with WMHs were extracted. **Data synthesis:** Researchers have reported that WMHs occur in a substantial minority of healthy adolescents and adults (e.g. prevalence in some samples ranging from 8% to 47%). Moreover, there have been numerous studies reporting that adolescents and adults with depression (14–70%), bipolar disorder (18–69%), conduct disorder (14%), and schizophrenia spectrum disorders (2–85%) have one or more WMHs. **Conclusions:** This project helps clinicians understand the prevalence of abnormalities seen on neuroimaging in various clinical populations, as well as healthy controls, thereby enhancing the clinician’s ability to conceptualize cases with “non-specific” radiological findings.

**B35****Do validity scales of the MMPI predict performance on symptom validity tests? Preliminary findings***Horwitz JE, Fisher JM, McCaffrey RJ*

**Objective:** This study was designed to investigate whether performance on validity scales of the MMPI2 predicts performance on symptom validity tests (SVTs). Given previous research, we hypothesized that only the FBS may be a significant predictor of performance on SVTs. **Method:** We used archival data from 109 patients administered the Word Memory Test (WMT), Test of Memory Malingering (TOMM), Victoria Symptom Validity Test (VSVT), and MMPI2. Four logistic regression analyses were performed, each using nine validity scales from the MMPI2 as predictors of passing or failing the WMT (cut score = 82.5 on any of three subscales), the TOMM (cut score = 45 on trial two), the VSVT with a cut score of 16/24 on hard items, and the VSVT with a cut score of 9/24 on hard items. **Results:** A test of the full model was statistically significant for the TOMM,  $\chi^2(9, N = 92) = 20.38, p = 0.016$ , indicating that the

predictors reliably distinguished between individuals who had passed and failed the TOMM. Examination of individual predictors revealed that only FBS was a significant predictor (Wald = 5.34,  $p = 0.021$ ). Although the full model did not significantly predict performance on the VSVT, the FBS was a significant predictor (Wald = 4.944,  $p = 0.026$ ) when using a cut score of 9/24. Conclusions: Findings indicate that the standard validity scales of the MMPI2 are not significant predictors of performance on SVTs. However, the FBS does differentially predict whether an individual will pass or fail SVTs. Implications will be presented in detail.

### B36

#### **The MMPI-2 fake bad scale (FBS) for detection of symptom exaggeration on neuropsychological testing: Further extension and cross-validation**

*Macher R, Bauer L, Gavett B, Yantz C, Horwitz J, Lynch JK, Fisher JM, McCaffrey RJ*

**Objective:** The MMPI-2 Fake Bad Scale (FBS) has been developed to detect the exaggeration of psychological and physical symptoms in personal injury litigation. The present study sought to extend previous findings by analyzing the sensitivity, specificity, and positive and negative predictive values (PPV and NPV) of the FBS in detecting symptom exaggeration separately for men and women. **Method:** Archival MMPI-2 and symptom validity test data were extracted from 202 personal head-injury litigants. FBS cutoff scores were selected based on Larrabee's (2003) recommendations (19; 22; 23 for males, 25 for females). Symptom exaggeration was defined differentially in three separate analyses: (1) failure on the test of memory malingering (TOMM), (2) failure on the word memory test (WMT), and (3) failure on both the TOMM and the WMT. **Results:** Sensitivity of the FBS was greatest for females with cut scores of 25 who failed both the TOMM and WMT. Specificity was greatest for females with cut scores of 25 who failed the WMT. Sensitivity was lowest for males with cut scores of 23, while specificity was lowest for litigants with cut scores of 19. Both PPV and NPV were highest across all three analyses for females with cut scores of 25, and lowest for males with cut scores of 23. **Conclusion:** In the present study, the FBS showed PPV were low except when a cutoff score of 25 was used with females. The NPV were moderate at all cutoff scores for all analyses. The clinical implications of these findings will be discussed.

### B37

#### **MMPI-II personality characteristics associated with suboptimal effort in a clinical sample**

*Anderson EJ, Ryba M, Horner MD*

**Objective:** To examine personality characteristics of individuals who provided suboptimal effort on neuropsychological evaluation. **Method:** Archival data were reviewed from 153 outpatients seen for evaluation at a VA Medical Center neuropsychology clinic. Patients were referred from throughout the medical center and had various neurological and psychiatric diagnoses (e.g. TBI, CVA, other neurological illness, mood and anxiety disorders, etc.). Symptom validity tests (e.g. Test of Memory Malingering, Rey-15 Item Test, Portland Digit Recognition Test) and other criteria were used to classify 37 patients as providing suboptimal effort and 116 as providing good effort. All patients who were given the MMPI-II as part of routine clinical examination were included. Demographic and MMPI-II data were compared between the two groups using MANOVA and *t*-tests. Patients' mean age was 51.2 years (S.D. = 13.8); mean education was 13.1 years (S.D. = 2.5); 95% were male. **Results:** Patients exerting suboptimal effort were less educated than the good effort group ( $p < 0.01$ ). MANOVA indicated significant group differences on MMPI-II ( $p < 0.05$ ). On post hoc analyses, the suboptimal effort group had higher F and lower K *T*-scores, consistent with previous literature. They also had higher *T*-scores on Scales 2, 6, 7, 8, and 0. **Conclusions:** Suboptimal effort was associated with specific findings on clinical and validity scales. Such patterns could potentially be helpful for characterizing these patients, making treatment recommendations, and determining effort in clinical settings.

### B38

#### **Re-evaluating the recommended cutoff score for the MMPI-2 validity index**

*Lange RT, Sullivan K, Scott C*

**Objective:** In a recent contribution to MMPI-2 interpretation, Meyers, Millis, and Volkert (2002) developed the MMPI-2 Validity Index. These authors recommended a cutoff score of  $\geq 5$  on the Validity Index as the criterion to detect exaggeration. The purpose of this study was to evaluate the clinical utility of the Validity Index to detect feigned responding on the MMPI-2. **Method:** Participants were 49 (75.5% female) university students who completed the

MMPI-2 under one of three conditions: Honest responding ( $n = 20$ ), Feign PTSD ( $n = 15$ ), or feign depression ( $n = 14$ ). Results: Based on the recommended cutoff score of  $\geq 5$ , the false positive error rate in the honest responding group was 5%; however, the true positive rate in the combined feigned responding groups was only 82.8%. Fixing the true positive rate at 90–95%, a cutoff score of 3 or higher was considered optimal (i.e. true positive = 93.1%; false positive = 10%). Based on measures of sensitivity, specificity, and predictive power calculated across the range of validity index scores, a cutoff score of  $\geq 3$  was again the most optimal in detecting feigned responding from honest responding (i.e. sensitivity = 0.93, specificity = 0.90, PPP = 0.88, NPP = 0.94). Conclusion: The MMPI-2 Validity Index looks promising as a means of detecting feigned responding on the MMPI-2. However, the recommended cutoff score of  $\geq 5$  appears to be too high and will fail to detect some individuals who are attempting to exaggerate. A lower cutoff score of  $\geq 3$  is recommended; though further research will be needed to verify the usefulness of a lower cutoff score.

### B39

#### The relationship of conation and effort on HRNB performances of litigants

Yantz CL, Bauer L, McCaffrey RJ, Lynch JK, Fisher JM

Objective: This study examined effects of conation (purposeful persistence) on Halstead-Reitan Neuropsychological Test Battery (HRNB) performance in litigants whose effort was either adequate or suboptimal. Performance differences based on effort were expected to increase as required conative ability of tests increases. This study extends findings of a paper by Reitan and Wolfson demonstrating a relationship between brain injury status and predicted conative requirements on the HRNB. Method: Nineteen HRNB raw test scores from 65 litigants administered both the HRNB and test of memory malingering (TOMM) were used. Raw HRNB scores were converted into rank scores to directly compare the tests. Independent-samples  $t$ -tests were used to compare group means of ranked HRNB test scores for either adequate or suboptimal performance on the TOMM. Correlations were completed to determine the magnitude of relationships between predicted dependence on conation of each test and group differences. Results: TOMM passers performed significantly better than TOMM failers on 15 HRNB tests ( $p = <0.001$ – $0.03$ ). The relationship between conation and effort as measured by the TOMM was poor, with no distinct trends relating group differences to conation. Correlations of predicted conative requirement with both  $t$ -ratio difference and mean group difference were non-significant. Conclusion. Poor TOMM performance was associated with poorer HRNB test scores, but not with their conative requirements. Conative requirements seem not to influence magnitudes of mean test score differences between TOMM passers and failers. Findings support the TOMM as a measure of effort and suggest that effort and conation are different constructs.

### B40

#### The impact of self-reported mood before and after traumatic brain injury

Crockett D

Objective: To determine the impact of emotional distress and level of functioning on objective measures: Method: Data were collected as part of an archival review of referrals to a private practice in an urban center. Participants ( $n = 104$ ) were asked to describe their recollections of signs and symptoms associated with depression and anxiety before their traumatic accident using the BDI, ARS, and STAI. A subset of participants ( $n = 99$ ) also completed a battery of neuropsychological tests measuring problem-solving (BSCAT), motor-speed (TMTA, Stroop-D), processing (TMTB, Stroop-C), oral fluency (WFT-FAS, HVOT, INT), learning (RCFDT-Copy, RAVLT1–5) and recall (BVRT, RCFDT-Immediate and Delay, RAVLT-Immediate, and WMS-HARD). Results: Self-reported levels of depression and anxiety before their accident fell within the lower portion of distribution of normative samples ( $<25$ th percentile rank). When asked to describe the presence of chronic and acute levels of distress, participants reported elevated levels of distress ( $>90$ th percentile rank). The presence of brain injury at the time of the accident was non-significantly related to changes in distress and objective measures of neuropsychological functioning. In contrast, changes in chronic and acute depression and chronic anxiety were predictive of levels of functioning on many measures of neuropsychological functioning. Conclusion: These results were interpreted as reflecting the importance of the participants' perception of changes in their emotional status relative to the presence of brain injury at the time of their accidents. LIMITATIONS: Limitations include absence of measures of effort, missing data, selection bias, and absence of collateral informants.

## PROFESSIONAL ISSUES: TEST DEVELOPMENT AND METHODS

### B41

#### **Development and validity of the facial affect learning and memory test (FALMT) and the facial identification of affect task (FIAT)**

*Armstrong CM, Strauss GP, Allen DN*

**Objective:** This study aims to establish the validity and reliability for two measures. The first is designed to assess visuospatial learning and memory for emotional information, the facial affect learning and memory test (FALMT). The second, the facial identification of affect task (FIAT), is a measure of facial affect discrimination. The FALMT was constructed to be analogous to commonly used assessments of learning and memory. The FIAT is a complementary procedure to the FALMT, allowing for examination of the role of facial affect discrimination in learning and memory. **Method:** A battery of tests that assessed memory, verbal, and visuospatial abilities was administered along with the FALMT and FIAT to fifty healthy adults. To establish validity, correlations were calculated among the FALMT, FIAT, and other measures in battery. Additionally, the FALMT and FIAT were repeatedly administered to allow for examination of test–retest reliability. **Results:** Results supported validity of the FALMT. Correlations with measures of memory functioning indicated the FALMT did indeed assess memory functioning. Correlations with measures of emotion also indicated the FALMT was valid measures of emotion processing. Correlations from repeated administrations of the FALMT and FIAT provided some support for their reliability. **Conclusions:** Little information is currently available on learning and memory for emotional information. Because emotion is expressed to a large extent through non-verbal means, the FALMT may prove to be a valuable tool for assessing this aspect of emotion processing. Additional research with clinical populations who have known disturbances in emotion processing would further support the validity of these instruments.

### B42

#### **A repeated measures study of the Shipley Institute Of Living Scale (SILS)**

*Bourgeois M, Dilks LS, Marceaux J, Mayeaux B, White R, Ashworth B*

**Objective:** Repeated administrations of neuropsychological instruments have been conducted with a belief that a reduction in pathological indicators is evidence of improvement. The manual for the SILS states there is no practice effect; however, there is no literature on the effects of repeated administration of the SILS. It was the purpose of this project to investigate this perception and evaluate the stability of scores for repeated administration of the SILS with an unimpaired population. **Method:** Forty-six individuals (24 males, 22 females) with a mean age of 21 years (ranging 17–50 years) were administered the SILS on six alternating days. Participants volunteered from an undergraduate psychology class and were offered compensation for participation. On each administration, researchers read test instructions and allowed 5 min to complete each section. **Results:** The researchers conducted a repeated measures analysis (at 95% confidence interval) with the raw scores and *t*-scores, since the test is not evaluated by raw scores in practice. Multivariate tests were significant for raw vocabulary scores [ $F(5) = 4.14, p = 0.003$ ] and raw abstraction scores [ $F(5) = 23.91, p < 0.001$ ]. The multivariate tests were also significant for vocabulary *t*-scores [ $F(1) = 14.1, p = 0.001$ ] and abstraction *t*-scores [ $F(1) = 8.78, p = 0.005$ ]. **Conclusions:** The results suggest a significant increase in scores as trials progress. This is representative of a practice effect. Consequently, repeated use of the same neuropsychological instrument is an imprudent endeavor as it cannot be concluded that decreases in pathological indicators are related in client improvement.

### B43

#### **Discrepancy between intellectual abilities and the neuropsychological assessment battery (NAB) in older adults**

*Brooks BL, Iverson GL, White T*

**Objective:** Neuropsychologists often use discrepancy analyses between intellectual and cognitive abilities to help determine if performance on a neuropsychological measure is unusually low. The purpose of this study is to provide comprehensive base rate tables of discrepancy scores for older adults between the Reynolds Intellectual Screening Test (RIST; Reynolds & Kamphaus, 2003) and index scores on the neuropsychological assessment battery (NAB; Stern & White, 2003). **Methods:** Participants included healthy older adults from the NAB standardization sample 55–74 ( $n = 586$ ) and 75–97 ( $n = 335$ ) years old. The demographically corrected index scores for the NAB include attention,

language, memory, spatial, executive functions, and a total score. Results: The median RIST-NAB discrepancy scores were 3 points for the 55–74 year-old group and 11–15 points for the 75–97-year-old group across the index scores. Healthy older adults between 55 and 74 years with low average (80–89) or average (90–109) intellectual abilities had, on average, comparable neuropsychological abilities. The big differences emerged in 55–74-year olds with high average (110–119) or superior (120+) intellectual abilities. In healthy older adults 74–97-years old, a similar pattern of larger discrepancies associated with high average or superior intellectual abilities emerged. Conclusions: These data dispel the myth that people with high average or superior intelligence are expected to have comparably high scores across a battery of neuropsychological tests. This information allows a sophisticated interpretation of NAB discrepancy scores with older adults.

#### B44

##### **Base rates of low scores on the screening module of the neuropsychological assessment battery (S-NAB)**

*Brooks BL, Iverson GL, White T*

Objective: The NAB Screening Module (S-NAB) was designed to be used in isolation or to facilitate and guide further neuropsychological assessment. This study illustrates the base rates of low scores on the S-NAB. Methods: Participants were the 1433 healthy adults comprising the normative sample. The S-NAB provides 16 demographically corrected *T* scores, five screening indexes (i.e. attention, language, memory, spatial, and executive functions), and a total screening index score. Results: When the five screening index scores were considered simultaneously, 46% of healthy adults had one or more scores below 1 S.D. from the mean and 9% had one or more scores below 2 S.D. from the mean. In adults with low average intellectual abilities, 87% had one or more low index scores ( $<1$  S.D.), compared to 32% of those with high average intellectual abilities. Examining the 16 individual tests simultaneously, 79% of the sample had one or more low scores and 37% had three or more low scores ( $<1$  S.D.). Using 2 S.D.s below the mean as a cutoff, approximately 35% had at least one extremely low score. Considering level of intelligence, 47% with low average abilities had five or more low scores ( $<1$  S.D.) compared to 9% of those with high average intellectual abilities. Similarly, 34% of adults with low average intellectual abilities had two or more extremely low scores ( $<2$  S.D.) compared to only 6% of those with high average intellectual abilities. Conclusions: Low scores on the S-NAB are common in healthy adults. The prevalence of low scores varies with level of intelligence.

#### B45

##### **Education effects and base-rate information for the Delis-Kaplan Executive Function System (DKEFS) fluency measures**

*Chelune GJ, Holdnack J, Levy J*

Objective: Demographic factors are known to be associated with cognitive performance. While the DKEFS tasks are age-corrected, we examined whether education further affects performance on the verbal and design fluency measures and their associated discrepancy scores. Method: Age-corrected scaled scores for the verbal fluency letter, category and switching trials and the design fluency filled, open, and switching trials from the DKEFS standardization sample were obtained with permission from Harcourt assessment. Subjects were 875 normal adults aged 20–89 who were stratified by four education-levels: “Less-than-High School” ( $n=165$ ), “High School” ( $n=310$ ), “Some College” ( $n=225$ ), and “College/+” ( $n=175$ ). Results: Significant Spearman correlations and Chi-squares were found between education-level and age-corrected scores for each of the DKEFS fluency trials, with higher age-corrected scores associated with higher education levels. Because stronger associations were noted for the verbal tasks ( $\rho$  0.160–0.356) than for design tasks ( $\rho$  0.129–0.160), education-Level was also associated with larger letter-filled design and category-open design discrepancies ( $\rho=0.193$  and 0.137). To enhance the diagnostic use of the DKEFS fluency tasks, base-rate tables were generated by education-level for each of the fluency trials and their corresponding discrepancy scores, with cutoff scores identified for the bottom 5th, 10th, and 15th percentiles. Conclusions: Education is significantly associated with DKEFS fluency scores, especially on the verbal trials. Base-rate data by education-level are presented to further enhance the diagnostic utility of the age-corrected fluency scores.

**B46****The role of adaptation in reducing the effect of a third party observer***Gavett BE, McCaffrey RJ*

**Objective:** The current study was conducted to determine whether adaptation, a technique commonly used to neutralize observer reactivity, can attenuate the effect of a third party observer (TPO) during neuropsychological assessment. It was hypothesized that allowing for adaptation to a TPO would reduce the performance-inhibiting effects of the observer. **Method:** Eighty undergraduates volunteered to fulfill course requirements or earn extra credit. Two between groups (observed/unobserved, adaptation/no adaptation) factors yielded four groups to which participants were randomly assigned. All participants were administered memory (word lists) and motor tests (used for adaptation). Analysis of variance (ANOVA) was utilized to test the hypothesis, using average memory score as the dependent variable. **Results:** ANOVA revealed a significant observation by adaptation interaction ( $F(1, 76) = 6.92, p = 0.01$ ). Under conditions without a TPO, adaptation led to a greater number of items recalled ( $M = 8.07, S.D. = 1.26$ ) than did no adaptation ( $M = 6.88, S.D. = 0.85$ ). However, when an observer was present, recall did not differ between the adaptation ( $M = 7.01, S.D. = 1.30$ ) and no adaptation ( $M = 7.135, S.D. = 1.00$ ) conditions. **Conclusions:** Although the a priori hypothesis was not supported, the TPO was found to moderate the effects of adaptation observed in the control group. Under normal testing conditions (i.e. without a TPO), individuals may be expected to perform better once they have become acclimated to the testing situation. However, the results of the current study suggest that the presence of a TPO may prevent this adaptation from occurring.

**B47****Comparing *T*-score norms for core Halstead-Reitan measures: Steinmeyer, Heaton, Russell, and New Stratified research norms***Greer S, Pennett D*

**Objective:** Users of the Halstead-Reitan Adult Battery who calculate *T*-scores may rely upon pooled but unstratified norms or stratified regression-based norms. These normative systems also differ in the types of normal subjects employed, whether volunteers, pseudo-neurologic referrals, or both. These normative systems were compared to a new normative system that utilized all types of normals. **Method:** To produce a more diverse and stratified pool, normal controls ( $N = 17,980$ ) of any type were combined from studies reporting at least one core Halstead-Reitan measure other than trailmaking (110 studies) or trailmaking alone (96 studies). The under-girding metric for each study and normative system was actual or estimated WAIS/WAIS-R Full Scale IQ, the latter calculated from demographic regression formulae and calibrated for obsolescence. *T*-scores for Halstead measures were then compared in a referred clinical outpatient sample ( $n = 200$ ). **Results:** The mean number of elevated scores, mean *T* for each subject, number of score differences ( $>5T, >10T$ ), and score differences that crossed an interpretive boundary of  $T = 55$  were significantly different (all  $p$ 's  $< 0.001$ ) and least likely to suggest dysfunction when using normative systems based upon patient or pseudo-neurologic groups. A normative sample that utilized Caucasian volunteers was consistently most stringent. Current norms were most centristic for such level-of-performance considerations and showed expected average IQ progression for most age and education clusters. **Conclusion:** This study demonstrates the importance of subject diversity and the utility of IQ calibration in normative group composition for core Halstead-Reitan measures.

**B48****Development and validation of a WISC-IV short form for a general clinical population using a theory based approach***Harris K, Hines L, Harvey D, Korman B, Golden C*

**Objective:** This study used an approach retaining the original factor structure to develop and validate several short-forms of the WISC-IV for use with a general clinical population. **Method:** Participants were 115 child outpatients administered the WISC-IV in a mental health setting. Sixty-five of participants were male with mean age of 9.97 ( $S.D. = 2.66$ ) and mean education of 4.17 years ( $S.D. = 2.57$ ). Mean FSIQ was 92.8 ( $S.D. = 16.61$ ). Predicted FSIQs were generated from four, five, and six test short-forms of the WISC-IV. Predicted FSIQs were compared with actual obtained subject FSIQs. **Results:** Three Pearson product-moment correlations found significant ( $p < 0.001$ ) positive relationships of a large magnitude between predicted IQ generated from the four, five, and six subtest short-form candidate models and actual subject FSIQ ( $r^2 = 0.88, 0.94, 0.89$ ). Mean difference scores between predicted and actual FSIQ were small for



all forms ( $m = 1.21$ ,  $S.D. = 6.66$ ;  $m = 0.10$ ,  $S.D. = 4.43$ ;  $m = 0.78$ ,  $S.D. = 6.00$ ) and few subjects scores exceeded a 15 point difference ( $n = 3$ , 1, and 2, respectively). Conclusions: A six subtest short-form of the WISC-IV that retained the original factor structure met stringent criteria for reliable and accurate predication of FSIQ. A different six test form and a four test form also met criteria but showed greater variability of prediction. Use of the most reliable six subtest short-forms was recommended. Replication of current findings with a larger sample is recommended.

#### B49

##### **Development and validation of a WISC-IV short form for a general clinical population using a multiple regression approach**

*Harvey D, Harris K, Hines L, Lloyd A, Golden C*

**Objective:** This study used a multiple regression approach to develop and validate several short-forms of the WISC-IV for use with a general clinical population. **Method:** Participants were 115 child outpatients in a university mental health services setting. Sixty-five percentage of participants were male with mean age of 9.97 ( $S.D. = 2.66$ ) and mean education of 4.17 years ( $S.D. = 2.57$ ). Mean FSIQ was 92.8 ( $S.D. = 16.61$ ). The study sample was randomly divided into two groups for development and cross-validation. **Results:** Stepwise regression found significant ( $p < 0.001$ ) positive relationships of a large magnitude between four, five, and six subtest short-form candidate models and WISC-IV FSIQ for both sample 1 ( $R^2 = 0.90, 0.91$ , and  $0.94$ ) and sample 2 ( $R^2 = 0.92, 0.94$ , and  $0.96$ ). Cross-validation of candidate models found significant ( $p < 0.001$ ) relationships of a large magnitude between actual FSIQ and predicted FSIQ for both sample 1 ( $r^2 = 0.83, 0.91, 0.91$ ) and sample 2 ( $0.88, 0.91, 0.95$ ). **Conclusions:** Both a five and six subtest short-form of the WISC-IV were found to meet stringent criteria for reliable and accurate predication of FSIQ. A four subtest short-form met most criteria but showed greater variability of prediction. Use of the five and six subtest short-forms was recommended over the four test form for this reason. Replication of current findings with a larger sample is recommended.

#### B50

##### **Screening for brain damage: Halstead-Reitan procedures**

*Horton AM*

**Objective:** Reitan and Wolfson (2006) have proposed two phased procedures to screen for brain damage using measures from the Halstead-Reitan Neuropsychology Test Battery (HRNTB). This study evaluated evaluates the phased procedures in a sample of brain damaged adult subjects. **Method:** A sample of 25 heterogeneously brain damaged subjects was selected from patient who had been administered the HRNTB. Seven patients had brain tumors, 6 had cerebrovascular disease, 5 had head injuries, 2 had Alzheimer's disease, 2 had multiple sclerosis, 1 has Parkinson's disease, and 2 had brain infections. Twenty-two patients were males and all but one was right handed. Phase I criterion is a rating of 2 (86 or more seconds) on the trail making test (TMT) part B and Phase II requires a combination of ratings on the HRNTB. The Finger localization test was substituted for the tactual form recognition test due to data set limitations. Data analyses determined hit rates for phases I and II screening procedures. **Results:** Phase I hit rate was 92% and phase II was 80%. For Phase I, if the criterion was changed to add also a rating of 2 on TMT A (40 or more seconds) than the hit rate improved to 96%. If the scores from both phases I and II were combined then a hit rate of 96% was obtained. **Conclusion:** The Reitan and Wolfson screening procedures have considerable promise and additional research is needed.

#### B51

##### **Convergent validity of the repeatable battery for the assessment of neuropsychological status in a memory disorder clinic sample**

*Humphreys J, Dempsey JP, Sutker PB, O'Bryant SE*

**Objective:** The objective of the current study was to examine the convergent validity of selected subtests of the RBANS in a memory disorder clinic sample. **Method:** Participants were 109 patients (43 male and 66 female) with a mean age of 75.21 ( $S.D. = 8.47$ ) and mean education level of 12.95 ( $S.D. = 3.92$ ). Fifty-five (50.5%) were diagnosed with AD, 37 (34.0%) with MCI, and 11 (10.1%) with some other dementia syndrome. Participants were tested using a neuropsychological battery that included the RBANS, WAIS-III Digit Symbol and Digit Span, WMS-III Logical Memory I and II, Boston Naming Test (BNT), and COWAT. **Results:** Scores on RBANS Story Memory positively correlated

with WMS-III Logical Memory I ( $r=0.51$ ,  $p=0.03$ ), and scores on RBANS Story Recall positively correlated with scores on WMS-III Logical Memory II ( $r=0.83$ ,  $p<0.001$ ). RBANS Picture Naming subtest scores were significantly correlated with scores on both the 30-item BNT ( $r=0.63$ ,  $p<0.001$ ) and 60-item BNT ( $r=0.77$ ,  $p<0.001$ ). RBANS semantic fluency and the COWAT animal naming test were significantly correlated ( $r=0.58$ ,  $p<0.001$ ). RBANS digit span was positively correlated with WAIS-III digit span ( $r=0.82$ ,  $p<0.001$ ). Lastly, scores on the RBANS coding subtest significantly correlated with scores on WAIS-III digit symbol ( $r=0.86$ ,  $p<0.001$ ). Conclusion(s): The present results provide support for the convergent validity of RBANS subtest scores in a clinical sample. Further research is needed to validate its convergence with similar neuropsychological measures.

