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WEDNESDAY AFTERNOON, FEBRUARY 14, 1996

Poster Session 1/4:30–7:00 p.m.

ASSESSMENT–1

A. PAOLO, J. RYAN, & A. TRÖSTER. Demographically Based Regression Equations to Estimate WAIS-R Subtest Scaled Scores.
The WAIS-R and elderly WAIS-R standardization samples were combined to develop demographically based regression equations to predict subtest scaled scores. Equations generated from a development sample cross-validated well and final equations were generated from the entire sample of 2010 persons. The final equations demonstrated adequate ability to suggest possible subtest decline in a sample of 247 persons with confirmed brain dysfunction. Abnormal cutoff scores at the 10% level were provided to assist clinicians in the detection of abnormal discrepancies between the estimated and obtained subtest scaled scores.
Correspondence: *Anthony M. Paolo, Department of Neurology, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160-7314, USA.*

B.N. AXELROD, S.H. PUTNAM, J.L. WOODARD, & K.M. ADAMS. Cross-Validation of Predicted Wechsler Memory Scale-Revised Scores.
Equations for prorating the Wechsler Memory Scale-Revised General Memory (GM) and Delayed Recall (DR) index scores (Woodard & Axelrod, in press) were confirmed in a new clinical sample of 258 patients. Raw score results for Logical Memory, Visual Reproduction, and Verbal Paired Associates were entered into the prediction equations. Predicted GM and DR scores fell within 6 points of obtained scores for 94% and 97% of the sample, respectively. A multiple regression analysis yielded multiple R^2 of .976 and .984 for GM and DR, respectively. Additionally, the unstandardized regression weights were virtually identical to those initially presented by Woodard and Axelrod. These prediction equations for the GM and DR summary scores have validity for patient samples similar to those of the present study.
Correspondence: *Bradley N. Axelrod, Psychology Service, Department of Veterans Affairs Medical Center, Allen Park, MI 48101, USA.*

F. McCARTHY, W. BURNS, & A. SELLERS. The Estimation of Premorbid Intellectual Functioning in Elderly Patients with Intellectual Deterioration Due to Alzheimer's Disease.
The predictive validity of the WRAT3, WRAT-R, NART-R, and Barona Regression Index as estimators of premorbid intellectual functioning was evaluated with 30 normal elderly subjects and 60 patients with Alzheimer's disease classified as mild or moderate in severity based on scores on the Mini Mental Status Exam. The results of the study provided evidence that the three reading tests and the Barona Index were similar in providing accurate estimates of premorbid intellectual functioning. Because of the large standard error of the estimate on the Barona Index, it was suggested that the reading tests provide more preferable psychometric characteristics. Since the WRAT3 has the most up-to-date norms, it seems to be the most preferable of the reading tests.
Correspondence: *F. McCarthy, School of Psychology, Nova Southeastern University, 3301 College Ave., Ft. Lauderdale, FL 33314, USA.*

G. SMITH, R. IVNIK, J. MALEC, & C. LEMSKY. Using Word Recognition Tests to Estimate Premorbid IQ in Dementia: Longitudinal Data.
We examined the utility of word recognition scores in estimating verbal IQ scores obtained from 1 to 5 yr earlier. Two samples were employed: 288 normal older persons from the Mayo Older Americans Studies and 21 patients from the Mayo Alzheimer's Disease Patient Registry. In the dementia sample, the correlation between time 1 WAIS-R VIQ scores and time 2 WRAT-R reading score was .85 ($p < .01$), and discrepancy scores were not significantly different from 0. In normals, WAIS-R VIQ scores and AMNART estimates of VIQ reading score was .69 ($p < .01$). This difference score had a mean of −6.0 ($SD = 7.2$), which was significantly different from 0 ($p < .0001$), suggesting that the AMNART overestimates actual previous score in normals. In nine subjects initially enrolled as normals but developing cognitive impairment in the retest interval, AMNART provided reasonable estimates of initial VIQ.
Correspondence: *Glenn Smith, Department of Psychiatry and Psychology, Mayo Clinic, 200 First St., SW, Rochester, MN 55905, USA.*