## B52

### Platform effects on ANAM performance: Comparing DOS and Windows versions

Jones WP, Kadluek RM, Marks WJ

Objective: Automated neuropsychological assessment metrics, a series of cognitive scales on a DOS platform, is now distributed as ANAM-2001 for administration on Windows operating system. Performance on selected ANAM-2001 scales was compared with archived data to examine whether non-clinical normative data remained applicable given differences in visual presentation and timing software in the Windows version. Method: Archival data were available for up to 153 university students completing tests in a lab setting in 1998–1999. Comparison group of 73 from comparable pool completed Windows-version in the same lab in 2005–2006. Age and gender were equivalent in the two groups. Five ANAM scales were administered in both DOS and Windows: Matching to Sample, Math Processing, Spatial Processing, Sternberg Memory, and 2-Choice Reaction Time. Outliers were removed before analysis. Results: Statistically significant differences in efficiency (accuracy/speed ratio) were not evident between DOS and Windows versions of Matching to Sample,  $t(193)=0.067$ ,  $p=0.946$ , Math Processing,  $t(190)=1.551$ ,  $p=0.061$ , or Spatial Processing,  $t(161)=0.197$ ,  $p=0.844$ . Statistically significant differences were evident on: 2-Choice Reaction Time,  $t(255)=2.520$ ,  $p=0.012$ , and Sternberg Memory,  $t(105)=2.910$ ,  $p=0.004$ . Conclusions: Results suggest caution in generalizing results from DOS to Windows versions until studies randomly alternating platform versions are completed. Differences favored the DOS platform on one scale and the Windows platform on the other. Additional study is needed to assess whether the etiology is only an artifact of these sample groups.

## B53

### Correlates of ANAM 2001 adapted logical reasoning scale

Jones WP, Marks WJ, Kadluek RM

Objective: Stimuli in the automated neuropsychological assessment metrics (ANAM) logical reasoning scale were adapted in prior study in our lab for interpretation as Planning scale in PASS model of cognitive processing. This study examined the effect of migration from DOS to Windows platform on the utility of the adaptation. Method: Seventy-three upper division university students completed the Windows-based ANAM with the adapted scale and the Woodcock Johnson-III Cognitive Abilities Test (WJ-III) in 2005–2006. Archived data on adapted version in DOS were available for 81 participants from comparable pool in 1999. In the adaptation a symbol series, for example \*@#, is followed by two statements, for example \* after # and @ before #. User indicates whether both or only one of the statements is correct. Higher efficiency (accuracy/speed ratio) is expected when user recognizes that it is unnecessary to read second statement if first statement is false. Testing was completed in university lab. Outliers were removed before analysis. Results: Correlations with ANAM scales previously identified as anchors for attention (Simple Reaction Time), successive processing (Math Processing), and simultaneous processing (Matching-to-Sample) were 0.13, 0.31, and 0.29, respectively. Correlation, corrected for range restriction, between the adapted scale and WJ-III GIA (g factor) was 0.77. Difference in DOS and Windows performance,  $t(143)=1.638$ ,  $p=0.1036$  was not statistically significant. Conclusions: Despite software limitations that precluded full equivalence of DOS and Windows versions, performance appeared essentially comparable with correlations in the hypothesized direction. Factor studies will follow when sufficient lab data are available.

**B54****Profile stability of the Stanford-Binet Intelligence Scales 5th Edition***Livingston RB, Jennings E, Reynolds CR, Carr O*

**Objective:** In this study the authors examined the stability of profiles obtained with the Stanford-Binet Scales, 5th Edition (SB5; Roid, 2003a). When examining the stability of test profiles, the question is whether a profile of scores changes on retesting and if this change affects clinical interpretations. **Method:** This study used the standardization test-retest data set described in the SB5 manual (Roid, 2003b). This data set involved 356 participants with a median test-retest interval of 7 days. Cattell's  $rp$ , D2, and D were calculated for SB5 profiles. Because these measures are sensitive to all dimensions of test profiles, individual indices were also calculated that are only sensitive to either profile level, shape, or scatter. **Results:** Cattell's  $rp$  were 0.92 for IQ profiles, 0.84 for factor profiles, and ranged from 0.79 to 0.84 for subtest profiles. Consistent results were obtained using D2 and D. Of the three profile dimensions, level is the most stable (mean  $r = 0.92$ ), followed by shape (mean  $r = 0.84$ ), then scatter (mean  $r = 0.64$ ). **Conclusions:** These results indicate that profiles produced by the SB5 demonstrate a high level of stability. Of the three profile dimensions, profile level is the most stable, followed by shape, then scatter. Clinicians should consider the stability of test profiles when interpreting test results and making recommendations.

**B55****Challenging Reitan & Wolfson: demographic corrections are necessary***Pachet A, Longman S*

**Objective:** Reitan and Wolfson argue that neuropsychological measures, such as the Halstead Reitan neuropsychological battery (HRNB) and the Wechsler Adult Intelligence Scale (WAIS) should be interpreted using consistent cutting scores in adults, regardless of age, sex, or education. This poster reviews the data for and against demographic corrections, with particular attention paid to arguments and information presented by Reitan and Wolfson. **Data selection:** A close examination of Reitan and Wolfson's data (1995, 2004, and 2005) is presented, specifically addressing the issues of false negatives and false positives. An extensive review of papers illustrating the demographic effects in the general population and in clinical groups is provided. Lastly, studies that directly compare demographically-corrected and uncorrected scores in identifying and classifying neuropsychological impairments are reviewed. **Data synthesis:** The overwhelming weight of evidence indicates that using demographically-adjusted norms more accurately reflects the neuropsychological status of varying patient populations and normals alike. Given the demonstrated sensitivity of the HRNB (among other neuropsychological measures) to age and education, cutoff scores based on young adults produce an unacceptably high rate of errors, especially false positives. Making demographic adjustments for age/education also results in consistently higher diagnostic classification accuracy than the use of non-adjusted scores. **Conclusions:** The evidence for reliance on population-based norms is weak, shows signs of confounding, and may lead to missing dysfunction in younger, better-educated adults with moderate injuries or falsely inferring it for older and less educated adults. Implications of this data in a forensic context are discussed.

**B56****Validity of the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) with Adult Attention-Deficit/Hyperactivity Disorder (ADHD) clients***Polance C, Daniel M, Lane JB, Brockwood K*

**Objective:** Determine if endorsement of items on the MMPI-2 that reflect ADHD symptoms produce elevations on clinical scales that could result in false positive indications of psychopathology. **Method:** Archival data was gathered from an outpatient university doctoral psychology training and research clinic. Subjects were diagnosed with only ADHD based on DSM-IV-TR criteria ( $n = 17$ ). A group with mixed emotional distress ( $n = 17$ ) was matched on gender, race, age, and education; mixed distress was defined as any mood, anxiety, or adjustment disorder based on DSM-IV-TR criteria. Raw and  $K$ -corrected scores for 12 scales (Hs, D, Hy, Pd, Pa, Pt, Sc, Ma, Si, L, F, K) were analyzed. **Results:** The Bonferroni inequality procedure was employed. There were no statistically significant differences between the two groups' non- $K$ -corrected raw scores for any MMPI-2 scales, although there was a trend for the mixed distress group to have higher raw scores. Examination of the  $K$ -corrected  $T$ -scores revealed that as a group, ADHD patients'  $T$ -scores for all MMPI-2 scales were within the normal range, although 35% of ADHD individuals obtained scores  $>65T$  on some clinical scales. As a group, the mixed distress patients had scores  $>65T$  on scales D, Pt, and Sc. **Conclusion:**

Endorsement of ADHD symptoms does not diminish the clinical validity of the MMPI-2 profile interpretation when group data is considered, but some individuals with ADHD may show elevations on MMPI-2 scales even when there is no other evidence of problems with adjustment.

## B57

### **Development of a category scale for the booklet category test**

*Rosenblum M, Prosje M, DeFilippis NA, Hill FF*

**Objective:** This study expanded on previous research on Booklet Category Test (BCT) scales and attempted to develop a new scoring scale for the BCT. Prior research identified the BCT Perseveration, Loss of Set, and Memory scales (Minassian, Perry, Carlson, Pelham, & DeFilippis, 2003; Pelham, 2001). **Method:** Archival data from 53 outpatients previously diagnosed with acquired brain injuries was utilized. Scores on the BCT and Wisconsin Card Sorting Test (WCST) were calculated to form the category scores for the newly developed Category Scale (BCT-CAT). Pearson's  $r$  correlations were analyzed in a multitrait-multimethod matrix. It was hypothesized that the BCT-CAT measure would significantly correlate with the WCST Category Scale (WCS), providing construct validity for the new scale. **Results:** The BCT-CAT mean score was 13.19, with S.D. of 6.74. The BCT-CAT was significantly correlated with the WCS ( $r = 0.478$ ,  $p < 0.01$ ). The BCT-CAT was more strongly correlated with the WCS than any other score from the WCST, suggesting the new score measures a construct more closely resembling the WCS and the construct of categorization. Results also revealed that the BCT-CAT had significant correlations with the visual ( $r = 0.644$ ,  $p < 0.01$ ) and verbal ( $r = 0.410$ ,  $p < 0.01$ ) memory measures from the WMS-R and with the WAIS-R Performance IQ ( $r = 0.502$ ,  $p < 0.01$ ). **Conclusions:** The BCT originally only had a single score and recently developed other new measures. The new BCT-CAT could increase the experimental and clinical utility for the BCT. Directions for future investigation are described.

## B58

### **ABCN and ABPN diplomates compared: Administration of WAIS-III supplementary and optional procedures**

*Ryan JJ, Glass LA, Tree HA*

**Objective:** A recent survey reported how frequently NAN Fellows administered the WAIS-III Letter-Number Sequencing (LNS), Symbol Search (SS), and Object Assembly (OA) subtests, and the optional procedures of Digit Symbol-Incidental Learning (IL) and Digit Symbol-Copy (DS-C). To extend these findings, the present survey reports data for the above mentioned WAIS-III components by diplomates of the American Board of Clinical Neuropsychology (ABCN) and the American Board of Professional Neuropsychology (ABPN). **Method:** From on-line directories, 127 ABPN and 124 ABCN diplomates were randomly selected. Each person was mailed a survey concerning WAIS-III administration practices. **Results:** Of the 251 surveys, 141 were usable returns (56.2%); 91 (73.4%) were ABCN and 50 (39.4%) ABPN. ABCN examiners rarely administer OA (8.8%), whereas LNS (69.4%) and SS (68.7%) are frequently utilized. ABPN diplomates show a similar usage pattern (OA 23.1%, LNS 76.4%, and SS 73.6%), with the OA frequency higher for ABPN than ABCN. Administration of IL and DS-C was 27.7% and 25.0% by ABCN and 47.8% and 47.0% by ABPN diplomates. The latter group reported significantly higher usage than the former. **Conclusion.** No supplementary or optional subtest/procedure is administered during every WAIS-III. LNS and SS are the most popular subtests since they are administered 70+% of time. OA is the least frequently administered component. ABPN had a significantly lower survey response rate, but administer OA, IL, and DS-C significantly more often than do ABCN diplomates.

## B59

### **Test-retest reliability of the repeatable battery for the assessment of neuropsychological status in a memory disorder clinic sample**

*Silva ME, Humphreys J, Dempsey JP, Sutker PB, O'Bryant SE*

**Objective:** The objective of the current study was to examine the test-retest of RBANS index scores in a memory disorder clinic sample. **Method:** Participants were 21 patients (11 male and 10 female) with a mean age of 74.52 (S.D. = 6.49) and mean education level of 14.24 (S.D. = 3.86). Ten (47.6%) were diagnosed with AD, 8 (38.1%) with MCI, and 3 (14.3%) with some other dementia syndrome. Participants were tested using a neuropsychological battery that included the RBANS and were subsequently retested using the same battery of tests 2 years later. **Results:** RBANS immediate memory ( $r = 0.69$ ), language ( $r = 0.80$ ), attention ( $r = 0.73$ ), and delayed memory ( $r = 0.70$ ) index scores as

well as RBANS total scores ( $r=0.73$ ) demonstrated adequate test-retest reliability ( $p<0.001$ ). Test-retest reliability for the Visuospatial/Constructional index score was approached significance ( $r=0.43$ ,  $p=0.054$ ). Conclusion(s): The present results provide support for the test-retest reliability of RBANS index and total scores in a clinical sample. Due to the nature of the neurodegenerative conditions seen in memory disorder clinics (i.e. Alzheimer's disease, MCI) it is possible that the current reliability coefficients are an underestimation of what might be found in other settings.

## B60

### **Discriminative validity and item analysis of the neurobehavioral interview (NBI)**

*Steelman A, Dsurney J*

**Objective:** The NBI will discriminate between several patient and non-patient groups. In addition, individual items within the NBI are examined for specificity regarding individual pathological conditions. **Methods:** Archival data was used that was collected from a university setting, a general medical center, and rehabilitation setting. There were 285 total participants. Includes 134 males and 151 females; 70 Black, 110 White, 13 Hispanic, 2 Asian, and 90 other/unknown. Age range of participants are 12–92 years. Subjects were from one of four groups, non-brain injured, brain injured, psychiatric disorder or low education level (<12 years). **Results:** An ANOVA was performed and yielded significant overall main effect. Post Hoc Tukey tests yielded significant differences between non-pathological and all other groups, brain injured and all other groups, low education and psychiatric groups differed from the non-pathological and brain injured group but not from one another. The item analysis yielded several items which discriminated between different types of brain injury. **Conclusion:** This study supports previous studies of the discriminative validity of the NBI. It provides preliminary support for item- and pattern analysis to discriminate different types of brain pathology.

## B61

### **A reliability study of the Casio MS-80TV as a measure of finger-tapping**

*White R, Dilks LS, Marceaux J, Mayeaux B, Bourgeois M, Ashworth B*

**Objective:** The development of new neuropsychological instruments is a significant undertaking in clinical practice with issues of reliability, validity, and cost-efficiency. The purpose of this study was to establish the reliability of the Casio MS-80TV calculator for possible use as a cost-efficient substitute for other tapping tests. **Method:** Forty participants were included in the study (37 females, 3 males), with a mean education level of 13.43. Researchers solicited individuals from undergraduate psychology courses, offering bonus points for participation. The materials included the Casio MS-80TV finger-tapping test and a record form. The electronic tapping test, manufactured by Casio, has administration procedures very similar to those of the well-established Halsted-Reitan Tapping Test. Upon acquiring consent, the researchers administered the tapping test beginning with the dominant hand and alternating hands across five trials. The researchers repeated this procedure 1 week after the first administration. **Results:** To examine the reliability of the Casio tapping test, the researchers conducted a correlation (at a 95% confidence interval) comparing the first administration to the re-test. Researchers indicated a strong correlation between the test and re-test ( $r=0.912$ ,  $p=0.01$ ), supporting the reliability of the test. Correlations were also found between the left and right hand trials. **Conclusion:** Findings suggest the Casio is an adequate substitute for other finger-tapping tests. The data corresponds with previous validity studies conducted by the authors. In addition, there are monetary and accessibility benefits which may influence client care.

## **Poster Session C**

### **CULTURAL AND GENDER ISSUES**

## C1

### **Linguistic changes on the verbal expression as a preclinical marker of the Alzheimer disease onset**

*Arango J, Cueto F, Uribe C, Valencia C, Lopera F*

**Introduction:** Specific linguistic alterations may appear in the preclinical phase of Alzheimer's disease; however, changes that may occur in spontaneous language have not been investigated. **Objective:** The aim of this study was to determine if alterations in verbal expression existed in patients in the preclinical phase of Alzheimer's disease. **Method:** Forty asymptomatic Spanish-speaking subjects from Antioquia, Colombia participated in the present study: 19 carriers of the E280A mutation of the presenilin-1 gene in 14 chromosome and 21 non-carriers. Both groups were similar in

education, age, and gender. Procedure: The Boston picture description task was administered. The content of each patient's verbal description was evaluated based on semantic content and grammar. Statistical analysis: The data were compared using a multivariate analysis (MANOVA). Results: Even though carriers and non-carriers had similar verbal fluency, significant differences were found between groups on some variables. Carriers scored significantly lower than the non-carriers on: identification of characters in the picture, description of actions of the characters, number of inferences describing what might happen next, and number of complex sentences. Conclusions: Asymptomatic carriers provided less amount of information. Early detection of these language alterations in verbal fluency content by specialists may help in the early diagnosis of this disease.

## C2

### **Non-verbal neuropsychological test performance: Effects of culture and gender**

*Arango J, Gonzalez-Nosti M, Cuetos F, Merrit N, Rogers HL, DeLuca J*

There is a paucity of research examining the effects cultural issues on cognitive performance in Spanish-speaking individuals. Objectives: The aim of the present study is to determine the influence of level of acculturation and gender on non-verbal neuropsychological test performance. Methods: Forty Spanish-speaking Hispanic participants in the U.S. (lower acculturated  $n = 19$ , higher acculturated  $n = 21$ ) and 40 Spanish participant residents of Spain were administered the Digit Symbol Test (DST) and the Wisconsin Card Sorting Test (WCST). Results: Controlling for education, Spanish scored significantly higher on the DST than the low acculturated Hispanics ( $p < 0.001$ ). Controlling for education, women had significantly more perseverative responses compared to men ( $p < 0.05$ ). Lower acculturated men had significantly higher WCST total correct scores compared to lower acculturated women ( $p < 0.05$ ) and compared to Spanish men ( $p < 0.01$ ). Within high acculturated Hispanics, men needed significantly more trials to reach the first category compared to women ( $p < 0.05$ ), whereas both genders in the low acculturated and Spanish groups performed similarly. Conclusions: Although neuropsychological test norms often take into account an individual's age and educational level, culture factors (such as acculturation level) and gender also influence cognitive performance on certain non-verbal tests of cognitive function. Clinical neuropsychologists must be aware of such individual differences that affect test scores and continue to examine cultural factors.

## C3

### **A comparison of emotion recognition in women with and without symptoms of post-partum depression**

*Friedman K, Spiers MV*

Objective: Evidence suggests reduced emotion recognition (ER) abilities in major depression. However, no studies have explored neuropsychological implications in post-partum depression (PPD). The purpose of this study is to examine the impact of PPD in ER skills. We hypothesized that PPD women would have reduced ER accuracy for adult faces; and would rate their ability to recognize emotions as more troublesome. Method: We compared a group of PPD women ( $n = 5$ ) to a control group ( $n = 12$ ) in a series of ER tasks. Participants were recruited from OB/GYN clinics and PPD support groups. PPD was defined by a score of 13 or higher in the Edinburgh Post-natal Depression Scale (EPDS). Participants were assessed with a demographic questionnaire, the EPDS, the PENN ER-40 Emotional Recognition Test, a Schematic Faces Emotional Perception Scale and an Emotional Recognition Questionnaire. Results: Women in the PPD group showed a trend towards reduced ER accuracy in the PENN ER-40 ( $M = 30.8$ ,  $S.D. = 3.347$ ) as compared to controls ( $M = 33$ ,  $S.D. = 2.796$ ) although no significant difference was found  $t(15) = 1.4$ ,  $p = 0.182$ . There was no significant difference in the schematic faces ratings. PPD women showed a significantly higher number of false positive anger identifications in the PENN ER-40 Test ( $p < 0.05$ ). PPD women reported higher difficulty recognizing their babies' emotions ( $p < 0.05$ ). Conclusion: Although pilot results indicate no difference in overall ER accuracy, there was a tendency towards false positive anger identifications and more difficulty recognizing their babies' emotions.

## C4

### **Exploring the relationships between PTSD, verbal learning & recall, and intrusive thoughts**

*Jorgensen M, Vik P*

Objective: Previous research has shown intrusive thoughts negatively impact memory functioning. The purpose of this study was to explore how intrusive thoughts due to sexual assault impact memory. Method: Participants included 48 sexually-assaulted, incarcerated women who completed the California Verbal Learning Test-II (CVLT-II), Immediate

Recall task and a writing task designed to measure intrusive thoughts. Participants completed the CVLT-II, Delay Recall task and a set of questionnaires. Results: Intrusive thoughts were inversely related to verbal learning at Trial 1 ( $p=0.02$ ,  $r=0.33$ ) and total words learned ( $p=0.02$ ,  $r=0.34$ ). Re-experiencing PTSD symptoms was related to verbal learning at Trial 1, ( $p=0.04$ ,  $r=0.3$ ), total words learned ( $p=0.01$ ,  $r=0.35$ ), short-delay cued ( $p=0.04$ ,  $r=0.3$ ) and free recall ( $p=0.03$ ,  $r=0.30$ ). There was a trend for PTSD symptoms predicting long-delay free recall ( $p=0.06$ ,  $r=0.28$ ). Intrusive thoughts were hypothesized to mediate PTSD symptoms and CVLT-II scores; results did not support mediation. Instead, intrusive thoughts and PTSD symptoms exerted independent effects on verbal learning. Conclusion: Findings advanced research linking PTSD to verbal memory by demonstrating intrusive thoughts associated with sexual assault trauma as a negative influence on verbal learning. Future research should explore related constructs such as attention and working memory that might either additionally impact verbal learning, or explain the relationship between trauma and memory. Additionally, future investigations should expand upon this study to determine if similar effects can be found for non-verbal learning and recall.

## C5

### Using item difficulty to compare three Spanish naming tests

Marquez de la Plata CD, Hyman LS, Vicioso B, Lacritz LH, Diaz-Arrastia R, Cullum C

Objective: The Boston Naming Test, while commonly administered to evaluate naming ability in Spanish-speakers, has demonstrated considerable variability in the frequency distribution of correct responses across items. This requires reordering the items to reflect the expected inverse linear relationship between order of item presentation and item difficulty when used with Spanish-speakers. The Texas Spanish Naming Test (TNT) was recently developed to provide a naming test for this population by a priori selecting culturally salient items based on word frequency in Spanish and age of word acquisition. To explore the impact of item difficulty on naming accuracy among Spanish-speakers, the present study examined the distribution of correct responses by item order for the TNT compared with two existing naming tests that represent translated versions for use with this population. Method: Thirty-one minimally educated, Spanish-speaking patients with dementia were administered three Spanish naming tests: TNT, Modified Boston Naming Test-Spanish (MBNT-S), and Spanish Naming Test (SNT). It was hypothesized that the TNT would account for the greatest amount of variance in naming accuracy. Results: Pearson correlations showed all three naming tests were significantly inversely correlated with item difficulty. The TNT had the highest correlation (TNT  $r=-0.951$ ,  $p<0.001$ ; MBNT-S  $r=-0.879$ ,  $p<0.001$ ; 15-SNT  $r=-0.634$ ,  $p=0.011$ ), accounting for significantly more variance in naming accuracy than its counterparts (91%, 78%, and 41%, respectively). Conclusions: Results support the psychometric properties of the TNT and suggest that translated naming tests may not optimally assess naming ability in Spanish-speakers.

## C6

### Spatial ability among Japanese and Americans: Sex and cultural differences

Sakamoto M, Spiers MV, Elliott RJ

Objective: Studies of sex and cultural differences in spatial performance have reported that the magnitude of sex differences is smaller in Asians than Americans. Better overall performance among Asian participants may be attributed to a more spatially oriented aspect of pictorial Asian languages. It was hypothesized that native Japanese speakers would show smaller sex differences in spatial tasks than Americans or Japanese Americans. Method: Seventy healthy volunteers participated in this study [40 Americans (20 males and 20 females), 20 native Japanese speakers (10 males and 10 females), 10 Japanese Americans (native English speakers) (5 males and 5 females)]. The Mental Rotation Test (MRT) and spatial object location memory tests were administered. Results: As predicted, men performed better on the MRT and women performed better on the spatial object location memory tests [MRT:  $F(1)=29.93$ ,  $p<0.001$ ; 2D object location memory test:  $F(1)=4.25$ ,  $p=0.045$ ; 3D object location memory test (accuracy)  $F(1)=19.92$ ,  $p<0.001$ , (efficiency)  $F(1)=1.0$ ,  $p=0.032$ ]. Native Japanese speakers performed better on all tests but showed no decreased magnitude of sex differences in comparison to the other groups [MRT:  $F(2)=5.169$ ,  $p=0.008$ ; 2D object location memory test:  $F(2)=7.198$ ,  $p=0.002$ ; 3D object location memory test (accuracy)  $F(2)=3.591$ ,  $p=0.033$ , (efficiency)  $F(2)=3.614$ ,  $p=0.003$ ]. Conclusion: The existence of pictorial written language did show a relationship with higher spatial ability but not with decreased sex differences.

**C7****Effects of age and education on cognitive processes and executive function performance in older women***Shaw L, Foley J, Figueroa M, Briker L, Golden C*

**Objective:** Previous research has examined age-related decline with regard to specific cognitive processes in older adults. The present study was designed to assess these functions in older women. **Method:** Participants included 80 healthy females ranging from 55 to 93 years of age. Most were Caucasian (60%) and right-handed (70%). The total sample had a mean MMSE score of 28.42 (S.D. = 1.27), a mean GDS score of 8.92 (S.D. = 8.15), and a mean FSIQ score of 106.54 (S.D. = 12.66). Age was divided into three levels (55–65, 66–76, and 77+). Education was divided into two levels (7–13 and 14+). **Results:** Trails B Time performance showed significant main effects for age [ $F(1, 49.06) = 18.94, p = 0.000$ ] and education [ $F(2, 42.36) = 9.46, p = 0.000$ ], but not for the interaction effect. Stroop performance showed significant main effects for age [ $F(2, 74) = 8.59, p = 0.000$ ] and education [ $F(1, 74) = 5.18, p = 0.026$ ], but not for the interaction effect. COWAT performance showed a significant main effect for education [ $F(1, 74.04) = 1.08, p = 0.184$ ], but not for the main effect of age or the interaction effect. Post hoc Tukey results suggested that those with a low level of education performed more poorly than those with a high level of education. **Conclusion:** These results suggest that age and education level may have an effect on some forms of executive functioning. Clinical implications of these findings will be discussed.

**C8****Are there differences in WAIS-III short-forms for English and bilingual Spanish-speakers?***Thompson RL*

**Objective:** To determine whether short forms of the WAIS-III are valid for use with Spanish-speaking bilingual subjects. **Method:** Archival data from WAIS-III administrations with English-only ( $N = 71$ ) and bilingual Spanish speakers ( $N = 30$ ) were analyzed. Participants were evaluated for bilingual ability by asking them to translate and interpret a phrase in Spanish. Following Ryan & Ward, (1999), short form scores were computed for Verbal IQ (VIQ), and two forms of Performance IQ (PIQ) and Full Scale IQ (FSIQ). Because of a high correlation between education and scores, English-only participants with more than 12 years of education were excluded from the study to allow for a comparable match with the lower-educated bilingual group. ANOVAs were used to compare the differences in short form and original WAIS scores between the two language groups. **Results:** There was no statistically significant difference between language groups for the actual and estimated IQ scores, with no difference for either form of PIQ and FSIQ. Eta-squared effect sizes were very small, supporting the finding of no difference for each comparison. There were some limitations in the study. The sample size was relatively small, comparisons were not made for those with more than a high school education. Scores for the PIQ computed using Block Design were not uniformly distributed. **Conclusion:** This study of archival data suggests that an abbreviated WAIS-III administration is equally valid for bilingual Spanish-speakers and English-only subjects.

**C9****Use of cognitive effort indicators with ethnic minority and ESL populations***Victor TL, Boone KB, Salazar XF, Wen J, Lu PH*

**Objective:** No published data are available regarding effort test performance in English-speaking ethnic minorities, or in individuals who speak English as a second language (ESL), requiring clinicians to use cutoffs derived primarily from monolingual, mostly Caucasian normative samples. The main objective of this investigation was to examine the validity of this practice. **Method:** A total of 168 individuals (Anglo-Caucasian = 85, African American = 32, Hispanic = 32 and Asian = 19; ESL = 28) referred for outpatient neuropsychological evaluation at a public hospital were administered a test battery, including nine commonly used indicators of effort (Rey 15 plus recognition trial, Warrington Recognition Memory Test—Words, Dot Counting E-score, Digit Span ACSS, Reliable Digit Span, RAVLT recognition, RAVLT recognition equation, RO effort equation, and RO/RAVLT discriminant function). Subjects were not involved in litigation or currently seeking disability, and did not meet criteria for dementia or psychometric criteria for mental retardation. **Results:** Caucasians scored significantly higher than Hispanics and ESL subjects on Digit Span indicators and higher than African Americans on RAVLT and RO measures. Examination of specificity, or the proportion of honest responders who were correctly classified, revealed that a number of test cutoffs required lowering to maintain adequate specificity for the ethnic minority and ESL samples. **Conclusions:** The impact of culture and language requires



adjustment in many effort test cutoff scores. Failure to do so will cause an unacceptable number of honest individuals to be inaccurately identified as not providing adequate effort on cognitive tasks.

### C10

#### **The mediating effects of education and acculturation on non-verbal intelligence**

*Gabriel Salazar BA*

**Objective:** Education has long been considered to be a main factor in the assessment of non-verbal intelligence in Hispanics. Many studies have ignored the role of culture in non-verbal intelligence due to non-verbal intelligence tests claiming to be “culture free”. The purpose of this study was to investigate the mediating role of both education and acculturation on a test of non-verbal intelligence. **Methods:** Eighty-four Hispanics were administered the Abbreviated Multidimensional Acculturation Scale (AMAS), the Beta-III non-verbal intelligence test, and the reading section of the Wide Range Achievement Test 3 (WRAT-3). **Results:** Using a linear regression, the results of this study show that both education and acculturation were significant predictors of Beta-III performance; however when using a mediation model both variables together were able to account for the most variance. **Conclusions:** Although education may play a significant role in predicting non-verbal intelligence in Hispanics, acculturation must also be considered when assessing this population.

### C11

#### **Interrelationships between acculturation, gestaltic processing, and abstract reasoning ability in a Mexican-American population**

*Soper HV*

**Objective:** Acculturation is difficult at best, so we decided to look at some of the factors which might facilitate acculturation. To do this we decided to investigate (right hemisphere?) visual gestaltic and (left hemisphere?) verbal abstract reasoning abilities. **Method:** The 96 participants were volunteers from Northern California who had emigrated from Mexico 1 to 3 years ago and who had no or limited English-speaking ability. Each was given the Marin Short Acculturation Scale for Hispanics; the Social, Attitudinal, Familial, and Environmental Acculturation Stress Scale; the Street Completion Test (a series of gestalt closure problems); and a modified Gorham Proverbs Test, a 15-item multiple choice test, each item having a direct Spanish equivalent and concrete as well as abstract alternatives. **Results:** As expected, acculturation and acculturation stress were inversely related, but weakly ( $r = -0.172$ ,  $p = 0.094$ ). Both were also unrelated to either Proverbs score ( $r = 0.050$ ,  $-0.076$ , respectively) or Street score ( $r = 0.044$ ,  $0.008$ ). Curiously, however, the Street and Proverb scores were related ( $r = 0.203$ ,  $p = 0.048$ ). This verbal-visual spatial relationship suggests that abstract reasoning may have a right hemisphere component. **Conclusions:** Strengths in gestaltic or abstract reasoning processing do not seem to facilitate acculturation nor reduce acculturation stress among those recently immigrated from Mexico. As expected, acculturation stress is inversely related to level of acculturation. Curiously, performance on proverbs, a verbal reasoning task, is related to gestaltic closure ability as assessed by the Street, a task already known to be unrelated to tested intelligence score.

### C12

#### **Gender differences in working memory involving verbal and visual material in an adult neuropsychiatric population**

*Durkin M, Kohn L, Renfrow S, Korman B, Golden C*

**Objective:** The present study examined what type of differences existed between males and females in verbal and visual working memory by looking at scores on the Digit Span subtest on the WAIS-III and the Spatial Span subtest on the WMS-III. **Method:** The participants included 300 adults with an average age of 34.70 (S.D. = 13.86) and average education was 13.66 (S.D. = 2.68). The sample was 46.0% male and predominately right-handed (85.3%). Seventy percent of the sample was Caucasian. Subjects were given an extended neuropsychological battery, which included the WAIS-III, WMS-III and other measures. **Results:** Two ANOVAs were conducted to compare gender on both the Digit Span subtest I and the Spatial Span subtest on the WMS-III. Males performed significantly better ( $p < 0.05$ ) than females ( $F(1, 298) = 4.533$ ,  $p = 0.034$ ) on the Spatial Span subtest. No significant differences were found when comparing the males and females on the Digit Span subtest ( $F(1, 298) = 1.535$ ,  $p = 0.216$ ). **Conclusions:** The results of this study suggest that males perform better than females when it comes to working memory tasks that involve visual skills, although there is no difference in working memory tasks that involve verbal skills. These results correspond

with past research that indicated that males perform better on visual tasks of memory, although the results found in this study contradict past results of research on verbal tasks of memory. The need for further research is recommended.

## DEVELOPMENTAL AND PEDIATRIC I: ATTENTION DEFICIT HYPERACTIVITY DISORDER

### C13

#### **A comparison of children with and without ADHD on the test of variables of attention**

*Briker L, Harvey D, Korman B, Stack M, Golden C*

**Objective:** This study examined performance on the Test of Variables of Attention (TOVA) and Freedom From Distractibility Index (FFDI) of the Wechsler Intelligence Scale for Children-Third Edition (WISC-III) among children with and without Attention-Deficit/Hyperactivity Disorder (ADHD). It was hypothesized children with ADHD would score lower than children without ADHD on these measures when controlling for IQ. **Method:** Participants were 50 children divided into an ADHD ( $n = 25$ ) or No Diagnosis group ( $n = 25$ ). All were administered the visual TOVA and the WISC-III in a university mental health services setting. 66% of subjects were male and mean age was 10.66 ( $s = 2.85$ ), with mean education of 5.08 years ( $s = 2.62$ ). Most subjects (70%) classified themselves as Caucasian. **Results:** Four one-way ANCOVAs controlling for IQ were conducted at an alpha level of 0.0125 (0.05/4) to maintain the family-wise level at 0.05. Levene's tests indicated the homogeneity of variance assumption was tenable (Levene's tests  $> 0.05$ ). Significant differences were found between adjusted group scores on TOVA Commission Errors (CE) [ $F(1, 47) = 7.379$ ,  $MSw = 3018.63$ ,  $p = 0.009$ ] with lower performance for the ADHD group. No significant differences were found between groups on TOVA Response Time (RT), Response Time Variability, or the FFDI. **Conclusions:** Results were consistent with past findings regarding performance on TOVA-CE among ADHD children. Limitations of the present study were small sample size, and participants with co-morbid diagnoses.

### C14

#### **Confirmatory factor analysis of the CHC theory for individuals with ADHD**

*Davis AS, Shunk AW, Finch WH, Dean RS, Woodcock R*

**Objective:** The Cattell-Horn-Carroll (CHC) theory of cognitive abilities is a factor analytically derived theory designed to measure a wide range of cognitive abilities that assess all of the major domains of cognitive processing. The purpose of this study was to evaluate the CHC theory with a group of individuals who were diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD). Individuals with ADHD have been shown to have different cognitive profiles than normal controls. This study used confirmatory factor analysis to ascertain the utility of ipsative analysis in a cognitive measure that use the CHC theory with a sample of patients with ADHD. **Data selection:** The current sample consisted of 444 individuals diagnosed with ADHD (mean = 13.7 years, S.D. = 6.7 years). Each participant received, as part of a comprehensive battery, 14 cognitive tests that were selected from the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R, Woodcock & Johnson, 1989). **Data synthesis:** Results of the confirmatory factor analysis (CFA), used to assess the theoretical model for the CHC theory, suggested a good model fit. The CFI for the CHC model was 0.975, the TLI was 0.959, the RMSEA was 0.048, and the ratio of the  $\chi^2$  goodness of fit test to the degrees of freedom was 2.013. **Conclusions:** The CHC theory offered a good fit for the group of individuals with ADHD. The CHC theory and implications of these results will be reviewed for practitioners and researchers.

### C15

#### **Relationship between number of prompts and inattention scores on the CPT-II in children**

*Fastenau PS, Mandabach DR, Byars AW, Baum KT, Perkins SM, Johnson CS, Austin JK*

**Objective:** The Continuous Performance Test (CPT; Conners, 1995) contained no instructions for prompting (redirection); the CPT-II (Conners, 2000) permits only one prompt. This study: (1) described the frequency with which children require prompts; (2) tested the hypothesis that the number of prompts would correlate positively with CPT-II inattention measures; (3) characterized CPT-II performance by number of prompts. **Method:** The parent sample consisted of children ages 6–14 (50% s); 302 had had a first recognized seizure (FRS) within 3 months, and 172 were healthy siblings. Children with mental retardation were excluded (IQ  $M = 101.9$ , S.D. = 14.5); the FRS subgroup was only 2.7 IQ points below siblings. For 169 children (113 FRS, 56 siblings), examiners recorded number of prompts on the CPT-II. Children were classified into three groups by number of prompts (0, 1, or 2+). There was no association

between clinical status (FRS versus siblings) and prompt group ( $\chi^2 = 2.70$ ,  $p > 0.10$ ), so the samples were combined. Results: In this sample, 50% of children required no prompts; 12%, one prompt; and 38%, 2+ prompts. Number of prompts correlated with hit response time standard error (HRTSE;  $r = 0.42$ ) and %Omissions ( $r = 0.30$ ),  $p < 0.0005$ . Children requiring 2+ prompts scored significantly higher (HRTSE Mn = 64; %Omissions Mn = 57,  $p < 0.05$ ) than other prompt groups on inattention variables. Conclusions: The hypothesis was supported. These data provide a reference for examiners who prompt throughout testing and yield predicted scores for tests that are discontinued prematurely. Supported by NIH # NS 22416.

## C16

### **Working memory and CPT-II differences in children with ADHD or dyslexia**

*Guay J, Triebel K*

Objective: This study explored performance differences on objective measures of attention and working memory in children diagnosed with ADHD or dyslexia. Method: The sample was comprised of 92 children (ADHD = 62, dyslexia = 30). Exclusion criteria were: (1) FSIQ < 80 or > 120; (2) presence of a neurological disorder, serious medical illness, physical disability, or anxiety disorder. A comprehensive assessment paradigm was utilized to evaluate subjects. Diagnosis was made by a board-certified neuropsychologist based on DSM-IV-TR criteria. The main dependent variables in the study were WISC Freedom From Distractibility Index (FFDI) and CPT-II *T*-scores for omissions, commissions, HRT, HRT SE, and HRT ISI. Results: Univariate ANOVA revealed significant group differences for HRT SE ( $F = 4.719$ ,  $P = 0.011$ ), HRT ISI ( $F = 4.548$ ,  $P = 0.013$ ), and FFDI ( $F = 12.239$ ,  $P = 0.000$ ). As expected, the dyslexia group performed significantly better than the ADHD group on HRT SE and HRT ISI. Conversely, the dyslexia group performed significantly worse than the ADHD group on FFDI. Receiver operator curve (ROC) analysis revealed that FFDI was a better discriminator between ADHD and dyslexia than the CPT II measures. Conclusions: CPT-II measures of response consistency provided some differentiation between ADHD and dyslexia, while CPT-II measures associated with inattention (omissions) and behavioral inhibition difficulties (commissions) did not. A measure of working memory (FFDI) proved to have better discriminative value than CPT-II measures for classifying children with ADHD and dyslexia, with ADHD children demonstrating better working memory ability than children with dyslexia.

## C17

### **Sport participation and anxiety in boys and girls with ADHD**

*Kiluk B, Weden S, Culotta V*

Objective: The objective of this study is to examine the potential influence physical activity has on the emotional functioning of children with ADHD. Research has supported the beneficial effect of physical activity on mood symptoms in adolescents, but few studies have examined this effect in children with ADHD. Based on the catecholamine deficit hypothesis of ADHD, these children may be at greater risk for developing mood symptoms. Method: This study examined children diagnosed with primary ADHD versus a primary learning disability after being referred to an outpatient behavioral health clinic. Children underwent neuropsychological evaluation, and were grouped by gender, diagnosis, and number of sports. Groups were compared with regards to various mood and behavioral scores from parent-reported Child Behavior Checklist. Result: Analyses revealed significant negative correlations between the number of sports participated in and various mood scores of children with ADHD. Analysis of Covariance indicated a significant difference among the anxious/depressed scores of children with ADHD according to the number of sports participated in, after controlling for effects of school and social variables. These differences were not evident in the learning disability group. Conclusions: This finding suggests that the physical activity aspect of sport participation may serve to reduce the expression of anxiety/depressive symptoms in children with ADHD, which may have implications for treatment. Future research should examine the effect of physical activity in children with ADHD and the potential for increased effectiveness of pharmacotherapy when combined with physical activity.

## C18

### **Effects of rhythmic biofeedback training on performance of male ADHD children aged 6–13**

*Myers TE, Shaya N, Shternberg T, Leisman G, Kollins SH*

Objective: The study hypothesizes that ADHD children with a three-month course of rhythmic biofeedback intervention, demonstrate significant improvement in the qualitative ratings by teachers, parents, and clinicians in their overall

behavioral functioning compared with children not given this training. Method: One group of twenty 6–13-year-old males with ADHD participated. Each met the criteria of the DSM-IV and demonstrated absence of coexisting conditions. All had homogeneous WISC-R scores of 80 or better. The participants were treated with a twelve-week course of rhythmic biofeedback training. A second matched group of twenty was selected not treated as above. All participants were randomly assigned. A third group of fifteen normal participants received a twelve-week course of rhythmic biofeedback. Participants were matched as closely as possible for age, intelligence, and ethnicity. A Hotelings *t*-test compared subjects. Testing included the Clinical Global Impressions (Clinician, Parent, Teacher), the Connors', and SWAN Scales (parent, teacher) all administered pre- and post-training. A  $3 \times 7$  MANOVA with repeated measures was performed with tests for variance homogeneity. Results: ADHD participants demonstrated significant improvement on all measures with training compared without ( $p < 0.01$ ). Normals demonstrated no significant differences between pre- and post-measures. ADHD participants still demonstrated significant differences with normals at post-training ( $p < 0.01$ ). Conclusion: Rhythm feedback training appears to have a significant effect on clinically observed changes in behavior in ADHD elementary school-age children. Ongoing signal detection studies are ongoing to examine the nature of the observed relationships.

## C19

### Comorbidity profiles for attention-deficit/hyperactivity disorder

Neal TJ, Hiller TR, Hall JJ, Noggle CA, Dean RS

Objective: In addition to the cognitive processing deficits, academic difficulties, developmental anomalies, and medical risks that exist in individuals with attention-deficit/hyperactivity disorder (ADHD), individuals with this disorder often have comorbid neuropsychiatric disorders. Successful treatment of ADHD is dependent upon an accurate diagnosis and awareness of possible comorbid disorders. The importance of accurate diagnosis has increased with an emphasis on empirically-validated treatments. This study investigates and identifies prevalence rates of comorbid psychiatric disorders among a population of neuropsychological referrals. This will provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within an ADHD population. Method: The current study examined secondary and tertiary diagnoses of 863 individuals with a primary diagnosis of ADHD as the result of a comprehensive neuropsychological evaluation. Subtype analysis examines prevalence rates among ADHD subtypes. An odds ratio calculates percentages for prevalence rates among groups. Results: Results of odds ratio analyses indicated high prevalence rates of comorbid psychiatric diagnoses for individuals diagnosed with ADHD. Overall, 64% of individuals had secondary diagnoses, 39% had tertiary diagnoses, and 4% had fourth diagnoses. Learning disorders was the most common comorbid diagnosis (48.1%) followed by depression (13.4%) and anxiety (13.0%). Subtype analyses revealed salient differences in prevalence rates among subtypes. Conclusion: In sum, results indicated individuals have comorbid psychiatric disorders at a greater rate than demonstrated in the general population (APA, 2000).

## C20

### The relationship between dissociation and attention-deficit/hyperactivity disorder symptoms

Bruce AS, Bruce JM, Arnett PA, Ray WJ

Objective: The study of normative and pathological dissociation has recently gained importance due to its ability to inform us about cognitive processes. Many dissociative experiences are extremely similar in nature to symptoms of attention-deficit/hyperactivity disorder (ADHD). Surprisingly, few studies have explored the relationship and potential overlap between the two clinical phenomena. In the current study, we compared high and low dissociators on a self-report adult ADHD measure and also administered neuropsychological measures related to attentional processes. Methods: The Dissociative Experiences Scale (DES), a commonly-used measure of self-reported dissociative symptoms, was used to recruit participants. During the experimental procedure, the Connors Adult ADHD Rating Scale (CAARS) was administered in addition to the Iowa Gambling Task, the Operation Span task, the VIGIL, and the Wisconsin Card Sorting Test-64. The measures were administered to 33 high and 32 low dissociators recruited from an undergraduate sample. Results: High dissociators reported significantly more problems with ADHD-related symptoms than low dissociators on all subscales of the CAARS. The high and low dissociator groups also differed on the DSM-IV ADHD symptoms total score, [ $t(63) = -4.03, p < 0.001$ ]. Despite this, no between group differences emerged on the objective neuropsychological measures. Conclusions: Although highly dissociative individuals reported significantly

more ADHD-related symptoms than low dissociative individuals, these relative difficulties were not related to their performance on neuropsychological measures of executive functioning. Future research is necessary to further explore the overlapping nature of dissociative experiences and symptoms of ADHD.

## DEVELOPMENTAL AND PEDIATRIC I: OTHER

### C21

#### **Toward a valuation of pediatric neuropsychological assessments**

*Knapp JA, Emmons CL, Arffa S*

**Objective:** The purpose was to attempt valuation of neuropsychological assessments by utilizing measures of patient (parent) perceptions and external criteria. **Method:** Participants were sixty-five children ages 4–16, (mean = 9.7, 66% male, 75% Caucasian) given a neuropsychological examination in the years 2004–2006 at an outpatient facility. A five-point Likert questionnaire containing 13 estimates of utility (refine diagnosis, understand strengths and weaknesses, understand cognition and behavior, understand personality, change psychological treatment, change education, change parenting, measure progress, understand disorder, understand needs, understand prognosis, comparison to past evaluations, and overall relief) was created using medical necessity criteria and neuropsychologists' judgments. **Results:** Overall utility was above average (mean 3.89). The highest utility (mean 4.4), was understanding cognitive strengths and weaknesses, and the lowest utility, also above average, was documenting treatment progress (3.52). A modified "willingness to pay" paradigm led to a mean utility of 4.5 for "money spent" and 4.7 for "time spent". Patient's perceptions of monetary value worth did not statistically differ in those patients who paid out of pocket and those with third party reimbursement. In addition, external criteria for neuropsychological utility included identifying a new diagnosis. Forty eight percent of the sample received a new psychiatric diagnosis (primarily co-morbid condition), 17% had a psychiatric diagnosis eliminated, and 52% had a psychiatric diagnosis confirmed. Forty-three percent received a new diagnosis of learning disability. **Conclusion(s).** Utility of pediatric neuropsychological assessments was established via external criteria, and valuation was confirmed using patient perceptions.

### C22

#### **Comparing the convergent validity and clinical utility of the BASC-PRS and CBCL in children with epilepsy**

*Bender HA, Zaroff CM*

**Objective:** The present study compares the convergent validity and clinical utility of two parent-report behavior rating scales (BASC-PRS & CBCL) in measuring psychiatric symptomatology in children with epilepsy. We examined the extent to which analogous broadband (internalizing and externalizing behaviors) and narrowband syndrome scales (anxiety and depression) assess similar behaviors in this population. Based on previous investigations evaluating these relationships in non-referred and clinical samples, we predicted moderate to high correlations between syndrome scales. Given the comorbidity between pediatric epilepsy and social-emotional processing deficits, we hypothesized that a higher percentage of children would fall within the "at-risk" or "clinically significant" range on the BASC-PRS, as compared to the CBCL. **Methods:** Sixty subjects from 6 to 17 years (mean = 11.02 years, S.D. = 3.37) comprised the sample. All subjects had a confirmed diagnosis of epilepsy based on clinical history and/or EEG findings; children with FSIQ scores <70 were excluded. A coefficient of determination was computed for each similarly labeled scale of the BASC-PRS and CBCL in order to estimate their degree of agreement. **Results:** For the broadband internalizing and externalizing problems scales of these instruments, the correlations were  $r = 0.72$  and  $0.81$ , respectively. In contrast, correlations between narrowband scales were considerably more variable (range:  $-0.25$  to  $0.78$ ). **Conclusions:** Low correlations between several narrowband scales may reflect fundamental differences in the authors' clinical conceptualization of childhood disorders. Variability of the sensitivities of each measure, and correlations between measures, may also stem from underlying differences between rationally- and empirically-derived approaches to test construction.

### C23

#### **Pediatric prosopagnosia: The boy who mistook his mom for a stranger**

*Bridges AJ, Holler KA*

**Objective:** Prosopagnosia is a rare disorder presumably caused by bilateral lesions in the occipitotemporal gyrus. Few neuropsychological tests have been developed to assess it, most not applicable to children. We present a case of a

boy with prosopagnosia to illustrate (1) an unusual neurologic disorder in a pediatric patient; (2) the use of traditional assessment techniques in non-normative ways; (3) the development of materials in the absence of appropriate, well-developed tests. Method: Jack, an adopted Caucasian boy, was diagnosed with prosopagnosia at age 4. At birth he was without respiratory effort, requiring resuscitation. At age 8, he was seen in an outpatient neuropsychological practice for behavior management recommendations. Since Jack's prosopagnosia had been diagnosed previously, the evaluation focused on describing Jack's use of compensatory strategies to manage his environment. The examiners created stimulus materials to determine whether Jack was able to infer person characteristics. Using a Boston process approach, failures were further examined. Results: Jack's performance indicated chance level recognition of gender, age, and facial expressions in color photographs and line drawings. In contrast, he showed good ability in recognizing animals and common objects. Visually-mediated cognitive tasks were impaired, while auditory/verbal tasks were low average. Conclusions: It was recommended that Jack be taught strategies to aide in identification of others (e.g. hair length, clothing, jewelry), as he did not currently use these cues. Recommendations to help Jack manage his behavior, in light of the effort he expended daily to navigate his social world, were provided.

## C24

### **Developmental relationship in a standardized measure of palm writing**

*Hall JJ, Hiller TR, Neal TJ, Noggle CA, Dean RS*

Objective: Tactile perception has long been used in neurological and neuropsychological examinations without standardization or adequate norms. One such test is the "Palm Writing" test which measure sensory discrimination and left-right differences and is used in a number of clinical measures. This report examined the developmental curve of scores on the "Palm Writing" subtest based on the normative sample of the Dean-Woodcock Sensory-Motor Battery (D-WSMB). Method: One-thousand and eleven individuals aged 4 through 80 years were given the Palm Writing test from the D-WSMB. W-score results from the 5th and 50th percentiles on the right and left hand were plotted. Results: The plots of the 50th percentile for the right and left hand were similar. Both began with a rapid increase in scores, which lasted until about age 16 for the right hand and age 12 for the left hand. Then both hands' score remained stable. The fifth percentile plots had their own similar pattern. Scores began with a rapid increase until about age 10, followed by moderate increase until a peak at age 28. Then the scores in the fifth percentile steadily declined. Conclusions: Results show that it is reasonable to expect nearly the same performance on Palm Writing for an average individual between the ages 16 and 80. For those on the low end of performance, ability in Palm Writing should decrease increasingly more after age 28, relative to individuals of average ability. This is important in that these data offer the clinician interpretive devices for the test.

## C25

### **The relationship between processing speed and sensory/motor functioning in children**

*Hall JJ, Neal T, Hiller T, Noggle C, Dean RS*

Objective: Recent research investigating whether cognitive abilities were associated with attention deficit/hyperactivity disorder showed that inattentive symptoms of ADHD were significantly related to the CHC ability of processing speed (Penny, Waschbusch, Carrey, & Drabman, 2005). Processing speed has also been implicated in long-term phonological representation of words which explained variance in memory span in children ages 5–13 (Ferguson & Bowey, 2006). Unfortunately, there is a lack of research demonstrating the relationship of processing speed to sensorimotor functioning in children. The current study considered the relationship between processing speed and sensory motor functioning in children. Method: The current sample consisted of 281 subjects aged 12 years or younger. Each participant received, as part of a comprehensive neuropsychological battery, the Woodcock-Johnson Tests of Cognitive Abilities-Third Edition (WJ-III COG), including a measure of processing speed, and the Dean-Woodcock Sensory Motor Battery (D-WSMB). Results: Results of a multiple regression analysis demonstrated that 60% of the variance in processing speed was explained by all 18 measures ( $R = 0.776$ ) of the Dean-Woodcock Sensory Motor Battery (D-WSMB; Dean & Woodcock, 2003). Conclusions: There has been little research considering the relationship between sensory and motor functioning and processing speed in children. The current study demonstrated that all 18 measures sensory and motor functions on the D-WSMB underlie processing speed. This suggests that a child who has poor processing ability, such as children with ADHD, will also experience deficits on these measures of sensory and motor performance.

**C26****Normative and standardized examination of the Romberg***Hiller TR, Neal TJ, Hall JJ, Noggle CA, Dean RS*

**Objective:** The Romberg test has an extensive history in neurological examinations and considered a measure of subcortical functioning. The test includes three subtests: feet together, toe-to-heel, and one foot. Many neurological batteries only use feet together, have little standardization in their administration or scoring, and use only a “positive” or “negative” evaluation of performance. In comparison, the Dean-Woodcock Sensory-Motor Battery’s (D-WSMB) use of all three subtests, standardization, and incorporation of a five-point rating scale allows for a developmentally appropriate curve of performance to be plotted out. This report examined the developmental curve of scores on the Romberg tests based on the normative sample of the (D-WSMB). **Method:** Participants were 1011 individuals from the normative sample aged 4 through 80 years. Sampling variables were based on the U.S. population in accordance with the 2000 census. Participants were administered the Romberg test from the D-WSMB. W-score results from the 5th and 50th percentiles were plotted. **Results:** Results showed a similar pattern between the 5th and 50th percentile. Romberg scores increased until the age of 16 and then declined slowly until around the age of 62 after which a steeper decline began. **Conclusions:** An examination of changes in performance with age suggests that using a pass/fail scoring system for the Romberg, similar to that used by many neurology assessments misses a good deal of variability. A standardized measurement, such as that offered by the D-WSMB, would seem far more useful clinically and in research.

**C27****Sensitivity of the children’s category test level 2 to brain damage***Knatz DT, Allen DN, Mayfield J*

**Objective:** While the Children’s Category Test Level 2 (CCT-2) is commonly used to assess abstraction and problem-solving abilities in children ages 9–16, little information is available for clinical populations. The purpose of the current study was to investigate the psychometric properties of the CCT-2 in children with structural brain damage and attention-deficit/hyperactivity disorder. **Method:** One-hundred and fourteen children with structural brain damage (BD;  $n = 82$ ), primarily traumatic brain injury, and attention-deficit/hyperactivity disorder (ADHD;  $n = 32$ ) were administered a battery of tests which included the CCT-2. The psychometric properties of the CCT-2 were examined using principal components analysis, correlational analyses and between group comparisons using ANOVA. **Results:** Three factors were extracted, which was largely consistent with previous findings in normal children and children with traumatic brain injury. These factors showed differential correlations with achievement and IQ test scores. However, no differences were found for the factor or subtest scores between the ADHD and the structural brain damage groups ( $p = 0.24$ ). **Conclusion:** It appears that the psychometric characteristics of CCT-2 are stable across various clinical and non-clinical populations. However, the test does not appear particularly sensitive to brain dysfunction associated with structural brain damage or neurodevelopmental abnormalities of ADHD.