A. PAOLO, A. TRÖSTER, J. RYAN, & W. KOLLER. Comparison of NART and Barona Demographic Equation Premorbid IQ Estimates in Alzheimer's Disease.
Two methods of estimating premorbid WAIS-R intelligence were compared in matched samples of normal and patients with Alzheimer's disease (AD). The NART and Barona 1984 demographic equations accurately predicted the IQs of the normal group and overestimated the IQs of the AD subjects. The NART classified more AD subjects as demonstrating intellectual decline than did the demographic equations. When the AD group was divided into mild and moderately impaired subgroups, the more severely demented subjects displayed lower NART IQs, revealing that NART performance is sensitive to dementia severity. However, the NART IQs for the mild and moderately impaired AD subgroups were greater than the WAIS-R IQs, suggesting that while the NART is sen-

sitive to dementia severity, it may still provide relevant clinical information.
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R.J. IVNIK, J.F. MALEC, & G.E. SMITH. MOANS Norms for the COWAT, BNT, MAE Token, WRAT-R Reading, AMNART, STROOP, TMT, and JLO.
Mayo's Older Americans Normative Studies (MOANS) research provides age (>55 yr) and education norms for eight neuropsychological tests: COWAT, BNT, MAE Token, WRAT-R Reading, AMNART, STROOP, TMT, and JLO. While this information should prove useful for each test, the fact that these norms were simultaneously obtained from the same reference group should promote accuracy in comparing any person's performance on one test against his or her functioning on any other test with MOANS norms. Finally, the unique features of this MOANS sample are reviewed. These features must be kept in mind when these norms are applied in any specific clinical or research setting.
Correspondence: *Robert J. Ivnik, Psychology Division, Mayo Clinic, Rochester, MN 55905, USA.*

A.E. LANSING, C. RANDOLPH, R.J. IVNIK, & C.M. CULLUM. Short Forms of the Boston Naming Test.
The Boston Naming Test (BNT) is one of the most commonly used tests of confrontation naming. The length of the test, particularly when administered to impaired patients, has prompted the development of several different short forms. Short forms of the BNT have typically been equated in terms of difficulty, but not empirically derived for discriminating between normals and anomic patients. The present study examined BNT data from a total of 1,044 subjects, including 719 normals and 325 patients with Alzheimer's disease (AD). Scores were calculated for the entire 60-item version, as well as for eight previously published short forms, and examined for the effects of age, education, and gender, as well as for the ability of each form to discriminate between AD patients and normals. There was a significant effect of age, education, and gender on all previously published forms, and the short forms varied in their ability to discriminate between patients and controls. A stepwise discriminant analysis was done to empirically derive a new, gender-neutral short form with discriminability comparable to the full 60-item test. Norms from this sample on the empirically derived short form, categorized by age and education, are presented.
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H.B. MILLER, D. MURPHY, C. PANIAK, M. LaBONTE, & L. SPACKMAN. Continuous Visual Memory Test: Norms for Ages 9 to 15.
The purpose of the present study was to develop norms for the Continuous Visual Memory Test (Trahan and Larrabee, 1988) for 9- to 15-yr old children. Subjects were 640 students from the public school system in a large Canadian city. The Continuous Visual Memory Test (CVMT) was administered in the context of a 1 h, one-on-one neuropsychological assessment. The sample was stratified on the basis of age, sex, and IQ. Normative data were derived for the five scores reported for adults on the CVMT. The norms are thought to be representative, given the large sample and rigorous screening process. Similar to normative data presented for adults, there were significant age effects for children. However, in contrast to norms derived for adults, there were significant differences for sex, as well as for IQ, with better scores having been obtained by brighter children.
Correspondence: *Harry B. Miller, Department of Psychology, Kelowna General Hospital, 2268 Pandosy St., Kelowna, British Columbia V1Y 1T2, Canada.*