**C28****Standardization of a long used clinical evaluation of gait and station***Neal TJ, Hiller TR, Hall JJ, Noggle CA, Dean RS*

**Objective:** Gait and Station evaluations have long been a part of examinations administered by neurologists and family practitioners as it offers information useful in assessing motor functioning, strength, and coordination. However, research in neither neurology or neuropsychology has offered a standardized measure of these variables, useful in clinical and research settings. This report examined the developmental curve of scores on the Gait and Station subtest of the Dean-Woodcock Sensory-Motor Battery (D-WSMB) based on the normative sample. **Method:** Participants included 1,011 examinees from the normative sample of the D-WSMB aged 4 through 80 years. Sampling variables were based on the U.S. population in accordance with the 2000 census. Participants were given the Gait and Station subtest from the D-WSMB. W-score results from the 5th and 50th percentiles were plotted. **Results:** In the 50th percentile, scores were relatively stable until about age 52 where a moderate decline began. In the fifth percentile, there was a rapid increase in scores from age 4 to 10 and a slight increase until 39. This was followed by a slight decrease until age 52. After 52, a steep decrease then takes place. Examining the difference between the two percentiles, it is relatively small variability between the ages of 10 and 52, yet larger before and after this range. **Conclusions:** Results

show there are different patterns for individuals in the 5th and 50th percentiles, suggesting those of low functioning will have much different results at certain ages. Overall, these data are of considerable importance.

## C29

### **Comorbidity profiles for pervasive developmental disorders**

*Neal TJ, Noggle CA, Hiller TR, Hall JJ, Dean RS*

**Objective:** Pervasive Developmental Disorders (PDDs) are not rare conditions with circumscribed boundaries. Presentation of additional symptoms and disorders not accounted for within the PDD diagnostic criteria often occurs. Importance of accurate diagnosis increased with emphasis on empirically-validated treatments. Prevalence rates are unclear due to methodological considerations. This study investigates and identifies prevalence rates of comorbid psychiatric disorders among a population of neuropsychological referrals. This will provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within a PDD population. **Method:** The current study examined secondary and tertiary diagnoses of 150 individuals with a primary diagnosis of PDDs as the result of a comprehensive neuropsychological evaluation. Subtype analysis examines prevalence rates among PDD subtypes. An odds ratio calculates percentages for prevalence rates among groups. **Results:** Results of odds ratio analyses indicated high prevalence rates of comorbid psychiatric diagnoses for individuals diagnosed with PDDs. Overall, 49% of individuals had secondary psychiatric diagnoses, 24% had tertiary diagnoses, and 3% had fourth diagnoses. attention-deficit/hyperactivity disorder (ADHD) was the most common comorbid diagnosis (21.3%) followed by anxiety (14.0%) and depression (8.7%). Mental retardation (2.7%), epilepsy (2.7%), and head injury (2.7%) were also common comorbid diagnoses. Subtype analyses revealed salient differences in prevalence rates among PDD subtypes. **Conclusion:** Results indicated individuals have comorbid psychiatric disorders at a greater rate than demonstrated in the general population (APA, 2000).

## C30

### **Utility of expressive speech when related to age and ability**

*Noggle CA, Hiller TR, Hall JJ, Neal TJ, Dean RS*

**Objective:** Analysis of expressive speech has been included as part of comprehensive neurological and neuropsychological examinations. It traditionally requires examinees to repeat a group of words and phrases that help in diagnosing the presence of dysarthria. This report examined the developmental curve of scores on the Expressive Speech test based on the normative sample of the Dean-Woodcock Neuropsychological Battery (D-WNB). **Method:** Participants were 1011 subjects ranging in age from 4 to 80 years. Sampling variables were based on the U.S. population in accordance with the 2000 census. Participants were given the Expressive Speech subtest from the D-WNB and the W-score results from the 5th and 50th percentiles were plotted. **Results:** Plots revealed interesting differences in the patterns of the 5th and 50th percentiles. The 50th percentile had a basic pattern, beginning with scores rapidly increasing until the age of nine. Then they remain stable until about age 64, after which there begins a moderate decline. The fifth percentile sees the same rapid increase until age nine, but then there is a slight increase in scores until age 23. Then there is another rapid increase until scores peak at age 28. After this peak, there begins a steady, moderate decline. **Conclusions:** Results show that there are very different patterns for individuals in the 5th and 50th percentiles, suggesting that those of low functioning will have much different results at certain ages than those of average ability. Future research may wish to examine the factors related to different patterns of performance.

## C31

### **Cognitive deficits in childhood depression**

*Noggle CA, Neal TJ, Hall JJ, Hiller TR, Dean RS*

**Objective:** Many researchers have made the assumption that mood disorders and cognitive declines seen in depressed adult and geriatric patients should be expected in childhood depression (e.g. Carlson & Kashani, 1988). Other research is not clear whether children and adults experience the same symptoms in depression. Indeed, differences are not only in regard to behavioral and emotional features, but also cognitive impairments (Kovacs, 1996). When considering the impact cognition may have on ones' ability to perform adequately in school, the relationship between childhood depression and cognitive impairment is warranted. The present study compared the performance of children diagnosed with depression to those without on the cognitive portion of the Dean-Woodcock Neuropsychological Assessment



**System.** Method: The current sample consisted of 40 children with depression and 40 age-matched normals. Each participant received, as part of a comprehensive neuropsychological battery, seven cognitive tests that were selected from the Woodcock-Johnson III-Tests of Cognitive Abilities (WJ-III, Woodcock, McGrew, & Mather, 2001). Results: Results of a MANOVA found that children diagnosed with depression differed significantly ( $p < 0.05$ ) from normals on the concept formation and sound blending subtests of the WJ-III with the normals performing significantly better. Conclusions: While research had demonstrated how depression inhibits the cognitive functioning of adults, similar studies on children are limited. Current results indicate depression in children is related to cognitive impairment on specific subtests of the WJ-III. These areas of impairment may well be related to anxiety and deficits in attention that commonly occur in depression.

### C32

#### **Incidence rates of LD, ADHD, and previous head injury in high school athletes and between-groups comparison of ANAM subtest baseline performance**

*Wilson KR, Sim A, Terryberry-Spohr L, Bleiberg J*

**Objective:** Significant differences in baseline performance of high school athletes with LD, ADHD or previous head injury compared to control subjects has been demonstrated on non-computerized assessment tools such as the Standardized Assessment of Concussion (SAC) (Sim et al., 2005). The aim of this study is to expand on that research by providing incidence rates of LD, ADHD, and HI in a larger sample and to assess whether these factors affect baseline performance on computerized assessment tools such as the Automated Neuropsychological Assessment Metric (ANAM). **Method:** Baseline testing data including measures of symptomatology, neurocognitive functioning, and mental status was obtained as part of the Nebraska Concussion Study, a 5-year, grant-funded study to increase awareness of concussion and use of monitoring instruments across the state with high school athletes. **Results:** ANAM data for 793 high school athletes (mean age = 15.57; S.D. = 1.22) composed the sample. An incident rate analysis found 6.0% self-identified as LD ( $n = 48$ ), 4.3% identified as ADHD ( $n = 34$ ), 27.3% endorsed a previous HI or concussion ( $n = 218$ ). ANOVAs revealed a significant difference in ANAM Mathematical Processing scores ( $F = 4.859$ ,  $p < 0.01$ ). Participants with ADHD ( $M = 241.17$ , S.D. = 33.31) on average had lower scores than HI ( $M = 245.07$ , S.D. = 30.18) and controls ( $M = 247.56$ , S.D. = 30.59). **Conclusion:** ANAM data differentiated between LD, ADHD, HI, and control participants' mean Mathematical Processing subtest scores. The lack of differences in other areas continue to emphasize the need for individualized baselines.

### C33

#### **A prospective and descriptive report of variability in neuropsychological performance in young children with sickle cell disease (SCD)**

*Wodka EL, Tarazi RA, Grant M, Ely E, Barakat LP*

**Objective:** To examine variability in neuropsychological performance in young children with SCD and consider the role of maternal, environmental, and disease-related variables. **Method:** Twenty children with SCD completed a neuropsychological battery at baseline and 1 year later ( $M_{\text{age}} = 67.5$  months). Variability was defined as a significant WPPSI-III VIQ-PIQ split and the presence of  $>1$  S.D. difference between the highest and lowest standard scores of Language, Visuospatial, Memory/Attention, Reasoning, and Motor domains. Illness-related and psychosocial risk factors were gathered through chart review and parent report measures. **Results:** Occurrence of significant VIQ-PIQ splits dropped from 55% to 30% over time; however, the number of participants with significant differences across domain scores increased from 53.3% to 70%. There were no differences in age of child or mother, disease-related or psychosocial factors at time 1 between children who exhibited IQ or inter-domain variability at time 2 and those that did not. However, children who demonstrated variability only at time 2 had significantly higher disease severity ( $t = -2.6$ ,  $p = 0.026$ ) and parent-reported disease-related stress ( $t = -2.4$ ,  $p = 0.035$ ) at time 1, with only disease severity contributing significantly in a regression model ( $\beta = 0.62$ ,  $p = 0.049$ ). **Conclusions:** Disease severity appears to be a contributing factor to increased performance variability over time in children with SCD. Therefore, longitudinal assessments may be useful in identifying preschool children at-risk for disease-related cognitive and developmental effects of SCD.

## NEUROPSYCHOLOGICAL DOMAINS I: ATTENTION

### C34

#### **Digit, word, and visual spans are not interchangeable measures in healthy older adults**

*Giggey PP, Spencer RJ, Rice S, Katzel LI, Waldstein SR*

**Objective:** Wechsler Scale subtests Digit and Visual Span have been described as analogous/interchangeable working memory measures. Using factor analysis, we systematically examined their loadings alongside other neurocognitive measures. **Method:** Factor analyses were conducted in 112 stroke- and dementia-free, community-dwelling older adults (59% male; mean age = 65.9 {S.D. = 6.5}; mean education = 16.4 years) enrolled in a study of cardiovascular risk factors, brain, and cognition. Participants were free of major medical (except hypertension), neurological, and psychiatric disease and engaged in neuropsychological assessment. **Results:** Four factors (explaining 69.9% of variance) with eigenvalues above one were extracted from Logical Memory (LM) I and II, Visual Reproductions (VR) I and II, Trails-A, Trails-B, Digit- (DS-F), Word- (WS-F), and Visual-Spans (VS-F) Forward, and Backward (DS-B, WS-B, and VS-B). Varimax rotation produced: Factor 1: DS-F, DS-B, WS-F, and WS-B 1 (loadings = 0.75, 0.71, 0.86, and 0.77, respectively); Factor 2: Trails-A, Trails-B, VS-F, VS-B, (loadings = -0.66, -0.64, 0.72, and 0.73); Factor 3: LM-I, LM-II, (loadings = 0.94 and 0.95); Factor 4: VR-I, VR-II, (loadings = 0.84 and 0.83). Promax-rotated loadings were quite similar. **Conclusion:** Using orthogonal and correlated solutions, Visual Span consistently loaded on one factor with Trail-Making and not the two memory span tasks. This suggests Visual Span is more a measure of visuospatial scanning and is largely independent of the immediate memory construct underlying digit and word spans.

### C35

#### **The Wender Utah Rating Scale: ADHD/ADD Diagnostic Tool or Personality Index?**

*Hill BD, Jones GN, Pella RD, Singh AN, Gouvier W*

**Objective:** The Wender Utah Rating Scale (Wender) is used to determine whether adults are likely to have ADHD/ADD. This study sought to determine whether the Wender functions as an attentional index or instead measures dysfunctional personality traits. **Methods:** Two-hundred and thirteen subjects who had completed attentional measures such as the Wender, Conners' CPT, WAIS-III, WMS-III, and Trails B as well as the personality assessment inventory (PAI) as part of an assessment at a university psychological services center were utilized. Subjects ranged between the ages of 16 and 54 years with a mean age of 22 years. **Results:** Wender score correlated significantly ( $p < 0.05$ ) with all of the PAI psychopathology scales (SOM  $r = 0.20$ , ANX  $r = 0.37$ , DEP  $r = 0.39$ , MAN  $r = 0.28$ , PAR  $r = 0.33$ , SCZ  $r = 0.43$ , BOR  $r = 0.52$ , ANT  $r = 0.35$ ) as well as with the treatment scales. However, of all the neuropsychological attentional measures, only the WAIS-III processing speed index significantly correlated with Wender score ( $r = -0.16$ ,  $p = 0.02$ ) and it was the smallest correlation noted. **Conclusions:** In an adult population, the Wender appears to be more related to dysfunctional personality traits than to actual attentional performance. This begs the question of whether the Wender has any clinical utility in the diagnosis of attentional disorders in adults.

### C36

#### **Comparisons between the Ruff 2 & 7 and selected measures of the WAIS-III**

*Lloyd A, Levy D, Clark M, Kohn L, Golden C*

**Objective:** This study sought to determine the correlation between the Ruff 2 and 7 Accuracy and Speed Scores with selected measures from the WAIS-III. The Ruff 2 and 7 Controlled Speed Accuracy *T* scores have been found to correlate with the WAIS-R PIQ and the WAIS-R Digit Symbol subtest. No previous studies were found that examined the relationship between the Ruff 2 and 7 and these measures on the WAIS-III. **Method:** Participants were 54 adult outpatients administered both the WAIS-III and the Ruff 2 and 7 in a mental health services setting. Fifty percent of the participants were male with mean age of 34 (S.D. = 1.88). **Results:** A Pearson product-moment correlation revealed a significant relationship between the Ruff 2 and 7 Speed scores ( $p < 0.01$ ) and the digit symbol subtest ( $r = 0.41$ ,  $p = 0.003$ ). A significant relationship was also found between the Ruff 2 and 7 ( $p < 0.01$ ) and the PSI of the WAIS-III ( $r = 0.37$ ,  $p = 0.008$ ). However, no significant relationship was found between Ruff 2 and 7 and the PIQ. **Conclusions:** Results indicated that the Speed scores on the Ruff 2 and 7 were moderately correlated with the Digit Symbol subtest and the Processing Speed Index of the WAIS-III. However, the Controlled Speed Accuracy *T* score was not found to be significant with WAIS-III. Replication of current findings with a larger sample is recommended.

**C37****A quantitative meta-analysis of the symbol digit modalities test***Longman S, Crockett DJ*

**Objective:** The objectives of this study were to apply a quantitative meta-analysis (e.g. Barry, Bates, & Labouvie, 2002; Longman, 1994) to the Symbol Digit Modalities Test (SDMT; Smith, 1968; Smith, 1982) in normal adults and children, and develop regression-based predictions for scores in the normal population. A second goal was to assess the effects of various neurological conditions on this measure. **Data selection:** The English language neuropsychological literature was reviewed for representative published studies in control and neurological groups, beginning with sources referenced in standard assessment handbooks (e.g. Lezak, 1994; Spreen & Strauss, 1998), and papers referencing the primary citations. A total of 136 non-overlapping data points (comprising 24,381 subjects) were identified for control groups, and 93 non-overlapping data points (comprising 10,055 subjects) were identified for neurological groups. **Data synthesis:** Multiple regression, using age, education, and gender were used to predict scores for normal groups, demonstrating a very strong curvilinear effect of age over both the whole sample and in adults alone, a strong effect of education, and a small but consistent gender effect, with women outperforming men. In clinical groups, large effects ( $>1$  S.D.) were noted for both written and oral forms, with a clear effect of severity. **Conclusions:** The SDMT is a sensitive (but not specific) measure of cognitive dysfunction, and regression-based norms are useful for this measure in the group case, as well as potentially in the individual case. Strategies used for this analysis can be applied to other neuropsychological tests with consistent scoring.

**C38****Psychometric properties of a new measure of attention and working memory***Park BS, Lean B, Allen DN*

**Objective:** The current study seeks to evaluate a new paper-pencil measure called the Search Identification Task (SIT) that is designed to evaluate various aspects of attention and working memory. The format of the SIT allows for assessment of the basic components of attention without computers or other specialized equipment, allowing for administration in most evaluation settings. **Method:** Participants included 80 normal controls who were administered the SIT along with other neurocognitive measures of focused and sustained attention, mental flexibility, problem solving and set shifting (Trail Making Test, Digit Span, Digit Symbol, CPT, Wisconsin Card Sort, and Stroop Color-Word). The SIT begins with a basic cancellation task. The next three tasks increase in difficulty by the inclusion of an increasing number of distractors and greater demands on working memory. Processing of both verbal and visual information is required, allowing for examination of lateralization effects. Incidental recall and recognition are also assessed. Finally, an alternate form allows for repeated testing. **Results:** Validity and reliability data suggest expected differences based on task difficulty and stimulus type (verbal versus visual), and offer initial support for comparability of alternate forms. In multiple experiments SIT found association with other tests of attention establishing convergent validity. Immediate test-retest indicates no significant practice effects. **Conclusions:** These results suggest that the SIT is a valid measure of attention and working memory. Additional research with clinical populations is needed in order to establish its sensitivity to brain damage and other pathology.

**C39****Stimulant medication's effects on adult ADHD symptoms and NEO PI-R personality traits***Samuel DB, Ranseen JD*

**Objective:** Previous studies have indicated a consistent profile of basic personality traits correlated with adult ADHD; in particular low scores on the trait of Conscientiousness and high scores on Neuroticism. However, there is limited information concerning the effects of medication treatment for adult ADHD. The objective of the present study was to examine the impact of treatment on adults meeting DSM-IV criteria for attention deficit hyperactivity disorder (ADHD), particularly on personality functioning. **Method:** Over 18 months, 60 adults were diagnosed with ADHD based on strict, DSM-IV criteria following thorough evaluations that included self-report measures (e.g. CAARS), neuropsychological measures (e.g. Connors CPT-2) and personality measures (e.g. NEO-PI-R). To date, 10 subjects have returned to complete these same measures after undergoing sustained pharmacological treatment (mean = 42 weeks). **Results:** Pre-post-comparisons ( $t$ -test) indicate that this group of ADHD adults treated with stimulant medications exhibit significantly improved performance on the CPT measure (decreased commissions, decreased number of atyp-

ical scores), diminished self-report symptoms of inattention (CAARS; Inattentive symptoms and ADHD Index), and reported a significant increase on NEO PI-R Conscientiousness and a decrease on the Neuroticism scale. Conclusions: Following treatment with stimulant medications, adults diagnosed with ADHD evidenced diminished self-reported ADHD symptoms along with improvement in sustained attention/response inhibition on a CPT measure. Most interestingly, these adults also displayed a change on measures of basic personality traits suggestive of improved functioning (lowered emotional reactivity and increased self-discipline and self-control).

## NEUROPSYCHOLOGICAL DOMAINS I: EXECUTIVE FUNCTIONS

### C40

#### **Can executive function predict mathematical skills in children?**

*Alison C, Dowell C, Riccio C, Dyer N*

**Objective:** It has been proposed that measures of executive function, such as the WCST and Stroop, predict unique variance in mathematical ability for children. The relation between executive function and mathematical skills the executive measures considered, and the measure of mathematical ability considered. The purpose of this study was to examine the relation between children's performance on various laboratory measures of executive function and calculation, math application, and math fluency. **Method:** Subjects were 92 consecutive referrals to a research study at a Southwestern University who were administered a comprehensive battery of neuropsychological tests, and who obtained a Full Scale IQ of 80 or higher. The children had a mean age of 11.76 years (S.D. = 2.07). The sample included predominantly males (67.39%) and was predominantly white (80.43%). Of the 92, 44.57% met criteria for ADHD (with or without comorbid disorders) and 27.17% met criteria for some other disorder but not ADHD. **Results:** Measures of executive function significantly predicted calculation, math fluency, and math reasoning as measured by the WJIII. Significant contributors to the predictions were CMS General Memory, Stroop Word, WCST Categories, and CCPT Commission Errors. Regardless of the math skill in question, Stroop Word scores consistently emerged as a significant predictor. **Conclusions:** As indicated by other studies, many executive processes are implicated and predictive of math performance. Intervention for math difficulties may need to address deficient executive processes.

### C41

#### **Prediction of mathematical skills with the BRIEF in children**

*Barrois L, Haynes B, Riccio C, Haws B*

**Objective:** It has been proposed that measures of executive function predict unique variance in mathematical ability for children. The relation between executive function and mathematical skills, however, may vary depending on the sample (clinical or non-clinical), the executive measures considered, and the measure of mathematical ability considered. The purpose of this study was to examine the relation between parent ratings of children's executive function and calculation, applied problems and math fluency. **Method:** Subjects were 92 consecutive referrals to a research study at a Southwestern University who were administered a comprehensive battery of neuropsychological tests, and who obtained a Full Scale IQ of 80 or higher. The children had a mean age of 11.76 years (S.D. = 2.07). The sample included predominantly males (67.39%) and was predominantly white (80.43%). Of the 92, 44.57% met criteria for ADHD (with or without comorbid disorders) and 27.17% met criteria for some other disorder but not ADHD. **Results:** The results of the Parent BRIEF significantly predicted Calculation on the Woodcock Johnson-III with the greatest variance accounted for by the Shift subscale ( $r = -0.32$ ;  $p = 0.001$ ). Regression results were not significant for the BRIEF with Applied Problems although correlations between Applied Problems and multiple BRIEF subscales (inhibit, shift, initiate, working memory) were significant. Similarly, BRIEF subscales did not predict Math Fluency despite significant correlations with initiate and working memory. **Conclusion.** Parent ratings of executive functioning may be helpful in informing the intervention planning for children experiencing difficulty with calculation and applied problems.

### C42

#### **The cerebellar contribution to cognitive functions: Evidence from patients with olivopontocerebellar atrophy**

*Biechowska D, Jodzio K, Harciarek M, Gasecki D*

**Objective:** It has long been recognized that the cerebellum plays an important role in movement coordination, but research over the past two decades have expanded the traditional views on the role of the cerebellum in behavior. Recent

studies have shown, that the cerebellum, through multiple connections with the cerebral cortex, is also involved in higher cognitive functions, but still little is known about the potential role of the cerebellum in cognition. The goal of the present study was to analyze the structure and dynamics of the cognitive functioning in patients with cerebellar disorders. Methods. Attention, mental processing speed, working memory, abstract reasoning, verbal skills and executive control processes were evaluated. As a method of a presentation, we have chosen the case study approach. Two patients with progressive cerebellar atrophy underwent a comprehensive neuropsychological and radiological evaluation. Each patient was examined twice: first shortly after establishing a diagnosis and then a year later. Results: Both patients presented with a longstanding cognitive impairment including visual memory deficits, visuo-constructional problems and deficits of verbal reasoning which were accompanied by executive dysfunction, including attentional disorder and difficulties with choice of problem solving strategies. Our case studies have indicated the complex cognitive symptomatology associated with dementia secondary to cerebellar atrophy. Moreover, the qualitative analyses add an important piece of information to the current knowledge about the specific pattern of cognitive impairment in patients with cerebellar disorders. In conclusion, these clinico-pathological correlations provide further evidence that the cerebellum makes important contributions to the regulation of some higher cognitive functions.

#### C43

##### **How does Rey performance compare with measures of executive function in children?**

*Bowden R, Lawrence K, Riccio C, Cohen MJ*

Objective: The Rey Osterreith Complex Figure Test is purported to be a measure of planning ability, as well as visual motor integration. The purpose of this study was to examine the relation between performance on the Rey Copy task with various laboratory measures of executive function. Method: Subjects were 85 consecutive referrals to an out-patient facility who were administered a combination of neuropsychological measures including the Rey, NEPSY Tower and Arrows, verbal fluency, clock face, and VMI. The children had a mean age of 10.18 (S.D. = 1.81). The sample included predominantly males (71.76%) and was predominantly white (81.18%). Referrals were generally for learning or behavioral problems; 63.53% met criteria for ADHD and 45.88% met criteria for learning disability. Results: Results of the Rey copy task were found to significantly correlate with Full Scale IQ, NEPSY Tower, Clock face form, fluency, NEPSY arrows, and general memory. Pearson coefficients ranged from 0.49 ( $p < 0.001$ ) for Full Scale IQ to 0.30 ( $p = 0.007$ ) for NEPSY Arrows and VMI. Conclusions: Results support the contention that performance on the Rey figure copying task utilizes components of executive function to a significant degree, and may add to the information gained from neuropsychological assessment. The extent to which organization and planning in particular are tapped by the Rey copy task is not discernible from these data, but warrants further investigation.

#### C44

##### **The relationship between fluid intelligence and clinical vs. experimental measures of working memory**

*Hill BD, Shelton J, Elliott E, Calamia M, Gouvier W*

Objective: Working memory (WM) has been proposed to be highly predictive of general fluid intelligence (Gf). The purpose of this study was to determine whether WM's proposed relationship with Gf holds for both experimental measures of WM commonly employed by cognitive psychologists and clinical measures of WM used by neuropsychologists in practice. Methods: Thirty-four subjects participated in fulfillment of a research requirement at their university. Three experimental tasks commonly employed by cognitive psychologists (the operation span [ospan] task, the listening span [lspan] task, and the n-back task) and two clinical measures of WM (the WAIS WM index and the WMS WM index) were used in this study. The Raven's Advanced Progressive Matrices (RAPM) was also given as a measure of Gf. Results: The RAPM significantly correlated (all  $p < 0.01$ ) with the following: ospan ( $r = 0.64$ ), lspan ( $r = 0.57$ ), and n-back ( $r = 0.61$ ) tasks and the composite score of all three tasks ( $r = 0.68$ ,  $p < 0.01$ ). Neither the WAIS ( $r = 0.30$ ) nor WMS ( $r = 0.22$ ) WM indices were significantly correlated with RAPM ( $p > 0.05$ ). Even for WAIS full scale IQ, the experimental WM measures were more highly correlated ( $r = 0.61$ ,  $p < 0.01$ ) than either WAIS WM ( $r = 0.57$ ,  $p = 0.01$ ) or WMS WM indexes ( $r = 0.38$ ,  $p = 0.03$ ). Conclusions: A variety of experimental measures of WM were significantly related to a measure of Gf but neither of the clinical WM measures commonly employed by neuropsychologists demonstrated such a relationship. This raises questions concerning the applicability of cognitive research to neuropsychological test interpretation.

**C45****Evaluating the role of motor regulation in figural fluency***Kraybill M, Suchy Y*

**Objective:** Figural fluency is often thought to assess the ability to “think fluently and flexibly in the visual-spatial mode” (Ruff, 1996). However, the contribution of motor regulation component to the performance of this task has not been previously examined. The goal of this study was to evaluate the potential relationship between motor sequence fluency (without a visual-spatial component) and figural fluency. **Method:** Fifty-five participants (ages 18–68 years) were administered the (1) Ruff Figural Fluency Task (RFFT), (2) Trail Making Test Part A (TMT-A), which overlaps with RFFT in visual tracking and graphomotor demands, and (3) an electronically administered Motor Sequence Fluency Test (MSFT), which overlaps with RFFT in generation of novel hand movements in the absence of visual stimuli. **Results:** MSFT was a significant predictor of RFFT scores above and beyond age, education, and TMT-A [ $F(1, 50) = 11.372, p = 0.001$ ], whereas TMT-A did not significantly predict RFFT scores beyond age and education [ $F(1, 51) = 1.275, p = 0.264$ ]. **Conclusions:** Even though the RFFT is widely believed to assess the visual-spatial aspects of generative fluency and executive functioning, the role of motor regulation and motor flexibility may in fact be more important for RFFT performance than previously thought.

**C46****Executive function and mathematical skills in children***Lawrence K, Allen C, Riccio C, Cohen MJ*

**Objective:** It has been proposed that measures of executive function predict unique variance in mathematical ability for children. The relation between executive function and mathematical skills, however, may vary depending on the sample (clinical or non-clinical), the executive measures considered, and the measure of mathematical ability considered. The purpose of this study was to examine the relation between children’s performance on specific measures of executive function and math calculation. **Method:** Subjects were 85 consecutive referrals to an out-patient facility who were administered a combination of neuropsychological measures including the WCST, verbal fluency, clock face, Rey, and Children’s Memory Scale, as well as the WRAT-3 Math subtest. The children had a mean age of 12.18 (S.D. = 2.33). The sample included predominantly males (72.94%) and was predominantly white (76.47%). Referrals were generally for learning or behavioral problems. **Results:** Multiple regression with WRAT-3 Math as the dependent variable and General Memory, Clock Face, fluency, Rey Copy, and WCST Categories and Failure to Maintain as independent variables was significant ( $p < 0.001$ ). Specifically, memory, fluency, and Rey scores accounted for significant variance in calculation. **Conclusions:** Findings from this clinical sample support existing research that executive function (or dysfunction) is predictive of math computation. Although not possible to discern from this study, it may be that retrieval fluency (i.e. the ability to retrieve facts and procedures rapidly from memory) may be key to dyscalculia in some individuals.

**C47****Effects of non-invasive neuropsychological manipulation on psychoticism scores***Leffler GP, Palmer JA*

**Objective:** To demonstrate that stress to the dorsolateral prefrontal cortex and anterior cingulate is detrimental to moral reasoning and altruistic behavior. **Method:** To affect this fatigue, a variant of the Stroop test was performed. The task of making an appropriate response when given two conflicting signals is associated with activity in the dorsolateral prefrontal cortex and the anterior cingulate. Participants then completed the Eysenck Personality Questionnaire—Revised (EPQ-R) after 5 min of responding to either the Stroop Test or to a placebo test which did not involve cognitive conflict. **Participants:** Forty-one non-colorblind, literate college students enrolled in an introductory psychology course, self-selected by signing up to participate for extra credit, constituted the participant pool. **Variables:** Group assignment to the experimental condition or the control condition is the independent variable. Score on the P scale of the EPQ-R is the dependent variable. **Results:** The psychoticism scores of the Experimental Group ( $M = 15.05, S.D. = 4.61$ ) were significantly higher than the Control Group ( $M = 10.65, S.D. = 3.72$ ) at the  $p < 0.01$  level. The experimental condition used accounted for 23% of the variability in EPQ-R scores, as measured by eta-squared. **Conclusions:** The stress to the brain caused by the Stroop Test reduced levels of moral/altruistic functioning in the experimental group. The control group did not show a reduced level of this functioning, again consistent with the hypothesis. Mental stress causes decreased levels of executive functioning as measured with regards to inhibition, as measured by the EPQ-R.

**C48****Validity of the comprehensive trail making test***Servesko AM, Smith S, Edwards JA*

**Objective:** The Comprehensive Trail Making Test (CTMT; Reynolds, 2002) has been cited as promising new measure, potentially addressing many of the norming and standardization issues of the Trail Making Test, Parts A and B (TMT). The CTMT consists of a sequence of five trails designed to be sensitive to brain damage and attentional difficulties. Unlike the traditional TMT, several of the CTMT trials include distractors and multiple set-switching demands. The reliability and validity information presented in the CTMT manual appear to be quite robust; however, there is currently no independent validation of this measure in the literature. The present study examined the convergent, divergent, and discriminant validity of the CTMT. **Data selection:** Data from both neuropsychological assessment outpatients ( $n=21$ ) and non-clinical samples ( $n=61$ ) were used. **Data synthesis:** Results suggested that the CTMT was convergent with measures of visuospatial processing (DTVP-A), cognitive inhibition (Stroop), and Performance IQ and divergent with measures of Verbal IQ. **Discriminant validity assessment** indicated that the clinical and non-clinical groups differed on three of the five trails as well as the overall composite score. Interestingly, both groups scored below the mean of the measure on all items. **Conclusions:** Overall, results suggest that the CTMT may be a valid measure of processing speed, cognitive inhibition, and visuomotor integration. Implications for the use CTMT in clinical practice will be discussed as well as future directions for research.

**C49****Executive dysfunction discrimination among children with emotional and neuropsychiatric impairment***Shaw L, Foley J, Finlay R, Durkin M, Golden C*

**Objective:** The aim of the present study was to evaluate the utility of WCST in identifying possible differences in types of executive dysfunctions in groups of children and adolescents with differing psychiatric and cognitive disorders. **Method:** Participants included 515 neuropsychiatry-referred children and adolescents. The mean age was 9.9 years ( $S.D.=3.1$ ) and mean education was 4.1 years ( $S.D.=2.9$ ). Diagnoses included ADHD, conduct disorder, learning disability, mood disorder, and adjustment disorder. **Results:** Results from ANOVAs indicated that scores on WCST variables are sensitive and specific in identifying executive functioning deficits across groups. For example, there was a significant difference between children with adjustment disorder and children with conduct disorder shown on total perseverative errors performance,  $F(2, 85.08)=3.23$ ;  $p=0.05$ . On total perseverative errors, the group with conduct disorder ( $M=32.96$ ,  $S.D.=20.92$ ) performed significantly worse than the group with adjustment disorder ( $M=25.42$ ,  $S.D.=12$ ). A significant difference was found between children with adjustment disorder and children with mood disorder on total number of errors performance,  $F(2, 455)=3.15$ ;  $p=0.04$ . On total number of errors, the mood disorders group ( $M=55.28$ ,  $S.D.=26.49$ ) performed significantly worse than the adjustment disorder group ( $M=45.67$ ,  $S.D.=21.93$ ). **Conclusion:** These results suggest sensitivity of the WCST to detect impairments in executive functioning among children with some developmental disorders, particularly conduct disorder, mood disorders, and learning disorders. The clinical implications of these findings are discussed.

**NEUROPSYCHOLOGICAL DOMAINS I: LANGUAGE AND APHASIA****C50****The relationship of demographic variables and verbal fluency scores***Edwards-Stewart A, Coady EL, Uomoto JM, Shaw JA*

**Objective:** The current study attempts to elucidate the relationship between demographic variables and verbal fluency scores. **Method:** Sixty-six participants (27 TBI and 39 other neurological disorders; 65% male; 83% Caucasian) underwent neuropsychological assessments at a Pacific Northwest rehabilitation hospital. Demographic ranges were: age 17–73 ( $M=45$ ,  $S.D.=13$ ), education 10–22 years ( $M=15$ ,  $S.D.=3$ ), and Full Scale WAIS-III IQ (FSIQ) 53–129 ( $M=106$ ,  $S.D.=14$ ). Demographic variables considered were: age, total number of years of education, FSIQ, clinical diagnosis, and gender. A multiple linear regression and subsequent t-tests determined the relationship of demographic variables and F-A-S total scores. **Results:** The linear combination of F-A-S total score and demographic variables yielded:  $F(4, 60)=7.51$ ,  $p<0.01$ ,  $R=0.59$ ,  $R^2=0.35$ . FSIQ [ $t(65)=4.08$ ,  $p<0.01$ ] and diagnosis [ $t(65)=2.00$ ,  $p<0.05$ ] both uniquely contributed to this model where age, education, and gender did not. This model was consistent

across F, A, and S with the exception of only FSIQ significantly contributing to the predictive equations. Conclusion: F-A-S total scores seem to be significantly impacted by the combination of age, education, FIQ, and clinical diagnosis. However, when demographic variables are examined individually, only FSIQ (and diagnosis) appears to uniquely contribute to F-A-S total scores. Such findings indicate that FSIQ has the strongest influence of all demographic variables on verbal fluency.

## C51

### **Selectivity of lexical-semantic disorders in aphasia. Evidence from single-word comprehension**

*Jodzio K, Leszniewska-Jodzio B, Biechowska D, Harciarek M*

**Objective:** Several neuropsychological studies have shown that brain-damaged patients may demonstrate selective category-specific deficits of auditory comprehension. **Methods.** The present research reports on the investigation of aphasic patients'; preserved ability to perform a semantic task on spoken words despite severe impairment in auditory comprehension, as testified by failure in matching spoken words to pictured objects. Six narrowly defined semantic categories for which dissociations have been reported are colors, body parts, animals, food, objects (mostly tools), and means of transport. **Results:** The great discrepancies among these categories were observed in aphasic patients, who had much more difficulty comprehending names of colors than they did comprehending other names. Animals were most often the easiest category to understand. The possibility of a simple explanation in terms of word frequency was eliminated. **Conclusion.** Evidence from the present study support the position that so called 'global'; aphasia is very imprecise term and should be redefined. These results are discussed within the connectionist and modular perspectives on category-specific deficits in aphasia.

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

## C52

### **Comparison between memory test results using persons with Alzheimer's disease**

*Hall SJ, Adams W*

**Objective:** It was hypothesized that two major normed memory batteries (Wide Range Assessment of Memory and Learning, 2nd Edition (WRAML2) and the Wechsler Memory Scale, 3rd Edition (WMS-III) would yield similar results among individuals diagnosed with Alzheimer's Disease (AD). Also hypothesized was that the WRAML2 and the WMS-III would correlate significantly with an ecologically meaningful memory measure. **Method:** One male and 11 females ranging in age from 65 to 89 years ( $M = 81.67$ ,  $S.D. = 4.19$ ) participated. Each was in early to middle stages of AD. Participants completed the WRAML2 and WMS-III in counterbalanced order. Also the Everyday Memory Scale (EMS) was completed by each Participant and a knowledgeable caretaker. **Results:** WRAML2 and WMS-III indexes purporting to measure similar constructs were compared. Index scores of the batteries were found to correlate at moderate to high levels ( $r = 0.42-0.81$ ). Index score means found equivalent included Verbal Memory/Auditory Immediate Indexes ( $t = -0.44$ ,  $p = 0.667$ ), Visual Immediate/Visual Memory Indexes ( $t = 1.82$ ,  $p < 0.096$ ) and General Memory Indexes ( $t = 1.18$ ,  $p = 0.263$ ). Correlations between memory batteries and the EMS were non-significant for all Index scores, including the General Memory Indexes. **Conclusions:** While the two major adult memory batteries seem to measure some of the same constructs, about half of the index measures yield scores that are significantly different when used with persons with AD. Further, with AD clients, there seems to be little relationship between formal memory test results and perceived everyday memory functioning.

## **NEUROPSYCHOLOGICAL DOMAINS I: OTHER**

## C53

### **Sympathetic arousal to mild rotary stress in high and low hostile men**

*Carmona JE, Harrison DW, Manuel CM, Stratton H*

**Objective:** The vestibular system is one of the least understood and most complex sensory systems. Vestibular complaints of dizziness are among the most common somatic complaints of adults with increased prevalence among the elderly accounting for a third of all somatic complaints. The current experiment extends prior literature on the influence of cerebral activation differences in high and low hostile individual to the vestibular system. **Method:** This experiment



examines differences in sympathetic arousal in healthy adult males after a mild dizziness inducing rotary stress. Skin conductance was calculated for groups of 14 high and 14 low hostile men after paced 120/second rotation on a platform-elevated rotary chair. In addition, dichotic listening performance was evaluated both before and after rotation. Results: Results of skin conductance arousal levels and dichotic listening scores are discussed in terms of the functional systems cerebral activation model and implications for further exploration will be discussed. Hostile men significantly differed from low hostile men in skin conductance after rotation as well as on performance of the dichotic listening test. Conclusions: Few published experiments have examined the relationship of hostility and the sympathetic system after vestibular activation. It is proposed that differences in arousal among high and low hostile men are primarily due to participation of the frontal regions to sympathetic arousal and vestibular disruption.

#### C54

##### **The effects of chronic alcohol ingestion on verbal & visuospatial learning and planning ability in recently detoxified alcoholics: A pilot study**

*Carter CC*

Objective: Neurological sequelae of chronic alcohol ingestion can appear as diffuse brain damage (i.e. cerebral atrophy, sulcul widening, and hypometabolism). Despite these neurological abnormalities, certain cognitive domains such as verbal memory appear resilient to compromise whereas visuospatial and fluid problem solving skills are susceptible to impairment. This pilot study examined basic verbal and visuospatial learning and problem solving in a group of recently detoxified men with alcohol dependence. Method: Twenty male participants were identified by local police as chronic users of regional detoxification facilities, and received routine evaluations on release (mean: age = 46, days sober = 96). Measures included the California Verbal Learning Test (CVLT), Ruff-Light Trail Learning Test (RULIT) and Tower Test (Delis Kaplan Executive Function System; DKEFS-TT). Recall and Total Achievement *T*-scores were compared against normative data using single sample *t*-tests. Results: CVLT Immediate and total recall were comparable to the 50th percentile of the normative sample ( $M = 46.5$  and  $52.2$ ). RULIT Immediate Recall was significantly different from the normative sample ( $M = 40.5$ ;  $p < 0.001$ ), as was total correct recall ( $M = 32.5$ ;  $p < 0.001$ ). DKEFS-TT Total achievement, accuracy, and rule violations were not significantly different ( $M = 49.7, 48.2$ , and  $50.1$ ). Conclusions: A profile of impaired visuospatial learning and preserved verbal learning and problem solving was demonstrated in individuals with chronic alcohol dependence and a 90-day sobriety history. Results from this study will guide future research specific to the recovery of bilateral learning ability associated with sustained sobriety.

#### C55

##### **Attitudes, perceptions, and use of quality of life information in neuropsychology**

*Cieply KR, Donnelly JP*

Objective: To assess neuropsychologists' attitudes and use of quality of life (QoL) data in patient assessment and management. Method: A web-based survey including demographics and items adapted from prior studies of professional attitudes toward QoL in oncology was developed. Forty-eight neuropsychologists completed the survey in response to invitations via the npsych.com and AACN list serves. The sample was 50% female with a mean age of 45 (S.D. = 10.1). Geographic location was primarily USA ( $n = 40$ ) with a small number from Canada ( $n = 5$ ) and Europe ( $n = 3$ ). Membership in professional organizations included NAN (65%), INS (65%) and Division 40 (63%). Results: Nearly all respondents reported discussing QoL issues with patients (94%), with 62% indicating that these discussions happen "often". In addition, 83% of respondents indicated assessing QoL, with over half (55%) using standardized measures and the remainder utilizing interviews. Many respondents (40%) reported reading studies often reporting QoL findings, however 60% also indicated they would be more likely to use QoL data in practice if measures were easier to understand. Correlations between percent of time in various professional activities with attitudes produced several significant findings; for example, time spent in clinical research was significantly correlated with use of QoL measures ( $r = 0.38$ ,  $p = 0.01$ ). Patterns of QoL assessment were unrelated to age and gender. Conclusions: This is the first study to examine neuropsychologists attitudes toward QoL data. Overall, attitudes and behavior in this sample were quite positive, but room for improvement in more user-friendly measures is evident as well.

**C56****The association of mood states using the PAI and cognitive performance***Coady EL, Edwards-Stewart A, Uomoto JM, Shaw JA*

**Objective:** The current study attempts to determine what impact mood state has on cognitive performance with a clinical population. **Method:** Participants were 66 patients referred for neuropsychological evaluations at an outpatient medical facility. The population was: 65% male, 83% Caucasian, 44% head injury, 56% were diagnosed with psychiatric diagnosis and other neurological disorders (e.g. ADD, epilepsy), with mean age 45, and 15 years education. The mean Personality Assessment Inventory (PAI) mood scale (ANX, ARD, DEP, SCZ, and BOR) elevation was a *T* score of 57.6. Scores were obtained from each patient's WAIS-III and PAI profiles. **Results:** Linear multiple regression yielded  $R=0.236$ ,  $R^2=0.056$   $F(3, 61)=1.20$ , ( $p<n.s.$ ). The PAI Factor 1 "subjective distress" score (*T*-score of  $ANX + ARD + DEP + SCZ + BOR/5$ ) was not significantly associated with specific WAIS-III subtests: Digit Symbol-Coding, Arithmetic and Digit Span. Correlation coefficients were also computed for the five PAI "subjective distress" scales against these WAIS-III subtests, and again there were no significant findings. **Conclusion:** The current findings suggest that measures of concentration and attention that are often used in neuropsychological testing, were not associated with current mood state scores as measured by the PAI (e.g. depressed mood, elevated anxiety). Such findings run counter to the notion that elevated PAI scores may reflect decrements on tests of attention and concentration. Though further research is needed, these findings suggest the relative independence of attention and concentration scores as measured by the WAIS-III and PAI profile results.

**C57****The impact of the Flynn effect on neuropsychological normative data***Dickinson M, Hiscock M*

**Objective:** It is a well documented phenomenon that IQ scores have risen substantially since the implementation of intelligence testing, this is known as the Flynn effect. Examination of different subtests of the Wechsler Adult Intelligence Scales have shown that the Flynn effect influences these subtests differentially, with performance subtests evidencing a larger effect compared to verbal subtests. Therefore, it is reasonable to suspect that the Flynn effect is also present in certain neuropsychological tests. **Data selection:** Normative studies spanning several decades were selected to examine changes in performance from one generation to the next. Norms were selected for the Symbol Digit Modalities Test (SDMT), Trail Making Test (TMT), Grooved Pegboard (GP), Finger Tapping (FT), and the Boston Naming Test (BNT). **Data synthesis:** Analyses revealed differences in scores across generations for the TMT, with younger generations performing significantly better. Analyses of the SDMT were suggestive of superior performance in younger generations, but not definitive due to scarcity of normative data. Finally, the Flynn effect was not present in normative studies of FT, GP, and BNT. **Conclusions:** Preliminary analyses revealed that the Flynn effect is present in neuropsychological tests thought to measure more fluid abilities and not present in those measuring more crystallized abilities. These results support the conclusion that the Flynn effect is a widespread phenomenon that occurs in both intelligence and neuropsychological assessment. In addition, the lack of the Flynn effect in FT, a test of motor speed, contradicts the hypothesis that the Flynn effect is based on biological changes across generations.

**C58****The relationship between sensory-motor functioning and Gait and Station***Hiller T, Hall JJ, Noggle C, Neal T, Dean RS*

**Objective:** Past studies have demonstrated that the absence of Gait and Station problems in adults over 60 years of age predicted functional independence (Perrault, Wolfson, Egan, Rockwood, & Hogan, 2002). Other studies have shown that gait and balance problems were related to increased risk of death (Wilson, Schneider, Beckett, Evans, & Bennet, 2002). Unfortunately, there has been a lack of studies that have examined sensory and motor functions which underly Gait and Station problems. The present study considered the degree to which sensory and motor tasks were related to Gait and Station in adults over 60 years. **Method:** The current sample consisted of 295 subjects aged 60 years and older. Each participant received, as part of a comprehensive neuropsychological battery, 18 subtests from the Dean-Woodcock Sensory Motor Battery (Dean & Woodcock, 2003), including gait with station. **Results:** Results of a multiple linear regression analysis demonstrated that five variables, Romberg, Finger Identification-Left, Near Point Visual Acuity, Grip Strength-Dominant, and Coordination Finger to Nose Left of the D-WSMB, predicted 67% of the variance in

gait and station ( $R=0.823$ ). Conclusions: Past research has shown relationships between Gait and general functioning; however, little published research exists which investigates underlying sensory and motor functioning. The current study demonstrated that multiple sensory and motor functions are related to Gait and Station. This suggests that one can expect the aforementioned sensory and motor functions to decline as Gait and Station decline.

### C59

#### **Changes to flicker fusion as a result of subliminally induced neural plasticity**

*Holloway SR, Náñez, Sr. JE, Donahoe C, Seitz AR*

**Objective:** Critical flicker fusion threshold (CFFT) is the lowest level of continuous flicker that is perceived as a steady source of light and has historically been shown to be remarkably stable within and across multiple days of testing. The current study was designed to test the relationship between CFFT and subliminal learning. **Methods:** In two experimental groups, a total of seven participants were exposed to sub-contrast-threshold coherent dot motion occurring as a background feature of a rapid serial visual presentation (RSVP) task. Twenty-eight additional subjects were recruited as controls. Neural plasticity was instigated and measured with a Dynamic Random-Dot Display computer program. A macular pigment densitometer was used to measure CFFT. **Results:** Herein, we demonstrate that subjects who underwent 1 h of subliminal motion training per day for 9 days experienced a significant increase in CFFTs (an average of 30%). This only occurred for subjects who experienced task-irrelevant coherent motion paired with training targets. Subjects who completed tasks without the motion-pairing showed no significant improvement in CFFTs. Furthermore, a subset of the experimental subjects was retested 1 year after their initial exposure and demonstrated that the increases in CFFTs were sustained for over 1 year. **Conclusions:** These results demonstrate, for the first time, that the perceptual experience of subjects can dramatically alter CFFTs, and that changes in CFFTs were long-lasting. They also imply that CFFTs are highly related to dorsal stream motion processing.

### C60

#### **Word decoding ability as a function of dorsal stream processing**

*Holloway SR, Náñez Sr. JE, Donahoe C, Seitz AR*

**Objective:** Critical flicker fusion (CFF) threshold is the lowest level of continuous flicker that is perceived as a steady source of light. Recent work from our lab has indicated that CFF is highly related to dorsal stream processing. CFF thresholds have also been shown to be impaired in populations with reading disorders, such as dyslexics. While CFF and reading scores have been compared between normal reading and dyslexic populations, few studies, if any, have compared CFF thresholds and reading within a normal reading population. **Methods:** Seventy-six subjects were recruited at Arizona State University. CFF thresholds were assessed on a macular pigment densitometer, using the method of limits by a 1-deg diameter green (peak = 570 nm) test field. Reading was measured using the Bader Reading and Language Inventory: Reading-Word Decoding Test (1998). **Results:** The results show a very strong correlation ( $r=0.79$ ,  $p \ll 0.001$ ) between CFF thresholds and scores on the Reading-Word Decoding Test. **Conclusions:** The outcome of this study suggests that reading, specifically the ability to decode words, may be dependant on cortical processing in the dorsal stream. These results imply that the efficiency of the functioning of temporal modulation and spatial processing, elements of the visual cortex, may affect the ease with which people read. Future research should consider the possibility that a perceptual learning paradigm that is known to increase temporal processing may have benefits for patient populations who have diminished CFF thresholds, such as those who suffer from dyslexia and other reading disabilities.

### C61

#### **Symptom validity testing and personality assessment inventory performance among psychogenic non-epileptic seizure patients**

*Holsman MN, Heather RR, Drane DL, Stroup ES, Chaytor N, Holmes MD*

**Objective:** Psychogenic non-epileptic seizure (PNES) patients fail symptom validity tests (SVT) at an elevated rate (Drane et al., in press), and multiple factors could contribute to performance invalidity (e.g. conversion or mood disorder, malingering, pain, fatigue). We explored the impact of somatization and depression on SVT performance by comparing PNES patients who passed the Word Memory Test (WMT) to those who failed on appropriate subscales of the Personality Assessment Inventory (PAI). **Method:** Sixty-six patients diagnosed with PNES through video-EEG monitoring were divided into groups based on WMT performance (WMT-fail:  $n=20$ ; WMT-pass:  $n=46$ ), and statistical

comparisons were made using the Depression (DEP) and Somatic Complaints (SOM) scores of the PAI. All patients experienced behavioral events of unresponsiveness or significant motor involvement in the absence of epileptiform EEG abnormality. Results: Among PNES patients, ANOVA results indicated no significant differences among WMT pass and fail groups on the SOM scales, or on the DEP subscales. However, the WMT fail group scored significantly higher ( $M = 70.55$ ,  $S.D. = 12.53$ ) compared to the WMT pass group ( $M = 63.33$ ,  $S.D. = 13.16$ ) on the DEP clinical scale,  $F(1, 64) = 4.09$ ,  $p < 0.05$ ,  $\eta^2 = 0.06$ . Conclusions: Current results demonstrate a high SVT failure rate in PNES patients. Results also indicate that PNES patients who fail the WMT do not differ from those who pass on somatization orientation. While PNES patients tend to report a significantly higher rate of depression, the effect size suggests this difference may not be overly robust.

## C62

### Mazes and spatial cognition

Levin SL, Krawczyk M, Ayaz H, Platek SM

**Objective:** This study investigated sex differences in performance in spatial navigation, for which males excel, and spatial working memory, for which females excel. Males have been shown to use more mileage estimates and cardinal directions, while females remember landmarks better. The current study is one of the first to investigate SWM in a navigation setting. We hypothesized no sex difference in time to complete mazes with objects, but differences would emerge when landmarks were removed. **Method:** Eighteen college students (8 female, 10 male) were asked to complete five sets of 8 3-dimensional mazes on the computer. The first four mazes in each set included objects that could be used to navigate the space, and the objects were removed in the second four mazes. Subjects were also asked questions about the level of difficulty of the mazes. Statistical analysis was computed to determine whether there were sex differences in total time to complete maze (object/no object). **Results:** Our hypothesis, that a sex differences existed in time to complete mazes as a function of presence of objects, was supported. Females were able to perform similarly to men when objects were in the mazes. Females also rated the mazes as significantly more difficult than males when the objects were removed. **Conclusion:** This study lends support for the idea that males and females may perform equally or similarly on spatial tasks when using sex-specific cognitive strategies. It may be necessary to expand the studies of navigation to test environments that allow females to use this approach.

## C63

### Susceptibility to relaxation techniques in CVA and TBI patients

Levy D, Foley J, Shaw L, Clark M, Golden C

**Objective:** This study was designed to investigate the degree of hypnotic susceptibility in individuals who had sustained a cerebrovascular accident or traumatic brain injury. **Methods:** The sample consisted of 20 patients (12 TBI and 8 CVA) on the Inpatient Rehabilitation Unit of a community hospital as well as 16 healthy community based adults. Age averaged 42.4 ( $S.D. = 11.0$ ) and education averaged 14.5 ( $S.D. = 2.78$ ). Seventy percent of all participants were Caucasian and 61% were female. The length of time since patients had incurred their injury ranged from 1 to 15 weeks. Measures included the Mini Mental Status Exam (MMSE), the Hypnotic Induction Profile (HIP), and the Glasgow Coma Scale (GCS). Scores on the MMSE showed mild cognitive impairment in the brain injured groups. **Results:** HIP post-test analyses showed no significant differences between groups for any test ( $p > 0.05$ ), suggesting that groups could not be differentiated based on pre-injury variables. The Profile Grade Score for TBI patients and CVAs did not significantly differ from the normal population when age and education were controlled for. However, the Induction Score for TBIs and CVAs was found to be significantly lower than the normal population. **Conclusion:** Lower Induction Scores in TBI patients and CVAs, however, are indicative that demonstrated capacity for hypnosis is lower in brain-injured patients than it is for the normal population. The scores on the MMSE imply that brain-injured patients may have reduced hypnotic capacity because of lower global intellectual functioning.

## C64

### Neurobehavioural features of impaired emotional processing

Makelki M, Alfano D

**Objective:** In the neuropsychological literature, impaired emotional processing is typically associated with frontal lobe dysfunction. Alexithymia is a term used to denote a disorder of emotional processing characterized by problems with

the recognition and description of emotion in self and others. The deficits in emotional processing characteristic of alexithymia are strikingly similar to those of frontal lobe dysfunction. The objective of this study was to examine the relationship between alexithymia and neurobehavioural features of impaired emotional processing. Method: The Toronto Alexithymia Scale-20 was used to classify research volunteers into those who were high and those who were low on the alexithymia continuum. Seventeen participants comprised the high alexithymia group and 20 comprised the low alexithymia group. The Neuropsychology Behavior and Affect Profile (NBAP), a 106-item self-report questionnaire designed to assess affective behaviour from a neuropsychological perspective, was completed by the participants. The NBAP is comprised of five scales: indifference (lack of insight into deficits), inappropriateness (unusual or bizarre behaviour), pragnosia (difficulties with the pragmatic aspects of communication), depression (sadness, apathy, withdrawal), and mania (impulsivity, irritability, euphoria). Results: The group that was high on the alexithymia continuum had significantly higher scores on the indifference, inappropriateness and depression scales of the NBAP; a trend toward significance was found on the Pragnosia scale. Conclusions: These results indicate that alexithymia is associated with a number of neurobehavioural features of impaired emotional processing and suggest that alexithymia may be a valuable heuristic for the neuropsychological study of impaired emotional processing.

## C65

### Verbal learning and memory in a pediatric neurological sample

Rumble SM, Burns T, DeFilippis N

Objective: This study expands upon findings of a previous study regarding the association of processing speed with verbal learning and memory. Rumble, Burns, VanWinkle, and Baker (2006) reported a correlation between processing speed on the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV) and Total CVLT-C score on the California Verbal Learning Test–Children’s Version (CVLT-C; Delis, Kramer, Kaplan, & Ober, 1994) in a pediatric sample following traumatic brain injury (TBI). Similar findings were reported by Donders and Minnema (2004), and they concluded that deficits in speed of information processing were primarily responsible for learning deficits on the CVLT-C after pediatric TBI. This study investigated processing speed and verbal learning and memory in a clinical neurological sample. It is hypothesized that low Processing Speed scores will be associated with low Total CVLT-C scores in this sample. Method: Seventy-three males and 55 females ages 5–16 were evaluated with the WISC-IV and the CVLT-C. All subjects were evaluated after referral to the neuropsychology department at a children’s hospital. The subjects were evaluated in association with a variety of neuropsychological disorders, and included both inpatient and outpatient. Results: A statistically significant positive correlation was found between Processing Speed score on the WISC-IV and Total CVLT-C score ( $R = 0.372, p < 0.001$ ). Conclusions: Results support the hypothesis that deficits in processing speed are associated with deficits in verbal learning and memory in a clinical population.

## C66

### The use of the SCL-90-R in identifying cognitive deficits

Sindell D, Buddin H, Harris K, Hines L, Golden C

Objective: This study explored the relationship between the SCL-90-R and the Categories test on the Halstead Reitan Battery. It was hypothesized that an individual’s level of emotional distress would be correlated with his or her level of actual cognitive impairment. Method: Participants were 30 outpatients whom were administered the SCL-90-R and the Categories test as part of a larger neuropsychological battery in a community mental health center setting. Fifty-three percentage of the participants were female and the mean age was 34.23. The mean education level was 13.41 years. Results: The results of a Pearson correlation show that the correlation between the obsessive-compulsive subscale of the SCL-90-R and the Category test on the Halstead is significant ( $r = 0.52; n = 25; p < 0.01$ ). In addition, there was a significant correlation between the PSDI on the SCL-90-R and the Category test ( $r = 0.55; n = 24; p < 0.01$ ). Conclusions: An individual’s self-report of obsessive-compulsive symptoms is related to actual cognitive dysfunction. The symptoms reported on the SCL-90-R may interfere with test performance or the client or the test may be misinterpreting cognitive symptoms as psychiatric symptoms. Since the SCL-90 is a frequently used in neuropsychological exams, these inter-relationships require more extended study so as to aid in more accurate interpretation of the meaning of SCL-90 elevations in a brain injured population.

**Poster Session D****AGING AND DEMENTIA II: ALZHEIMER'S DISEASE****D1****A new visuospatial memory test discriminates patients with mild cognitive impairment from controls: The Indiana faces in places test***Beglinger LJ, Duff K, Van Der Heiden S, McCoy CF, Siemers ER, Kareken DA*

Visual paired-associate learning (PAL) performance is among the most sensitive predictors of conversion from MCI to dementia. Objective: To examine the clinical utility of a novel paper and pencil visuospatial memory test, the Indiana Faces in Places Test (IFIPT), in patients with MCI and controls. Methods: Thirty adults with amnesic MCI and 37 controls who completed the WRAT-3 Reading subtest and the IFIPT as part of a comprehensive neuropsychological battery. The IFIPT is a PAL test with 10 faces paired with spatial locations (three learning trials and non-cued delayed recall). A subset ( $N=36$ ) also completed the Hopkins Verbal Learning Test-Revised (HVLT-R) and the Brief Visuospatial Memory Test-Revised (BVM-T-R). Results: There were no differences between the two groups on WRAT-3 Reading, education or gender, but MCI participants were older ( $p<0.005$ ). MCI participants scored lower than controls on the two primary IFIPT scores (Trial 3 hits,  $p<0.0001$ ; Delay hits,  $p<0.05$ ), even after controlling for age. Partial correlations revealed that IFIPT learning (Trial 3 hits) was associated with BVM-T-R total learning and delayed recall (both  $p=0.001$ ), and HVLT-R learning ( $p=0.04$ ) and delayed recall ( $p=0.001$ ), as well as WRAT-3 Reading ( $p=0.03$ ). IFIPT delayed recall was only associated with the two BVM-T-R scores (total learning  $p=0.001$ , delayed recall  $p=0.01$ ). Conclusions: The IFIPT appears to be a promising measure of visuospatial associate learning and memory in adults with MCI and shows convergent validity with other, established memory measures.

**D2****'Accidental MCI' in healthy older adults: Lessons from the neuropsychological assessment battery (NAB)***Brooks BL, Iverson GL, White T*

Objective: When assessing older adults for mild cognitive impairment (MCI) or early Alzheimer's Disease, it is possible to 'accidentally diagnose' someone with memory impairment by over-interpreting isolated low test scores. The present study examined the base rates of low memory scores in healthy older adults on the Memory Module of the Neuropsychological Assessment Battery (NAB; Stern & White, 2003). Methods: Participants included those between 55 and 97 years of age from the NAB standardization sample ( $N=921$ ). The NAB Memory Module consists of four co-normed memory tests (i.e. list learning, shape learning, story learning, and daily living memory) yielding 10 primary scores that are converted into demographically corrected  $T$  scores. Nine of these  $T$  scores contribute to the memory index score. Results: When all 10 memory  $T$  scores are examined simultaneously in the entire sample, 59% have one or more scores 1 S.D. below the mean and 34% have two or more low scores. Using a more stringent cutoff (i.e. 2 SDs below the mean), 19% of healthy older adults obtain at least one low score. Obtaining low memory scores occurs more often with greater age and lesser intellectual abilities. For example, 83.3% of older adults between 75 and 97 years of age with low average intellectual abilities obtain one or more low memory scores. Base rates of low memory scores in older adults are somewhat variable across levels of education. Conclusions: Understanding base rates can reduce over-interpretation of isolated low memory scores and minimize false positive diagnoses.

**D3****Neuropsychological correlates of self-reported depression among patients with mild cognitive impairment***Bruce J, Tremont G, Bhalla R, Westervelt H, Davis J, Williams V*

Objective: As many as 46% of patients with Mild Cognitive Impairment (MCI) experience significant depressive symptomatology. To date, few studies have examined the relationship between MCI patients' self-reported depressive symptoms and their neuropsychological test performance. In the present study, we explore the relationship between self-reported depression and neuropsychological performance among patients with MCI. Method: A detailed neuropsychological evaluation was conducted on 83 consecutive MCI patients who presented at an outpatient neuropsychology clinic. All patient completed the beck depression inventory (BDI) and a subset of 55 patients also completed the cognitive difficulties scale (CDS), a self-report measure of common cognitive lapses. Patients were classified with MCI using Peterson's criteria. Results: Pearson correlation analyses revealed that patients who reported

few depressive symptoms on the BDI were significantly more impaired on the Modified MMSE ( $r=0.30$ ,  $p<0.01$ ), the Hopkins Verbal Learning Test ( $r=0.30$ ,  $p<0.01$ ), and the learning ( $r=0.32$ ,  $p<0.01$ ), delayed recall ( $r=0.46$ ,  $p<0.001$ ), and retention ( $r=0.31$ ,  $p<0.01$ ) portions of Logical Memory subtest from the WMS-III. In contrast, no significant relationships were found between self-reported depression and measures of language, attention, and executive functioning. Follow-up analyses revealed that patients who retain less information on LM also report fewer cognitive symptoms on the CDS ( $r=0.36$ ,  $p<0.01$ ). Conclusions: MCI patients with larger degrees of amnesia report fewer symptoms of depression and fewer cognitive difficulties. Results suggest that patients with mild cognitive impairment may have difficulty reporting their depressive and cognitive symptoms.

#### D4

##### **Practice effects and retest reliabilities in mild cognitive impairment**

*Duff K, Beglinger LJ, Van Der Heiden S, Moser DJ, Paulsen JS, Schultz SK, Arndt S*

**Objective:** Repeat neuropsychological testing can be useful for tracking cognitive decline in older patients with suspected dementia. Accurate evaluation of repeat testing, however, requires some knowledge of practice effects and retest reliabilities of the measures used. The current study was conducted to assess these psychometric properties in older adults with mild cognitive impairment (MCI) and controls. **Methods:** Twenty elderly controls and twenty-one with MCI were evaluated at two sessions 7 days apart on a battery of tests, including the Brief Visuospatial Memory Test—Revised (BVM-T-R), Hopkins Verbal Learning Test—Revised (HVLT-R), Controlled Oral Word Association Test, Trail Making Test, and Symbol Digit Modalities Test (SDMT). Alternate forms of the tests were not used. Practice effects were calculated as baseline minus 1-week scores, and the groups were compared in a series of *t*-tests. **Results:** The two groups were significantly different on practice effects on four of the nine measures ( $p<0.05$ ), with controls improving significantly more than MCI on BVM-T-R Total Recall and SDMT, and MCI improving more than controls on BVM-T-R and HVLT-R Delayed Recall. Retest reliabilities (pooled within group correlations) ranged from 0.61 to 0.93 (all were  $p<0.01$ ). **Conclusions:** Although differential practice effects were observed between these two groups, the current results could be used to further inform clinicians about reliable changes in older patients with possible dementia. Additionally, this study demonstrates that some patients with MCI are capable of benefiting from practice, which could be useful for future intervention trials.

#### D5

##### **Improved attention and verbal fluency following short-term donepezil treatment**

*Hester AL, Cullum CM, Ringe WK, Brooker M, Weiner MF, McColl R, Lipton AM, McDonald E, Rubin CD, Allen G*

**Objective:** Cholinesterase inhibitors have been demonstrated to slow the rate of cognitive decline and transiently improve aspects of cognition in some individuals with Alzheimer's disease (AD). Drug studies typically utilize brief cognitive screening measures and suggest primary benefits in attention. The purpose of this study was to employ a more detailed neuropsychological battery to determine if donepezil treatment affects additional cognitive domains. **Method:** AD subjects ( $N=14$ ) were evaluated before and after 8 weeks of donepezil treatment (5 mg/day increased to 10 mg/day after 4 weeks). Participants were administered the ADAS-Cog, MMSE, WAIS-III Digit Span, Vocabulary, and Block Design subtests, WCST, FAS and Animal Fluency, Boston Naming Test, and WMS-III Logical Memory. **Results:** Whereas most scores showed a slight test-retest increase, post-treatment performance significantly improved on tasks of attention [WAIS-III Digit Span (forward);  $t=-1.88$ ,  $P=0.04$ ] and letter fluency [FAS;  $t=-2.88$ ,  $P=0.01$ ] and approached significance on a measure of category fluency [ $t=-1.68$ ,  $P=0.06$ ]. **Conclusion:** Donepezil treatment significantly improved performance on measures of attention and verbal fluency, with less change observed in problem solving, visuospatial abilities, and memory. It appears that cognitive changes associated with short-term donepezil treatment may be related to increased attention and arousal and not to functions more fundamental to the disease (i.e. memory). The findings underscore the importance of comprehensive neurocognitive assessments in determining medication effects and support the need for treatments to target other AD-related symptoms.

**D6****Qualitative analysis of naming errors on the Boston Naming Test in Alzheimer's and subcortical vascular dementia***Klingler LK, Hill FF, Schmidt JM, DeFilippis NA*

**Objective:** In light of contradictory findings regarding the contributions of visual perceptual and semantic etiologies in the errors produced in confrontational naming along with the paucity of research comparing cortical and subcortical naming deficits, this study examined the qualitative errors on the Boston Naming Test to determine if there are significant differences in the types of errors produced between Alzheimer's disease (DAT) and subcortical vascular dementia (SVD). **Method:** From an archival database drawn from a community medical center and private practice, the present study performed a qualitative analysis of naming errors on the Boston Naming Test in 19 participants with DAT, 12 participants with SVD, and 20 elderly controls. Trained raters classified errors into three mutually exclusive categories (visual, semantic, and other) with further subtype classification of semantic errors (category, superordinate, associative, and circumlocutory errors). **Results:** One-way ANOVA of error scores revealed significant effect for visual errors, in which DAT and SVD each produced significantly more visual errors than controls ( $p < 0.00$ ). When the DAT and SVD groups were compared on their proportion of visual and semantic errors, no significant differences were found. Chi square analysis revealed no significant effect for any of the semantic error subtypes by group. **Conclusions:** Consistent with previous research, prominent naming difficulties are observed in DAT. While the DAT and SVD produced significantly more visual errors than controls, with respect to naming errors, the present study supports no syndrome specificity between DAT and SVD groups. Issues concerning sample size, naming measure utilized, and dementia severity support further investigation.

**D7****Brain functional connectivity in response to donepezil treatment in Alzheimer's disease***Zaidel L, Fields J, Cullum C, Briggs R, Hynan L, Weiner MF, McColl R, McDonald E, Rubin CD, Allen G*

**Objective:** To investigate changes in functional connectivity between key regions of the brain in Alzheimer's disease (AD) after treatment with donepezil. **Method:** Participants were 11 patients diagnosed with AD and an MMSE score  $> 15$  (7 females; mean age 75.5 years, education 14.3 years, MMSE 24.6). Subjects were administered letter fluency (FAS) and WMS-III Logical Memory from a larger neuropsychological battery at baseline and 8 weeks following treatment with donepezil. Donepezil was initiated at 5 mg daily for 28 days and then increased to 10 mg daily for 28 days. Echo-planar time-series MRI data were also obtained at baseline and 8 weeks following donepezil. Regions of interest (ROIs), selected on the basis of their association with cholinergic neurotransmission, AD neuropathology, and neurocognitive deficits in AD, included the medial septal nuclei, bilateral hippocampi (HIPPO), left Broca's area and right homologue, bilateral dorsolateral prefrontal cortices (DLPFC), and bilateral visual cortices (selected as the "control" ROIs). The effect of treatment on connections between specific ROI pairs was investigated. **Results:** There was a significant improvement in letter fluency ( $p = 0.038$ ), but no change in logical memory ( $p = 0.93$ ). Only two connections showed a significant effect of the drug: connectivity between left HIPPO and left DLPFC decreased significantly ( $p = 0.028$ ), while connectivity between left and right DLPFC increased significantly after treatment ( $p = 0.029$ ). Relationships between changes in connectivity and in neurocognitive performance were also explored. **Conclusion:** The data suggest that the effects of donepezil on brain connectivity are most prominent in prefrontal networks.

**AGING AND DEMENTIA II: HEALTHY AGING AND COGNITION****D8****Serial administrations of the repeatable battery for the assessment of neuropsychological status (RBANS): Strategy learning and practice effects***Connor BB, Mahncke HW*

**Objective:** The RBANS was developed as a screening measure to assess cognitive abilities of individuals ages 20–89. Test-Retest stability has been established from Form A to A, and from Form A to B. Stability of RBANS A to A and A to B has been demonstrated for the total scale index. Serial administration of a test instrument with alternate forms may be susceptible to strategy learning and practice effects. We examine the effects of three administrations of the RBANS within 20–24 weeks, in the absence of an intervention. **Method:** Fifty-four participants in the 'no contact' group of a



larger interventional study were administered alternate forms of the RBANS at three time points, 8–12 weeks apart, in A-B-A or B-A-B order. Change scores for the RBANS Total Scale were examined for time 1–2, time 2–3, and time 1–3. Results: There was no significant difference in Total Scale change score from time 1 to 2 between alternate forms of the test. The change score between time 2 and 3 alternate forms, when time 3 was a repeat of the time 1 form, was highly significant ( $p < 0.001$ ), as was the change score between the same forms from time 1 to 3 ( $p < 0.0001$ ). Conclusion: When giving serial administrations of the RBANS over relatively short time periods, improvements in test performance as a result of test taking strategy learning and practice effects may be incorrectly interpreted as due to the intervention.

## D9

### **Interference of the mini mental state pentagons with a subsequent visual reproduction measure**

*Hughitt K, Spencer RJ, Giggey PP, Rice S, Katzel LI, Waldstein SR*

**Objective:** The Mini Mental State Examination (MMSE) often precedes measures such as WMS-R visual reproduction (VR) in neurocognitive assessment. To avoid interference, constructional tasks are not administered between the learning phase (VR-I) and the delayed recall phase (VR-II) of the test. We evaluated the potential clinical significance of MMSE pentagons being drawn during VR-II recall. **Method:** Participants were 132 stroke- and dementia-free, community-dwelling older adults (64% male; mean age = 66.3 {S.D. = 6.5}; mean education = 16.3 years) enrolled in a study of cardiovascular risk factors, brain, and cognition. Participants were free of major medical (except hypertension), neurological, and psychiatric illness and engaged in neuropsychological assessment and magnetic resonance imaging. All participants completed the MMSE approximately 15 min prior to administration of VR-I. We compared participants who mistakenly drew the MMSE pentagons during VR-II to those who did not exhibit pentagon intrusion, across neurocognitive and imaging variables. **Results:** A subset of 22 (17%) participants inappropriately drew the pentagons. These participants were not significantly different from the remaining sample on any demographic measure. Additionally, insertion of pentagons did not impart significantly different values across neurocognitive and imaging variables. **Conclusion:** Across the study measures examined, participants who inserted pentagons in the VR task did not significantly differ from those who did not. These findings suggest that the MMSE may interfere with an unacceptable proportion of VR-II protocols when it is administered shortly before VR-I.

## D10

### **Judgment of line orientation: Short forms have poor reliability in healthy older adults**

*Matthews CL, Spencer RJ, Giggey PP, Rice S, Katzel LI, Waldstein SR*

**Objective:** Short-forms of the Judgment of Line Orientation (JLO), a 30-item test of visuospatial perception, have been researched in clinical samples. This study explored the reliability of the JLO and its short-forms in healthy adults. **Method:** We examined internal consistency of JLO in 132 stroke- and dementia-free, community-dwelling older adults (64% male; mean age = 66.3 {S.D. = 6.5}; mean education = 16.3 years) enrolled in a study of cardiovascular risk factors, brain, and cognition. Participants were free of major medical (except hypertension), neurological, and psychiatric disease and engaged in neuropsychological assessment. Seven short-form versions of the JLO, ranging from ten to twenty items in length, were derived from selected items of the full form based on previous research. **Results:** JLO performance was superior in males ( $p = 0.001$ ), correlated with years of education ( $r = 0.26$ ,  $p = 0.003$ ), but was unrelated to age. Coefficient alpha for the full JLO form was 0.78, and ranged from 0.48 to 0.75, with a median of 0.62, for the various short-forms. **Conclusion:** While the full-form JLO exhibited generally acceptable reliability, the reliability of short forms ranged from poor to adequate. Reliability coefficients obtained in this sample were considerably less than those derived from research employing clinical samples, suggesting the full JLO should be used with healthy older adults.

## D11

### **The life satisfaction scale (LSS): Normative information for a healthy elderly sample**

*Spina L*

**Objective:** The measurement of quality-of-life and emotional issues is important in neuropsychological assessment of older adults in clinical and research settings. The Life Satisfaction in the Elderly Scale (LSSES) (now “Life Satisfaction Scale” (LSS) Salamon, 2003) is a self-report measure comprising eight subscales. This study aimed to expand LSS

norms by providing means and standard deviations for all subtests and for the Total Score of the LSS in a sample of community-dwelling healthy older adults across the United States. Method: Two-hundred and seven individuals nationally completed the LSS online. Participants were aged 60–86 (mean = 69), with a mean education of 14 years. Participants with self-reported major neurological or psychiatric disorders were excluded. Correlations between scales and demographic variables were conducted. Since the questionnaire was administered online, reliability analyses were also conducted: Spearman correlations for 2 month test-retest reliability in 195 participants were obtained for all Subscales and Total Score; Cronbach's alpha was calculated for internal-consistency reliability. Results: Demographics were not related to the LSS Total Score. Therefore, means and standard deviations were presented for the sample as a whole. Total Score test-retest reliability was 0.90. Individual subscales coefficients ranged from 0.74 (self-concept) to 0.90 (health). Internal consistency reliability for the scale was 0.93. Conclusion: Reliability coefficients in this sample were consistent with those reported by the author of the LSS. Therefore, administration by computer did not affect the reliability of the scale. This study presents means and standard deviations in a national sample of healthy elderly.

## AGING AND DEMENTIA II: OTHER

### D12

#### **Utility of the neurobehavioral cognitive status examination (Cognistat) with geropsychiatric outpatients**

*Ames H, Hendrickse WA, Bakshi RS, LePage JP, Keefe C*

Objective: Explore NCSE as screening tool with elders. We hypothesized that NCSE would (a) show good sensitivity/specificity for presence/absence of any cognitive disorder, (b) the manual definition of dementia would predict rater diagnosis, (c) NCSE would discriminate Alzheimer's from non-Alzheimer's involvement, and (d) NCSE would discriminate dementia from other cognitive disorders. Method: Sixty-eight consecutive outpatients participated in routine evaluation. Demographics of sample were largely male, and composed of 48 Caucasians, 18 African Americans, and 2 Hispanics. Mean education was 11.5, and mean age was 74.4. Independent diagnoses were made retrospectively by two psychiatrists based on progress notes (without access to NCSE results). Raters categorized patients as unimpaired, impaired (not dementia), dementia (non-Alzheimer's), dementia (Alzheimer's component), or as uncategorizable. Results: Sum of all scales' raw cut score of 65/66 best predicted impairment. NCSE showed excellent sensitivity (0.91) for dementia but "over-diagnosed" those without dementia (specificity = 0.73). Positive/negative predictive powers were 0.65/0.93. Optimum cut score for number of scales impaired was 5/6 with >5 more common among non-Alzheimer's dementia; however, classification accuracy was poor. Analyses revealed no significant group differences. Conclusion: NCSE is a useful screening tool with older adults. Sum of all raw scores is good predictor of presence/absence of any cognitive disorder. NCSE is less accurate at predicting presence/absence of dementia. NCSE tends to over-diagnose dementia based on manual's definition. NCSE has limited differential diagnostic utility in this population.

### D13

#### **Cognitive screening for the elderly (CSE): Investigation of mild cognitive impairment during routine medical examinations**

*Dunaway L, Lowe-Fierke B*

Objective: This is a content validity study of the Cognitive Screening for the Elderly (CSE), a questionnaire designed for use by primary care physicians to screen elderly patients for Mild Cognitive Impairment (MCI). MCI is the hypothesized prodromal phase in developing dementias. Method: Forty five patients from a midwestern primary care medical clinic comprised the final sample. Participants were 65 and older, medically stable, with no known neurologic compromise or alcohol abuse. The CSE was administered to patients attending routine medical appointments. In follow up, participants completed a comprehensive neuropsychological evaluation to determine their clinical diagnosis. Statistical analyses were conducted to determine the predictive value of the CSE in identifying those patients meeting criteria for MCI. Results: Positive predictive and negative predictive power for item domains and individual CSE totals revealed no helpful relationship between diagnosis and the CSE, though a power analysis concluded the ability to detect this relationship in this context was weak. The Rey Complex Figure Recognition Test surfaced as correlated with the CSE total and CSE domain scores at the 0.05 level. The finding that MCI and mild dementias are frequently missed during regular medical appointments was supported. Conclusions: Study results indicate that 33% of elderly medical patients

met criteria for MCI or dementia unbeknownst to their physicians. This reveals need of a screening measure that will detect neurodegenerative dementias in their earliest stages. Self report inventories, such as the CSE, will need to be highly sensitive to assess the subtle changes signaling early neurocognitive deterioration.

#### D14

##### **Reliable neurocognitive change scores in older adults with Parkinson's disease**

*Parsons TD, Woods SP, Paolo AM, Troster AI*

**Objective:** Assessment of intra-individual change is important for determining the significance of changes in test scores across serial neuropsychological assessments of demented and non-demented persons with Parkinson's disease (PD). Reliable change indices (RCIs) provide a criterion by which clinicians may establish that observed change is meaningful change. This study examines the cognitive functioning of demented and non-demented persons with PD over time using RCIs that correct for the effects of practice. **Method:** RCIs were derived from 122 older adults with PD who had undergone serial testing with a comprehensive neuropsychological battery (mean test-retest interval was 15.54 (4.06) months). Separate RCIs were calculated for participants with PD dementia, non-demented PD, and incident PD dementia at follow-up. **Results:** Analysis of differences in proportion of participants in demented and non-demented groups revealed significant variability for Mattis DRS (attention, construction, conceptualization, and total); WMS-R (Logical Memory II, and Digit Span Backward); CVLT (Short Delay Cued Recall, Long Delay Free Recall, Discriminability percent, and Sum 1–5); WCST (Perseverative Errors); and for the Boston Naming total. Significant trends were found on the WCST's Categories and for FAS total. **Conclusions:** Given the greater variability among the PD groups, RCIs will be useful for assessing intra-individual change and aid in determining the significance of changes in test scores across serial neuropsychological assessments. Limitations are discussed regarding ceiling effects at test baseline, and generalizability of study results. Clinicians should make judicious use of change indices and exercise their judgment when making treatment decisions.

#### D15

##### **RBANS index discrepancies in geriatric psychiatric inpatients**

*Soetaert DK, Matson RH, Baade LE, Duff K*

**Objective:** Base rates for discrepancies between the index scores of a neuropsychological test are useful when interpreting an individual's performance across domains. Discrepancy base rates for the repeatable battery for the assessment of neuropsychological status (RBANS) are available for the normative sample and for community-dwelling geriatric adults. This study presents discrepancy base rates among RBANS Index scores for a geriatric psychiatric inpatient population. **Method:** During their stay on a geriatric psychiatric unit at a rural general hospital 120 participants were given the RBANS. The average age of participants was 77 years (S.D. = 8.21, range 60–97) and mean education level was 12 years. The majority of participants were female (82%). All but one participant was Caucasian, and although this sample does not reflect the demographics of the United States, it is characteristic of small community hospitals in the Midwest. **Results:** Pairwise combinations of the total scale score and the five Index scores were used to calculate discrepancy scores. For each pair base rate discrepancy data was then compiled using the cumulative frequencies at +10th percentile (10th percentile and 90th percentile). This inpatient data was compared to the base rate discrepancy data from the Oklahoma Longitudinal Assessment of Health Outcomes in Mature Adults study (Oklahoma; Patton et al., 2005). Up to 23% of the inpatient sample fell outside of the Oklahoma 10th percentile. **Conclusions:** This inpatient geriatric population generally had bigger discrepancies than the normative sample to which it was compared. This study provides base rate discrepancy data for geriatric psychiatry inpatients.

#### D16

##### **Clinical utility of the Boston Naming Test for identification of dementia in adults with mental retardation**

*Palmer G*

**Objective:** The purpose of the study was to examine the utility of the Boston Naming Test (BNT) for discriminating between persons with mild to moderate mental retardation and dementia ( $n = 10$ ) and controls without dementia ( $n = 11$ ). **Method:** Participants were matched according to age, level of mental retardation, gender, and diagnosis of Down's syndrome. Individuals were administered the 60-item version of the BNT as part of a neuropsychological battery. **Results:** A  $t$ -test between groups on the 60-item version was significant [ $t(19) = -4.44$ ;  $p < 0.001$ ; CI of the difference:

–8.23 to –22.91]. A stepwise discriminant analysis was conducted in order to identify items that best differentiated between groups. Analysis identified 4 items from the BNT that adequately discriminated between individuals with dementia and controls. Performance on the 4-items revealed 100% sensitivity and 82% specificity for the sample. Current norms of the 60-item version of the Boston Naming Test were then examined to determine if expected scores on the BNT could properly identify participants in the sample. Performance of participants in the control group was lower than expected, suggesting current norms have poor specificity for identifying persons with mental retardation and dementia versus matched controls. Conclusions: The BNT does provide useful information for discriminating between persons with dementia and mild/moderate mental retardation from controls. In this study, four items provided adequate discriminability between groups. The use of current published norms for persons with mental retardation to assist with making the diagnosis of dementia might lack specificity.

## DEVELOPMENTAL AND PEDIATRIC II: LEARNING DISABILITY

### D17

#### **Predicting academic deficits with motor skills for children with learning disabilities**

*Davis AS, Estes BW, Hudson B, Peabody SR*

**Objective:** Deficits in motor skills have been found to be highly correlated with academic deficits. Indeed, recent canonical correlation research has indicated that 90% of the variance in a battery of sensory-motor skills overlapped with multiple measures of academic achievement. The connection between motor skills and academic abilities has been supported by other recent research investigating the role of the cerebellum in higher-order abilities. The purpose of this study was to investigate the predictive ability of a measure of motor skills on measures of academic functioning for a group of children with learning disabilities (LD). **Data selection:** This sample consisted of 53 individuals diagnosed with a LD (mean = 12.06 years, S.D. = 3.33 years). Some participants also had other neurological or psychiatric disorders. As part of a comprehensive neuropsychological battery, each participant received the Motor, Reading, Writing, and Arithmetic subtests from the Luria-Nebraska Neuropsychological Test Battery, Children's Revision (LNNB-C; Golden, 1987) or the Luria-Nebraska Neuropsychological Test Battery-II (LNNB-II, Golden et al., 1985) depending on their age. **Data synthesis:** Multiple regression revealed that the Motor Scale of the Luria Scales was predictive of a significant proportion of the variance in the Writing scale ( $R = 0.517$ ,  $R^2 = 0.267$ ), the Reading scale ( $R = 0.404$ ,  $R^2 = 0.163$ ), and the Arithmetic scale ( $R = 0.288$ ,  $R^2 = 0.083$ ). **Conclusions:** The Motor scale, which consists of tasks of motor planning, fine motor skills, and other motor skills, was able to predict a substantial proportion of the variance for each of the academic scales.

### D18

#### **Comorbidity profiles for learning disorders**

*Hiller TR, Neal TJ, Noggle CA, Hall JJ, Dean RS*

**Objective:** Comorbidity of learning disorders (LD) with other diagnoses makes it imperative to evaluate these possibilities when developing remediation programs. Contributions of related but separate diagnoses to learning are not understood relevant to brain functioning in individuals who show a combination of difficulties. Importance of accurate diagnosis increased with emphasis on empirically-validated treatments. This study investigates and identifies prevalence rates of comorbid psychiatric disorders among a population of neuropsychological referrals. This will provide practitioners and researchers with information regarding prevalence rates of comorbid neuropsychiatric disorders within an LD population. **Method:** The current study examined secondary and tertiary diagnoses of 1127 individuals with a primary diagnosis of LD as the result of a comprehensive neuropsychological evaluation. Subtype analysis examines prevalence rates among LD subtypes. An odds ratio calculates percentages for prevalence rates among groups. **Results:** Results of odds ratio analyses indicated high prevalence rates of comorbid psychiatric diagnoses for individuals diagnosed with LD. Overall, 41% of individuals had secondary diagnoses, 20% had tertiary diagnoses, and 2% had fourth diagnoses. Attention-deficit/hyperactivity disorder (ADHD) was the most common comorbid diagnosis (4.1%) followed by depression (3.5%) and anxiety (2.5%). 39% of individuals had a secondary LD diagnosis. Subtype analyses revealed salient differences in prevalence rates among subtypes. **Conclusion:** In sum, results indicated individuals have comorbid psychiatric disorders at a greater rate than demonstrated in the general population (APA, 2000).

**D19****Distinguishing characteristics of adults with learning disability: Systematic comparisons with psychiatric and physical disorders***Ferrari M*

**Objective:** This study on adults with previously identified learning disabilities (LD) addressed questions of developmental continuity at later ages. It also investigated other correlates of disorder that provide distinguishing value in establishing LD. **Method:** From 1000 consecutive adults, 803 cases were selected. Excluded from analysis were adults with disorders or events associated with known neuropsychological dysfunction (e.g. TBI) independent of prior LD. The resulting sample ( $N=560$ ) included three groups: LD, psychiatric, and physical disability. In discriminant function analysis (DFA), linear combinations of predictor variables tested whether neuropsychological data continue to distinguish adults identified with learning disabilities from other disorders. **Results:** DFA is appropriate when it is desirable to predict group membership. The LD group had lower FSIQ scores (mean 84.4), lower reading (78.6) and arithmetic (74.4) than other groups. The LD group was also more likely to include left-handers and have IQ-achievement disparities. In DFA, neuropsychological tests, academic and demographic factors distinguished LD status ( $p < 0.0001$ ); 68.2% correctly classified. Standardized canonical coefficients showed low arithmetic followed by low reading score held the highest weighting in maximizing group discrimination. **Conclusion:** LD diagnoses in childhood and adolescence are often seen as justified for assisting those with substantial academic problems, however still little is known about adult LD. This study provides an additional demonstration of the continuity of LD behaviors and tests the distinctiveness of certain definitional criteria (e.g. disparities) using statistical modeling techniques. Diagnostic accuracy, long-term outcomes of LD with implications and future directions are discussed.

**D20****Teratogenic variables and clinical co-morbidities in adult learning disability***Ferrari M*

**Objective:** Learning disability (LD) has a long history of both scholarly and applied argument concerning its origins, pathophysiology, and clinical course. This study investigated the reported developmental backgrounds and clinical co-morbidities in adults with a previously identified learning disability (LD) to better comprehend the picture of common concurrent disorders and foster increased diagnostic precision. **Method:** Three-hundred and forty-three adults referred for evaluation as part of a vocational rehabilitation service were participants. The average age was 33.57. There were 185 participants with a previously identified LD, and 158 with a non-LD-related chronic medical disorder (e.g. diabetes, renal disease, spinal bifida) used for comparative analysis. **Results:** The profile of co-morbid conditions differed across groups. Within the LD group, ADHD was the most frequent co-morbid factor (20%), followed by concurrent affective conditions (9.7%) including bipolar illness, unipolar depression and anxiety. A history of early developmental insult or suspected teratogenic influence was the one area significantly more common among those with chronic medical disorders (11.4%) than LD (7%). Some diagnostically significant co-morbid condition existed in 33.5% of persons with LD. **Conclusion:** Investigations of potential teratogenic influences may hold promise for eventually understanding the developmental matrix that gives rise to LD. Studies like this one provide further direction for prospective data collection that can delineate neural mechanisms most likely involved and find ways to attenuate those influences. Implications for developing theoretical and practical distinctions between organically based and functional forms of LD are of particular relevance to neuropsychologists and are discussed.

**D21****The internal consistency of the Luria-Nebraska scales for children with learning disabilities***Davis AS, Estes BW, Hudson B, Peabody SR*

**Objective:** The Luria-Nebraska Neuropsychological Test Battery, Children's Revision (LNNB-C; Golden, 1987) and Luria-Nebraska Neuropsychological Test Battery-II (LNNB-II, Golden et al., 1985) are comprehensive measures of neuropsychological functioning. The LNNB-II is the second most widely used comprehensive neuropsychological battery. Research on the validity of these tests has been mixed. However, limited research exists regarding the validity of the LNNB-C and LNNB-II for children with learning disabilities. The purpose of this current study was to examine the intercorelation of the 11 subtests of the Luria-Nebraska scales with a group of children with learning disabilities. **Data selection:** The current sample consisted of 53 individuals diagnosed with a learning disability (mean = 12.06 years,

S.D. = 3.33 years). Some participants also had other neurological or psychiatric disorders. Each participant received the entire LNNB-C or LNNB-II depending on their age. Data synthesis: Only one of the Pearson correlation coefficients were not significant at the 0.05 or 0.01 level for the combinations of the 11 subtests of the Luria-Nebraska Scales. The correlation coefficients ranged from 0.266 to 0.802. Conclusions: The results from this study support the construct validity of the Luria-Nebraska scales for children with a learning disability. Although each scale is comprised of heterogeneous items, there should be intercorrelations between the scales based on the constructs underlying the creation of the measure. This presentation will discuss the pattern of correlations in regards to implications for practitioners and researchers.

## DEVELOPMENTAL AND PEDIATRIC II: OTHER

### D22

#### **Examination of functional executive skills in children with Spina Bifida with shunted hydrocephalus**

*Crowley JA, Pongonis SJ, Feinberg J, Alford H, Sokol DK*

**Objective:** To examine functional executive skills in children with Spina Bifida with shunted hydrocephalus (SBSH) including differences associated with lesion level. **Method:** Retrospective review of parent ratings on the behavior rating inventory of executive function (BRIEF) in a clinic referred sample of 15 children with SBSH (60% males), mean age 11.8 years (S.D. = 2.6; range 7.3–15.5) from two tertiary medical centers. Nine children had lesions at L3 and above, with six at level L4 and below. **Results:** Student's *t*-test comparison were made for each scale, comparing SBSH scores with norm group. Significantly higher mean score differences from norms were seen on the Initiate ( $p < 0.001$ ) and Organization of Materials ( $p = 0.01$ ) Scales. Comparison of BRIEF scores by cord lesions level: HIGH versus LOW was determined via the Mann–Whitney *U*-test. Only the inhibition scale showed a significant difference ( $p = 0.04$ ) with greater scores in the HIGH compared to LOW lesion groups. **Conclusion:** This study does demonstrate the BRIEF as able to distinguish SBSH from a normative group. Results may implicate a possible effect of the increased ADL demands (bowel and bladder regimens, motor impairment) in this group as opposed to or in concert with circumscribed cognitive skill deficit. As to difference in inhibition capacity effected by lesion level, this may indicate a difference in the neurological deficit in these two groups or the adaptive outplay in motor functioning, etc.

### D23

#### **Neuropsychological profiles of Turner's syndrome with a mosaic phenotype**

*Emmons C, Knapp JA, Arffa S*

**Objective:** Turner syndrome results from the partial (“mosaic pattern”) or complete absence of one X chromosome in a phenotypic female. Individuals with TS typically have deficits in visual spatial skills, perceptual reasoning, and mathematics. While many researchers have equated this cognitive profile to that of a non-verbal learning disability, the literature remains highly variable in terms of specific deficits. The current study aimed to further elucidate the neuropsychological profile of children with the mosaic form of TS, whom are often reported to suffer fewer cognitive and physical effects. **Method:** Two females (ages 8 and 15) with a mosaic TS phenotype were administered a comprehensive neuropsychological battery to determine overall cognitive profiles. **Results:** While the older child demonstrated a clear non-verbal learning disability pattern and executive dysfunction, the younger child demonstrated only mild visual perceptual deficits. Analysis of previous evaluations indicated that the NVLD profile of the older child emerged only during adolescence. Both individuals, however, demonstrated a long history of mathematics deficits. **Conclusions:** Results from the current study indicate that there may be a delay in the emergence of a non-verbal learning disability profile until adolescence, suggesting a progression of deficits associated with the mosaic form of TS. Mathematics deficits, however, appear to be a more stable finding and have been associated with reduced grey matter in the intraparietal sulcus in children with “pure” and “mosaic” TS. While longitudinal studies are needed, variations in age ranges may account for the differing cognitive profiles observed across research studies.

### D24

#### **Identification of neurofibromatosis type 1 via neuropsychological evaluation**

*Estes BW, Davis AS, Peabody SR, Hudson B, Horwitz JL*

**Objective:** This case study describes a female child with a diagnostic history of ADHD and epilepsy who was referred for neuropsychological testing to assess the nature and severity of learning difficulties and oppositional behaviors.

Her family history was remarkable for neurofibromatosis (NF-1), a genetic disorder affecting multiple systems with cutaneous, orthopedic, and neurological manifestations. Data selection: A comprehensive neuropsychological battery was administered to the patient, including the NEPSY-A developmental neuropsychological assessment (core and extended subtests) and the wide range intelligence test. Data synthesis: Although this patient had no readily observable physical manifestations of NF-1, neuropsychological testing revealed primary visual and visuospatial disturbances, executive disturbances, speech difficulties, and ADHD-type behaviors. This profile of deficits has been found to occur in higher frequency among those children with NF-1 in the recent research, even though no specific neuropsychological profile is universally accepted as being characteristic of this heterogeneous disorder. Conclusions: As a result of a comprehensive neuropsychological evaluation, appropriate academic modifications were implemented and the patient was referred to a neurologist who confirmed the diagnosis of NF-1. This proposed presentation will compare and contrast this case with the expected sequelae based on the current state of the literature, and will discuss the relative contribution of a neuropsychological profile to both the diagnosis and treatment of NF-1.

## D25

### **WISC-IV profiles of children with neurofibromatosis (NF)**

*Hagar K, Taylor S, Stavinoha P, French C, Schnoebelen S*

Objective: Neurofibromatosis type 1 (NF1) is a common genetic disorder affecting the central nervous system. Research has indicated that children with NF1 tend to have lower Full Scale IQ scores as a population whole. Early studies suggested that children with NF1 had higher verbal compared to non-verbal IQ scores, while recent research shows both verbal and non-verbal weaknesses. Past studies made use of the (WISC-R) or (WISC-III). With the revision of the WISC to the Fourth Edition (WISC-IV) and the subsequent changing of subtests that load into the indices and Full Scale IQ (FSIQ) score, it is important to examine the WISC-IV intellectual profiles of children with NF1. Data selection: The present study examined the performance on the WISC-IV of children with NF1 who presented for neuropsychological evaluation as part of their ongoing case management. The four indices and Full Scale IQ from the WISC-IV were reviewed and analyzed for 22 patients with NF1 (age range 7–16) assessed between January 2005 and March 2006. Data synthesis: Results suggest that of this small population of NF1 patients, they demonstrated overall low average performance across all domains of the WISC-IV, with no significant differences noted between index scores or the Full Scale IQ. Conclusions: This data is generally consistent with previous studies of patients with NF1 utilizing the WISC-R or the WISC-III and suggest the revision to the WISC-IV has not substantially impacted the distribution of scores in this medical population.

## D26

### **Gotta have heart: Pediatric susceptibility for right hemisphere abnormalities following congenital heart defects**

*Hamilton W, Neale KM, Moore KD, Burns TG*

Objective: The purpose of this study was to investigate the effect of pediatric congenital heart defects and surgical intervention on intelligence development. Theoretically among this population, the developing brains of the fetus and newborn children are exposed to risk factors and resulting surgical stresses that impose a risk for brain injury. A theoretical model (Rourke) is presented in the context of intelligence data. Method: To acquire measures of intelligence, 38 children (19 male; 19 female) with histories of congenital heart defects (CHD) needing surgical intervention in the post-natal period were administered the Wechsler Abbreviated Scales of Intelligence. Pilot analyses were undertaken to establish whether intelligence differences existed. Results: A paired-samples *t*-test was conducted to evaluate whether the CHD children varied with regard to verbal and performance intelligence. The results indicated that the mean for Performance IQ ( $M=91.97$ ,  $S.D.=17.49$ ) was significantly lower than the mean for Verbal IQ ( $M=103.68$ ,  $S.D.=15.94$ ),  $t(36)=6.69$ ,  $p<.001$ . The mean difference was 11.71 between the two indices. Conclusions: Although still in the preliminary stages, this study indicated that CHD and surgical interventions would do well to consider right hemisphere brain integrity during early uterine and neonatal periods of development and intervention. Beyond intelligence, consideration is given to visuomotor and visuosperceptual domains for CHD populations.

**D27****Executive functions in a young adult with Sotos syndrome***House AE, Howard AM, Stagg J*

**Objective:** Develop greater understanding of the evolving cognitive functioning and challenges of individuals with Sotos syndrome, especially with respect to executive functioning **Methods:** A young male, previously diagnosed with Sotos syndrome and evaluated at age 18, was re-evaluated at age 22. The focus of the evaluation was on areas of previously identified neuropsychological difficulty—executive functions and adaptive behavior. The Delis-Kaplan Executive Function System, WCST, SIB-R, and other sources of information were obtained. **Results:** Deficits in social intelligence (lateral orbitofrontal) seemed most limiting, followed by difficulties in motivation (anterior cingulate), and then executive functions proper (dorsolateral prefrontal). **Conclusions:** Case studies of individual with specific neurodevelopmental syndromes provide opportunities evaluate our concepts and models of brain-behavior relationships and link these to specific consultation strategies.

**D28****Halstead Reitan neuropsychological battery vs. process neuropsychological examination in lead exposed children***Johnson DJ*

**Objective:** Exposure to lead has been associated with a number of neurodevelopmental problems, and neuropsychologists have made important contributions to the evaluation and understanding of specific sequelae of lead exposure at different levels at different stages of development. Neuropsychologists involved with forensic examination of children following lead exposure have assembled a battery of tests designed to measure functions hypothesized to be damaged by lead exposure, and have introduced findings from such a battery in lead paint cases in a number of states, although validation studies from this process battery are lacking. **Method:** This project compared findings from this process battery with Halstead Reitan Neuropsychological Battery findings among a group of children with history of lead exposure. The sample consisted of eighteen children, mean age eleven, evenly divided by gender. Lead exposure had occurred during preschool years, and mean lead level averaged in the 20 mg/dl. range. **Results:** The process battery testing identified all children as suffering brain damage from lead exposure, while HRNB classified only two children as brain injured. mean Impairment Index was 0.2. In a subset of children for whom independent pediatric neurological examination was available, none were identified as brain damaged. **Conclusions:** Findings raise the possibility that caution is necessary when utilizing a test collection hypothesized as sensitive to brain injury from lead exposure without validation against external criterion measures with demonstrated validity for and sensitivity to brain injury.

**D29****Neurocognitive functioning after pediatric cochlear implantation***Olds J, Fitzpatrick E, Rabjohn K, Gaines R, Durieux-Smith A, Schramm D*

**Objective:** Previous research has indicated that childhood hearing loss may be associated with later academic and occupational underachievement, and up to 30% may have additional disabilities. Within the last 15 years, cochlear implantation (CI) has become a treatment option for children with severe to profound hearing loss. Outcome research has focused on audiological functioning, speech and language. There has been little research on neurocognitive abilities after pediatric CI and little examination of academic abilities, particularly literacy. The objective of this study was to examine neurocognitive and reading abilities after pediatric CI. **Method:** All CI recipients, followed at a regional, pediatric CI centre, were potential candidates. Additional criteria were: at least 6-year old, cochlear implant use for at least 1 year, rehabilitation focused on oral language, education in English, and absence of global developmental delay. Participants ( $N=27$ ) were administered cognitive, language, phonological processing and reading measures. **Results:** Age at implantation varied from 1.01 to 15.86 years. Language functioning ranged from below average to above average and was correlated with verbal, but not non-verbal, IQ measures. Reading scores also varied and were related to cognitive variables. Time at implantation appeared to be related to outcome but was mediated by cognitive and age factors. **Conclusion:** These results indicate that after pediatric CI, higher levels of literacy and language are demonstrated than have been reported previously, although there is considerable variability. Moreover, outcome is related to a number of factors, which are important considerations in identifying and addressing clinical needs.



**D30****A case study of autistic phenotype found comorbid with Dandy Walker malformation***Pelphrey AL, Kronk R, Dubbs JL*

**Objective:** Dandy Walker malformation (DWM) is a congenital condition primarily involving cystic malformation of the cerebellum and fourth ventricle. It is often associated with hydrocephalus, decreased bilateral connections of the cerebrum, seizure activity, and various neurobehavioral impairments including ataxia, delayed achievement of motor milestones, and cognitive delay. Within the context of efforts to delineate potential functional social and communication impairments in individuals with DWM, we examined diagnostic comorbidity in one child with this condition. This effort fits well into increasing efforts that are being put forth to better characterize the neurobiology and genetic associations with autistic spectrum disorders (ASD). While autistic traits have been specifically linked to such conditions as Fragile X, tuberous sclerosis, and down syndrome, comorbidity with DWM has not been well documented. **Method:** The current project presents the neurobehavioral social and communication characteristics of a pubescent female with primary presentation of DWM who was referred to assess possible comorbid autism. **Results:** Phenotypic characteristics that were observed included ataxia, intellectual impairment, marked pragmatic language deficits interfering with functional communication, limited social reciprocity and diminished joint attention to tasks, wide range of atypical behaviors including resistance to change, repetitive sensory-oriented play, intense interests, and complex stereotypic movements. **Conclusions:** An increased awareness of neurobehavioral correlates and diagnostic comorbidity associated with DWM is valuable in early detection and treatment efforts essential in supporting optimal development and long term prognosis of behavioral functioning in affected children.

**D31****Estimating premorbid FSIQ scores for the American WISC-IV***Schoenberg MR, Lange RT, Brickell TA, Saklofske DH*

**Objective:** Neuropsychological evaluation requires a comparison standard against which current test scores are compared to determine if a change in cognitive function has occurred. Frequently, an estimate of premorbid FSIQ is used as a comparison standard. The Wechsler Intelligence Scale for Children—4th Edition (WISC-IV) is a commonly used measure of intellectual functioning. However, no method is available to predict premorbid intellectual functioning with the WISC-IV, limiting the utility of the test in neuropsychological assessment. The purpose of this study was to develop regression algorithms to predict premorbid FSIQ. **Method:** Participants were the American WISC-IV standardization sample ( $n=2172$ ). The sample was randomly divided into two groups (development and validation groups). The development group was used to generate 12 estimation algorithms for FSIQ. Predictor variables included demographic variables (e.g. parent education, age, gender) and WISC-IV subtest raw scores (i.e. vocabulary, information, matrix reasoning, and picture completion). **Results:** The algorithms accounted for 21–75% of the variance in FSIQ scores ( $SEE=7.68$ – $13.80$ ). When applied to the validation group, estimated FSIQ significantly correlated with actual FSIQ ( $r=0.49$ – $0.86$ ), and 61–82% of individual estimates were within +10 points of actual FSIQ. The algorithm using only demographic variables was the least accurate predictor of FSIQ. **Conclusions:** These algorithms yielded accurate FSIQ estimates for healthy children and adolescents. These algorithms may offer clinicians a method to estimate premorbid FSIQ scores. However, clinical validation is needed to establish these algorithms as a premorbid estimation procedure.

**D32****Estimating premorbid FSIQ scores using the Canadian WISC-IV norms***Schoenberg MR, Lange RT, Saklofske DH*

**Objective:** The Wechsler Intelligence Scale for Children, 4th Edition was published in 2003, and included both American and Canadian normative data. Unlike the current adult version of the Wechsler intelligence scales, there is no available method to estimate premorbid level of functioning using the WISC-IV. This study's purpose was to develop regression algorithms to estimate premorbid FSIQ scores for use with the Canadian WISC-IV. **Method:** Participants were the Canadian WISC-IV standardization sample ( $n=1100$ ). The sample was randomly divided into two groups (development and validation groups). The development group was used to generate 12 estimation algorithms for FSIQ using demographic variables (i.e. age, parent education, ethnicity, and gender) and/or WISC-IV subtest raw scores (i.e. vocabulary, information, matrix reasoning, and picture completion). **Results:** The algorithms accounted for 18–70%

of the variance in FSIQ ( $SEE = 8.6\text{--}14.2$ ). In the validation group, estimated FSIQ scores significantly correlated with actual FSIQ ( $r = 0.30\text{--}0.80$ ). The majority of predicted FSIQs were within 10 points of actual FSIQ (57.4–75.0%), and most fell within a 95% CI band ( $FSIQ = 93.1\text{--}97.4\%$ ). The least accurate estimates of FSIQ were obtained when using only demographic variables. The most accurate algorithms combined demographic variables with the information, vocabulary, and/or matrix reasoning subtests. Conclusions: These algorithms provided accurate estimates of FSIQ in a healthy sample. However, as a method for estimating premorbid functioning, clinical validation is required prior to use.

### D33

#### **Adaptive behavior assessment in the diagnosis of developmental disorders**

*Sichi MD, Drozdick LW, Frey FE*

**Objective:** Adaptive behavior has traditionally been studied in the context of the diagnosis and treatment planning of individuals with mental retardation. However, adaptive behavior deficits are found across many disorders. The current study investigates the performance of children diagnosed with either ADHD or a learning disorder on the parent form of the ABAS–II. **Method:** Participants included three samples ( $n = 34, 31$ , and  $49$ ) of children diagnosed with ADHD and two samples ( $n = 26$  and  $27$ ) diagnosed with one or more learning disorders. ABAS–II data were collected as validity measures during national standardization studies conducted by Harcourt Assessment, Inc. To determine whether a characteristic profile of scores exists for these disorders, skill area scaled scores across samples within each clinical group were compared using independent sample  $t$ -tests. **Results:** Mean skill area scores were below average for home living and self-direction across all three ADHD samples, and were below average for social in two of the ADHD samples. When comparing the ADHD samples to each other, no significant differences ( $p < 0.01$ ) were found between mean scores for the same skill areas. Within both learning disorder samples, mean skill area scores were below average for functional academics and self-direction. A significant difference ( $p = 0.0072$ ) was found between the mean scores of the two samples for the home living skill area. **Conclusions:** Results suggest that specific patterns of adaptive behavior deficits may be found in samples of children diagnosed with ADHD or learning disorders.

### D34

#### **Subtypes of children with mental retardation: External validation using the WIAT**

*Taylor AD, Saunders CD, Strang JD*

**Objective:** We examined the external validity of a previously determined WISC-III typology of children with mild to moderate mental retardation (MR; Taylor et al., 2005) utilizing the WIAT. **Method:** Participants included 169 children, 6–16 years of age, with WISC-III FSIQ scores of 75 or lower. A MANCOVA was employed to examine subtype differences in academic achievement level, while controlling for the potential effects of FSIQ. **Results:** Multivariate analysis revealed significant academic profile differences between the MR subtypes. Secondary univariate ANCOVAs also revealed significant subtype differences for each of the WIAT subtests analyzed. **Conclusion:** These results were consistent with the findings from previous subtyping studies with learning disability populations (e.g. Waxman & Casey, 2006). Our findings represent additional support (see Koushik et al., 2006) for the validity of these MR subtypes and have direct implications for expectations and needed interventions for these children.

### D35

#### **Executive function and attentional measures: Relationship to intelligence and age**

*Arffa S*

**Objective:** This study explores the relationship of intelligence and age to scores on the Wisconsin Card Sorting Test, The Stroop color Word Test, the Oral Word Fluency Test, the Design Fluency Test, Rey Complex Figure, the Trail Making Test, and the Underlining Test. **Data selection:** A sample of 44 normal children with Wechsler Intelligence Scale for Children-III (WISC-III) Full scale IQ above 130, 54 normal children with Full-Scale IQs between 117–129 and 37 normal children with Full-scale IQ's between 99 and 116 were administered the tests. **Data synthesis:** Partial correlations of raw scores, controlling for age revealed significant IQ-test correlations for Wisconsin Card Sort variables, Stroop color word condition but not word or color conditions, oral word fluency, design fluency, Rey Complex Figure, but not Trails and two Underling conditions. Analyses of variance and multiple regressions also evidenced significant relationships. **Conclusions:** The results indicate the need to consider premorbid IQ levels when using executive function measures in clinical practice.

**D36****Kallmann syndrome: Effectiveness of hormone replacement***Petrick J*

**Objective:** A case study of an individual with Kallmann syndrome, also known as olfactory-genital dysplasia, and related neuropathological and neuropsychological findings is presented. The nature of Kallmann syndrome is reviewed and the effectiveness of sex hormone replacement is emphasized. **Method:** This is a case study involving the neuropsychological profile of a 46-year old white male diagnosed with Kallmann syndrome in early adolescence and treated with gonatropin-releasing hormone (GNRH). Neuropsychological data showing the absence of significant cognitive deficit despite presenting complaints of anosmia and aguesia and abnormal MRI findings indicating hypertrophy of the corpus collosum is presented. **Results:** Neuropsychological testing did not show any significant impairment of cognitive functions despite abnormal MRI findings and symptoms associated with hypothalamic deficiency of gonatropin-releasing hormone (anosmia, aguesia, and hypogonadism). The effectiveness of early diagnosis and sex-hormone replacement is emphasized. **Conclusion:** Despite the severity of symptoms associated with Kallmann syndrome, early diagnosis and treatment with GNRH can prevent compromise of cognitive functions.

**D37****Creative assessment: What to do with the complex child who cannot respond to your tests***Morere D*

**Objective:** Testing children with multiple disabilities presents unique challenges, particularly when behavior, hearing, vision, and motor skills are all involved. A child whose combination of disabilities resulted in a greater need for testing adaptations than was originally apparent will be presented. As this case required a long flight to perform and alternative tests were not available, it illustrates how on-site adaptations can be made and qualitative tests generated to produce useful data and effective recommendations. **Method:** The child has multiple deficits secondary to CHARGE syndrome. Diagnoses included deafness, visual dysfunction, hypotonia, psychosocial delays, limited language functioning and academic progress, and suspected autism and cognitive impairment. Despite deafness-related modifications, standard instruments did not elicit useful responses. Extensive modification of both the instruments and administration, and novel materials generated on site resulted in both quantitative and qualitative data. **Results:** A combination of print and pictures using a multiple choice format produced responses to a range of tasks. Due to the generation of novel materials and extensive modifications required even for the standard tests, quantitative data were limited. However, the qualitative information gathered allowed for both diagnostic clarification and generation of extensive recommendations useful to both the school and parents to enhance this child's academical and social functioning. **Conclusion:** Using standard testing, even with communication access typically provided deaf children, this child had been labeled cognitively impaired, with minimal learning potential. This case demonstrates how modified and innovative measures can clarify diagnoses and generate useful recommendations despite their lack of standardization.

**D38****Neuropsychology of mixed receptive-expressive language disorder and impact on current language acquisition theory regarding critical and sensitive periods***Morrison JR, Allen Jr. TR, Lowther JL*

**Objective:** Human research, primarily through case studies, has been able to articulate the possible limitations to language acquisition, which is thought to be innate. Despite the argument that there is a finite period in which a child can develop the ability to use language appropriately (between toddler years and adolescence), there is also an indication of possible confounding variables in cases of children who have been isolated from language-based stimuli and have resulting immature or incomplete language development (e.g. Curtiss, 1977, 1988). Criticism has arisen regarding the ability to generalize these findings, given the possible impact of poor treatment, nutrition, social neglect, and associated psychological factors. **Method:** The current case provides neuropsychological results from a child with early deprivation from language exposure (from birth to three or so) due to a period of complete hearing loss, but a social environment characterized by appropriate nurturance and family support. Further, neuropsychological assessment, observation, and language-based therapy were completed over several years (video available). **Results:** Longitudinal neuropsychological data is provided from assessments including the NEPSY, WISC-III and WISC-IV, UNIT, and WJ-III achievement. **Conclusion:** The indications from this study is consistent with severe language

acquisition difficulties despite relatively early recovery from hearing loss but continued difficulty with skills such as auditory processing, reading skills, and expressive communication skills paired with a relative lack of behavioral and social skills deficits. Results suggest that the human language acquisition system may have a shorter window of opportunity for full language acquisition than has been previously suspected.

## NEUROPSYCHOLOGICAL DOMAINS II: EXECUTIVE FUNCTIONS

### D39

#### **Baseline neuropsychological evaluation of a patient with a dermoid cyst bifrontal craniotomy resection**

*Boyd C, Holland MC, Drake AI*

**Objective:** Case study of a pre-surgical neuropsychological assessment performed before a bifrontal craniotomy for dermoid cyst resection (photos included). **Method:** A 25-year-old female patient with a history of frontal headaches presented to an ER with an eye infection and subjective visual deterioration. Brain CT and MRI revealed two incidental intracranial masses, a large (43 mm × 42 mm × 20 mm) frontal fossa mass consistent with a dermoid tumor compressing the optic nerves at the entrance to the optic canals, and a small (7 mm × 8 mm × 8 mm), colloid cyst in the posterior third ventricle at the foramen of Monroe. There was no evidence of hydrocephalus. Cranial nerve exam is remarkable for anosmia present since childhood. Patient reported chronic attention and memory problems. **Results:** Mild deficits were found on WASI Vocabulary and Trail Making Test: Part A. Finger Tapping and Grooved Pegboard were mildly impaired for the dominant (left) hand and in the low average range for the non-dominant hand. Mild deficits in performance were noted on tests sensitive to frontal lobe functioning including the Stroop Test and WCST perseverative responses. Other tests associated with executive functioning (e.g. Similarities, Category Test, Trail Making Test: Part B and WASI Matrix Reasoning) were normal. All other scores were normal. **Conclusion:** The size and location of the mass would imply a greater level of impairment on neuropsychological tests associated with executive functioning/frontal lobe impairment, suggesting an over-reliance on test scores alone may not actually represent neurological abnormalities as evidenced in this patient.

### D40

#### **Relationships between fluency, flexibility, and creativity**

*DellaPietra L, Grugan PK, Dominello N*

**Objective:** Psychologists have long attempted to capture the essence of creativity by studying the life histories, traits, and personality styles of creative individuals. In 1959, utilizing the Alternate Uses Task, Guilford found that the responses of creative individuals were more fluent, flexible, and original, characteristics that neuropsychologists often endeavor to assess in their clients. This study sought to test the hypothesis that artists would show better performance on quantitative, normed measures of fluency and flexibility. **Method:** Twenty-four art academy students and 25 undergraduate controls completed the Comprehensive Trailmaking Test (CTT), Ruff Figural Fluency Test (RFF), and Controlled Oral Word Association (COWA). The groups were equivalent in gender, age, handedness, grade point average, and intelligence scores. **Results:** Results showed that there were significant differences ( $p < 0.01$ ) between the artists and non-artists on total CTT score, number of unique designs produced on the RFF, and number of words generated on the COWA, with artists scoring higher on all three measures. Artists also more often utilized a rotational strategy on the RFF. **Conclusions:** Commonly-used neuropsychological measures were able to detect differences between artists and non-artists, with artists excelling in flexibility of thinking, as well as both verbal and non-verbal fluency. Results support theories that creativity is a function of low levels of frontal inhibition and low levels of overall brain activation, which result in high levels of output (fluency) and defocused attention (flexibility), respectively.

### D41

#### **Slow reaction time may predict a specific switching weakness: A replication**

*Suchy Y, Gordon J, Kuss K*

**Objective:** Removal of outliers is a common practice in behavioral research. However, performance of participants with outlying values may be of clinical or theoretical interest, as their data may be characterized not only by a different level, but also by a different profile of performance. In particular, we have found that participants with slow performance on baseline (non-executive) trials of a switching task also exhibited slowing in switching abilities,

but only on verbal, not visual-spatial, trials (Suchy, 2006). The present study aimed to replicate prior findings with a different paradigm. Method: Ninety-six college students completed a switching task that required both verbal-grammatical and visual-spatial judgments. Switching costs were calculated as the difference between baseline- and switch-trial response latencies. Participants were divided into “normal” and “slow” groups according to their speed of performance on baseline (non-executive) trials, and compared on switching costs for both verbal-grammatical and visual-spatial trials. Results: Repeated measures analysis of variance (ANOVA) yielded an interaction between trial type (grammatical versus visual-spatial) and group [ $F(1, 93) = 4.10, p = 0.046$ ], with “slow” group performing more poorly during verbal-grammatical, but not visual-spatial, classifications. Conclusions: These results are consistent with prior findings and support the notion that individuals who perform slowly on baseline trials may be characterized by specific executive/switching difficulties that emerge only during verbal-grammatical tasks. This finding also supports the notion that performance profiles of participants who are outliers should be carefully examined.

#### D42

##### **Impact of emotional stimuli on executive processing**

*Suchy Y, Kuss K, Gordon J*

Objective: Although both emotion regulation and executive abilities are at least partly subserved by the frontal lobes, how these two functions interact is largely unknown. We examined whether happy and upset faces presented behind task-relevant stimuli would affect participants' speed during verbal-grammatical and visual-spatial classifications. Method: Eighty-nine college students completed a task that required verbal-grammatical and visual-spatial classifications. Happy or upset faces, or neutral abstract image, appeared behind the classification stimuli. Participants were divided into four groups based on their report of feelings experienced during task performance: (1) experiencing positive, negative, and neutral feelings congruent with the background stimuli, (2) no feelings, (3) positive feelings only during positive stimuli only, and (4) negative feelings only during negative stimuli only. Groups were compared on performance speed during verbal-grammatical and visual-spatial classifications. Results: Repeated measures analysis of variance (ANOVA) yielded an interaction between trial type (verbal-grammatical versus visual-spatial), emotional background (positive versus negative versus neutral), and group [ $F(6, 176) = 2.44, p = 0.027$ ], with group 3 (positive feelings) performing most slowly and group 2 (no feelings) performing the fastest; additionally, experience of positive and negative feelings improved performance on visual-spatial trials, but not on verbal-grammatical trials. Conclusions: These results suggest that executive abilities may be differentially affected by affective regulation style, emotional valence of the stimulus, and task demands (i.e. verbal versus spatial).

#### D43

##### **Sensitivity and specificity of the tower tasks in adults: A meta-analytic review**

*Sullivan JR, Riccio CA, French CL*

Objective: The objective of this meta-analysis is to provide a review of the extant literature on the use of tower tasks with adults in neuropsychological practice and research, with an emphasis on the sensitivity and specificity of these instruments. Data selection: Studies were identified through a search of PsychInfo and Medline, with the term “tower” that included adult samples back to 1965 or the earliest available on the database. A total of 67 journal articles were identified that reported results of adults on tower task variables. Additional references were generated from the review of the cited articles. Only those studies that contained data for more than one group were included. Data synthesis: Cohen's  $d$  was calculated for each tower variable within each empirical study when sufficient information was provided. Results indicate that neuroimaging and electrophysiological evidence were consistent with theoretical hypotheses of frontal involvement (e.g. planning and strategy use) in tower task performance. Further, adults with various disorders of presumed neurological basis demonstrated impaired performance on tower tasks. Conclusions: The tower tasks represent a group of measures commonly used in the assessment of executive function, with a presumption that successful solution is related to strategy use and prefrontal/frontal function. The most striking finding from the meta-analysis is the extent to which impaired performance on tower tasks has been observed across multiple disorders. Thus, tower tasks appear to be sensitive to CNS impairment, and those skills required for tower performance seem to be implicated to some degree in various disorders.

## NEUROPSYCHOLOGICAL DOMAINS II: MEMORY AND AMNESIA

### D44

#### Psychometric properties of the Warrington memory test in older outpatients

*Giggey PP, Spencer RJ, Rice S, Selnes OA*

**Objective:** The Warrington recognition memory test for words (WMT-W) and faces (WMT-F) is often used in assessment of verbal and visual memory storage; however, little is known of its psychometric properties. We explored the internal consistency of WMT-W and WMT-F and their relations to verbal (Rey Auditory Verbal Learning Test; RAVLT) and non-verbal memory (Rey Complex Figure Test; RCFT). **Method:** Participants were 150 outpatients (mean age: 66 years, 48% male) referred for neuropsychological examination. **Results:** Individual item responses were available for 89 individuals. WMT-W and WMT-F had alpha coefficients of 0.89 and 0.78, respectively, and each measure was significantly correlated with age and education. After controlling for age and education, WMT-W and WMT-F correlated at  $r = 0.59$  in the full sample. Furthermore, WMT-W and WMT-F performance correlated with NAART at 0.29 and 0.27, respectively, and with false-positive-corrected RAVLT recognition score at  $r = 0.73$  and 0.46, respectively. The WMT-W correlated with the RCFT (copy) at  $r = 0.29$  and with the RCFT (recall) at  $r = 0.47$ . The WMT-F correlated with the RCFT (copy) at  $r = 0.29$  and with the RCFT (recall) at  $r = 0.40$ . **Conclusion:** Both WMT-W and WMT-F demonstrated acceptable internal consistency and construct validity. WMT-W exhibited superior reliability and correlations with verbal and non-verbal tests of memory, suggesting a need for further examination of the incremental validity of WMT-F beyond WMT-W alone.

### D45

#### Memory complaints and memory test performance after brain injury

*Perna R, Doria M*

**Objective:** This study compares reported memory deficits with actual performance pattern after an acquired brain injury. While insight was not addressed in this study, magnitude and characteristics of memory performance and injury lateralization were compared with respect to reported memory problems. **Method:** Participants (26 males, 19 female, mean age 41.4 years) in a Neurorehabilitation program participants completed a brief battery including the Word List subtest: WMS-III, the reading Recognition: WRAT-3, other neuropsychological tests, and imaging findings. **Results:** ANOVA was used to compare groups (memory complaints-MC versus no complaints). Of participants, 62% (28) reported memory complaints. Groups did not differ significantly in lateralization of lesion, reading recognition, first trial recall, total words learned over four trials, of delayed short recall. Recall of the interference list and learning slope were lower, but not impaired in the MC-group. **Conclusions:** In this sample, the memory decrement noted in the MC group was just a few points greater than that in the other group. Additionally, their assessed memory decline on average appeared to be less than 1 S.D. It may be that there is some small magnitude of decrement that causes people to acknowledge a memory problem, not the standard deviation often looked for. An unexpected finding was that those with left hemisphere lesions did not do significantly worse on this verbal learning measure, perhaps suggesting either a sample specific finding or some bilateral encoding of learning list items, as some people may visualize them.

### D46

#### Organization of Rey Complex Figure at copy predicts recall at 2 weeks

*Rice S, Spencer RJ, Giggey PP, Matthews CL, Waldstein SR*

**Objective:** We evaluated the predictive utility of organized copying of the Rey Complex Figure Test (RCFT) on subsequent recall both within session and approximately 2 weeks later. **Method:** We examined the RCFT performances of 42 undergraduate students [78% female, mean age = 21.8 (4.3)]. Participants copied the complex figure (RCFT-C) while examiners recorded the organizational approach (RCFT-O) used in constructing the figure according to the Savage et al. (1999) coding system. Three minutes later, participants were instructed to draw the figure from memory (RCFT-SD). Participants constructed the figure from memory at session two (RCFT-LTR), one to 28 days later (mean = 12.1, S.D. = 6.7). Participants were not foretold they would recall the figure. **Results:** Two hierarchical regression analyses were conducted predicting RCFT-SD and RCFT-LTR. In the first model, RCFT-C in step one explained 12% of the variance in RCFT-SD ( $p = 0.05$ ), and RCFT-O in step 2 accounted for an additional 19% of variance ( $p < 0.01$ ). In the second model, total days between test sessions in step one explained 20% of the variance in RCFT-LTR ( $p = 0.02$ ),

and RCFT-O in step two accounted for an additional 21% of variance ( $p=0.01$ ). Conclusion: These results indicate organization at RCFT-C is predictive of short- and long-term recall. More research is needed to address the construct validity of RCFT-O performance.

#### D47

##### **Long-term recall of the Rey Complex Figure: Preliminary findings**

*Rice S, Spencer RJ, Giggey PP, Matthews CL, Waldstein SR*

Objective: Practical measurement of long-term memory remains poorly characterized. We evaluated long-term recall of the Rey Complex Figure (RCFT-LTR) against a long-term recall trial from the Symbol-Digit Modalities Test (SDMT-LTR). We also classified individual RCFT-LTR elements as structural or non-structural (according to Savage et al., 1999). Method: Forty-two undergraduates (78% female, mean age = 21.8 (4.3)) copied the complex figure (RCFT-C) and recalled it 3 min later. One to 28 days later (mean = 12.1 (6.7)), participants constructed the figure from memory (RCFT-LTR). Results: RCFT-LTR performance correlated with SDMT-LTR ( $r=0.39$ ) and number of days between assessments ( $r=-0.35$ ). A hierarchical regression analysis was conducted predicting SDMT-LTR. At step one, the number of days between assessments explained 11% of the variance in SDMT-LTR ( $p=0.03$ ). At step two, RCFT-LTR accounted for an additional 8% of variance ( $p=0.055$ ). Qualitatively, structural and non-structural elements were constructed with >94% accuracy at initial copy. At time two, structural elements were produced with 76% accuracy, whereas accuracy for detailed elements was 26%. Conclusion: Findings provide preliminary support for long-term recall of the Rey Complex Figure and Symbol-Digit Modalities as potentially informative supplements in cognitive assessment. The core, structural elements of RCFT are recalled with greater frequency than the smaller, non-structural elements.

#### D48

##### **Memory problems: Self-report versus objective testing in a dementia clinic**

*Spencer RJ, Giggey PP, Rice S, Selnes OA*

Objective: Self-assessments of cognitive complaints, while rarely interpreted at face value, are typically sought during neurocognitive evaluations. Method: Using responses on a Geriatric Depression Scale-Short Form (GDS) item assessing self-perception of memory problems (yes/no) as a grouping variable, we compared performance on objective tasks of memory and depression in 91 outpatients (ages 46–86; 47% male; 90% white) with memory problems (defined by performing below the published mean on Rey Auditory Verbal Learning Test (RAVLT), delayed recall). Tests included RAVLT, Warrington's Recognition Memory Test, and Rey Complex Figure Test-Recall. Results: The 26 individuals who did not endorse memory problems were older and trended toward having a lower GDS, adjusting for the memory self-perception item. On the RAVLT, individuals not reporting memory problems had poorer List-B recall, and trended toward more false positive recognition errors. Otherwise, self-report was unrelated to demographics and memory measures. Conclusion: Self-assessment of memory, while not strongly associated with performance on objective memory tests, may have value as an indicator of insight. Unawareness of memory problems is increasingly common with age and endorsement of fewer depressive symptoms in general. The current study examined only a single, dichotomous item assessing self-perception of memory and had a small percentage of individuals not endorsing memory complaints. Future research is needed to confirm these exploratory findings and investigate the interplay of insight and memory problems.

## **NEUROPSYCHOLOGICAL DOMAINS II: OTHER**

#### D49

##### **Emotion recognition in sex offenders**

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

Objective: Research has demonstrated that some populations, such as certain criminal offenders, have difficulty accurately recognizing and identifying emotions in others. Little is known about emotion recognition in sex offenders. The objectives of this study were to examine facial affect recognition abilities in an adult sample of (1) sex offenders (SO) relative to healthy volunteers (HV) and (2) pedophilic (PED) relative to non-pedophilic (NPED) child molesters. Method: A facial affect recognition task utilizing static computerized images depicting six basic emotions (anger, disgust, fear, happy, sad, surprised) was administered to PEDs ( $n=16$ ), NPEDs ( $n=23$ ) and HVs ( $n=20$ ). Composite

scores were created averaging the total errors and average response time across all six emotions. All groups were similar in age, education and IQ. The NPEDs were significantly higher on psychopathy than both the PEDs and HVs. Results: NPED made significantly more total errors than PED [ $F(2, 56) = 3.294, p < 0.05$ ]. The NPEDs tended to respond faster than both the PEDs and HVs, although this did not reach statistical significance [ $F(2, 56) = 2.783, p = 0.07$ ]. Conclusions: These results suggest that NPED responded more impulsively and less accurately compared to PEDs and HVs. The NPEDs emotion recognition deficits may be related to psychopathy, which is consistent with the literature indicating that psychopaths exhibit deficits in both verbal and non-verbal emotional processing. Thus emotion recognition may not play a causal role in the etiology of pedophilia.

## D50

### **Equivalency of an alternate form of the arithmetic task of the Wechsler Adult Intelligence Test 3rd Edition (WAIS-III)**

*Gagnon M, Mertens VB, Messier C*

**Objective:** The Arithmetic subtest of the WAIS-III (1997) was designed to evaluate attention and mathematical problem solving. However, practice effects tend to be observed on tasks requiring a specific solution. Therefore, an alternate form of this task was devised to be used in test-retest situations. The objective of this study was to examine the equivalency of the alternate Arithmetic subtest to the original subtest from the WAIS-III. **Method:** Both forms of the Arithmetic test were administered to 200 participants, younger participants ( $n = 107$ , mean age = 20.83) and older participants ( $n = 93$ , mean age = 70.14), on separate occasions following a counterbalanced design. **Results:** Scores on both forms correlated significantly, irrespective of age group and order of presentation. No significant difference were found between scores on both forms when comparing performance of participants receiving the original form and those receiving the alternate form during the first visit, for both age groups. When comparing performance on both forms of the task across visits, practice effects were only observed in the younger group when they were administered the original form before the alternate form. Because of the importance of test order in the younger group, equations that ensure a valid comparison of test-retest scores is also provided for test-retest situations. Split half reliability quotients are also provided. **Conclusion:** In general, results suggest that the alternate form of the Arithmetic subtest can be used in a test-retest situation.

## D51

### **Contributing factors to trail making test, part B (TMT-B) performance**

*Goldberg M, Lloyd H*

**Objective:** Cognitive factors associated with performance on TMT-B have received extensive research attention. The current study aimed to provide a unique addition to this literature by examining, in a mixed clinical sample, the relative contribution of a set of cognitive factors to TMT-B performance, controlling for effects of essential TMT-B performance elements (i.e. visuomotor processing speed, visual scanning, and sequencing). **Method:** Stepwise linear regression analysis was used. Visuomotor processing speed, visual scanning, and sequencing were indexed by performance on Part A of the TMT (TMT-A), with scores on this test entered first into the equation. Correlational analyses identified the final set of potential predictor variables included in the regression analysis. Subjects were consecutive individuals referred for an outpatient neuropsychological evaluation on which a complete set of data on relevant measures were available. In all, 154 individuals had complete data and comprised the study sample. **Results:** TMT-A accounted for 41% of the variance in TMT-B performance. Five other variables accounted for a significant additional amount of variance (20%) and included, in the order of entry, WAIS-III Letter Number Sequencing, WMS-III Visual Reproduction I, Brief Test of Attention, Rey Complex Figure Copy, and WAIS-III Digit Symbol-Coding. **Conclusions:** Within this mixed clinical sample, TMT-B performance was associated with not only overlapping elements indexed by the TMT-A, i.e. speed of visuomotor processing, visual scanning, and sequencing, but also capacities in auditory working memory, immediate visual memory, divided attention, and visuospatial processing and integration.

## D52

### **Cognitive variability in high-functioning individuals**

*Salomonczyk D, Jovanovski D, Campbell Z, Zakzanis KK*

**Objective:** When assessing intraindividual variability, the neuropsychologist may be tempted to deduce impairment upon findings of marked deficiency in one or more cognitive domain. However, it has been previously demonstrated



that intraindividual variability across cognitive domains exists irrespective of brain dysfunction. The objective of the present study was to assess and evaluate the degree of cognitive variance within and across high-functioning individuals without brain dysfunction in order to obtain a more comprehensive profile of cognitive function in this population. Method: A neuropsychological test battery was administered to a sample of 20 university professors with no history of psychiatric or neurological illness and with no prior exposure to neuropsychological testing. The battery consisted of the Rey Complex Figure Task, Digit Span, Judgment of Line Orientation Task, Finger Tapping Test, California Verbal Learning Test, and the Wechsler Abbreviated Scale of Intelligence (Two-Scale Form). Results: The average IQ score obtained was approximately 2 S.D. above average. Most participants, however, demonstrated notable variance across the various cognitive domains measured with some performances unexpectedly falling within the borderline and very poor range. Conclusion: The present findings suggest that intraindividual variability, as evinced in a neuropsychological assessment, may not necessarily serve as a marker of cognitive dysfunction.

### D53

#### **Hereditary mirror movements: Five affected individuals in a three generation kindred**

*Schenkenberg T, Bamshad M, Flanigan K*

Objective: Certain types of simultaneous, bilateral movements are common in daily life (e.g. smiling and blinking) and other simultaneous bilateral movements are features of normal childhood. Synkinesia in adults is most often associated with underlying neurological disorders. Isolated mirror movements are rarely familial. This paper describes a family with mirror movements that are inherited as an autosomal dominant trait. Method: We identified 18 individuals in a three generation family. Seven underwent a standard neurological evaluation and a battery of neuropsychological tests. MRI was performed on two affected individuals. Results: Five individuals displayed definite mirror movements; no other neurologic or MRI abnormalities were identified. All have normal cognitive ability and function successfully in a remarkable range of activities despite their mirror movements. Their performance on motor tasks is dramatic vis a vis the movements of the opposite hand during unilateral motor tasks. Four affected individuals have greater grip strength in their non-dominant hand than in their dominant hand, perhaps due to their continuous tendency to “clench” their off hand as a way of keeping that hand from moving during a task involving the dominant hand alone. Conclusions: In this family, mirror movements were not found to be associated with other neurological abnormalities. Further radiographic and genetic characterization is underway. Neuropsychologists should be aware of this rare syndrome that may produce unusual findings on standard motor tasks.

### D54

#### **Agenesis of the corpus callosum in an 8-year-old left handed bilingual boy**

*Mucci G*

Objective: Agenesis of the corpus callosum (ACC) is a rare disorder that results in a number of neurocognitive deficits, including deficits in processing, complex and novel problem solving, abstract reasoning, visuomotor skills, and social functioning. This presentation will highlight the clinical presentation of ACC previously undetected in a bilingual, left handed 8-year-old boy. Method: An 8-year-old bilingual (English/Spanish) boy initially presented with right hemiparesis, and follow-up MRI revealed complete dysgenesis of the corpus callosum. He had previous diagnoses of cerebral palsy and learning disabilities, and received physical therapy for hypotonia and speech and language therapy for articulation difficulties. A comprehensive neuropsychological evaluation was conducted to help clarify his neurocognitive deficits and help to determine appropriate treatment and educational recommendations. Tests administered included, but are not limited to, the WISC-IV, WIAT-II, NEPSY, CVLT-C, Purdue Pegboard, Hand Dynamometer, and language tasks. MRI scans will support the presentation. Results: PIQ > VIQ, with significant verbal comprehension, phonological processing, expressive and receptive language, sensorimotor, visuomotor, and bimanual motor coordination difficulties. Working memory and processing speed were impaired, and verbal memory was lower than visual memory. Achievement in reading comprehension, spelling and written expression were significantly lower than expected based on PIQ. Conclusions: Many findings were consistent with the literature on ACC, including slower mastery of novel tasks and difficulties with complex problems solving and abstract reasoning. However, due to his bilingualism, the findings help shed light on the complex interplay of language development in the context of ACC.

**D55****Forensic neuropsychological autopsy of a suicide following occupational solvent exposure***Singer R.*

**Objective:** This case will present a format for conducting a “forensic neuropsychological autopsy”. A married 46-year-old female took her life following a two-year illness subsequent to acute solvent exposure. **Forensic questions:** Did the solvent exposure significantly contribute to or cause her suicide? **Methods:** Review of the deceased’s educational, vocational, and medical records; personal exam of witnesses to the exposure and the subsequent illness; neurotoxicological analysis of exposure. **Results:** The deceased, a legal secretary in a building being renovated, was exposed for approximately 3 hours to paint fumes described by non-party witnesses as “horrible, immediately overwhelming, noxious”; causing persistent irritation or burning of the respiratory tract, dizziness, numb lips and tongue, with resulting chronic headache and fatigue. The paint was a modified epoxy paint with neurotoxic components. Her initial illness corresponded with the MSDS, and was later diagnosed as asthma and multiple chemical sensitivity. Doctors ordered an environmental investigation, finding workplace hazardous ventilation. Prior to exposure, she was uniformly described as intelligent, in good health, enthusiastic, independent, very sociable, and an excellent employee. Her CTMM full scale IQ had been 119 (90th%); PSAT verbal 91st%. She had been a hobbyist mechanic, building motorcycles. Vocational testing post-illness found mechanical reasoning (8th%) and spatial relations (2nd%); verbal and math reasoning 32nd%. In the month prior to her suicide, psychotic ideation was reported. **Conclusions:** Suicide from solvent-related illness can be determined using varied neuropsychological investigative methods, even if the subject is unavailable for testing.