A.K. TROYER & H. WISHART. A Comparison of Qualitative Scoring Systems for the Rey-Osterreith Complex Figure Test.
Qualitative scoring systems for evaluating strategy/organization on the Complex Figure Test were compared. Fifty-one healthy older adults copied and then later reproduced from memory the Complex Figure, and copy trials were scored according to eight different qualitative scoring systems. Correlational analyses showed that scores from all systems were highly intercorrelated, and interrater reliabilities were moderate to high. Scores from five systems were highly correlated with 30- min delayed recall; three were significant after correcting recall scores for accuracy of copy. Scores from six systems correlated highly with a measure of executive/conceptual ability. Overall, two of the scoring systems fared particularly well in these analyses, both of which incorporated multiple aspects of qualitative performance.
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R. HANKS, J. ALLEN, N. NABORS, J. RICKER, & S. DESHPANDE. The Make a Figure Test: Normative Data for a Measure of Design Fluency.
This study attempted to establish normative and clinical data for a new measure of design fluency, the Make a Figure Test. This particular test was employed due to its advantages over other known measures of design fluency. Some measures (Jones-Gotman & Milner, 1977; Ruff et al., 1987) have tended to suffer from a variety of construct or validity pitfalls such as unstandardized scoring criteria or overstructured administration procedure. This test was administered to normal controls, geriatric controls, and individuals with stroke or traumatic brain injury. Mean and standard deviations are reported for normative data. Data suggest that this measure may be a useful clinical instrument, particularly with anterior lesions, and may predict certain deficits related to initiating behaviors and creativity.
Correspondence: *Robin Hanks, Departments of Psychology and Physical Medicine and Rehabilitation, Wayne State University and Rehabilitation Institute of Michigan, 261 Mack Ave., Detroit, MI 48202, USA.*

P.S. FASTENAU, J.M. BENNETT, & N.L. DENBURG. Application of Psychometric Standards to Scoring System Evaluation: Examination of Yet Another Scoring System for the Rey Figure.
Psychometric standards were applied to a new scoring system for the Rey figure. Fastenau scoring criteria showed good interrater reliability (.90–.94), internal consistency (.87–.90), temporal stability over 2 yr (.95–.98), and content validity (100% sampling of the stimulus). For construct validity, recall ratings correlated with ECFT Recognition (.74–.75) and copy ratings with ECFT Matching (.44). Also Fastenau scores discriminated epilepsy patients from healthy controls. In comparison to the popular Osterrieth system, the Fastenau system took up to 6 times longer to apply, yet with little advantage in reliability and validity. The authors conclude with suggestions for applying psychometric principles. (American Psychological Association, 1985; Anastasi, 1982) to the evaluation of scoring systems in general.
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L. RAPPORT, R. CHARTER, J. KINGSLEY, T. FARCHIONE, & R. DUTRA. Interrater Reliabilities of the Rey Complex Figure Lezak-Osterrieth versus Denman Scoring Systems.
This study compares interrater reliabilities of the Lezak and Denman scoring systems using three independent rates ($N = 318$; copy and recall phases). In general, interrater reliabilities for both scoring systems were high and equivalent. Lezak copy reliabilities for inpatient psychiatry were lower than for neurology and rehabilitation medicine patient groups. It may be that distortions produced by the neurologically compromised patients were more obvious in nature, and therefore more conducive to reliable scores across raters, whereas distortions produced by psychia-

try patients were more subtle and prone to greater subjective interpretation using the Lezak method.
Correspondence: *Lisa J. Rapport, Department of Psychology, Wayne State University, 71 W. Warren, Detroit, MI 48202, USA.*

T.P. ROSS & B.N. AXELROD. The Interrater and Test-Retest Reliability of the Design Fluency and Ruff Figural Fluency Tests.
The interrater agreement and temporal stability of the Design Fluency Test (DFT) (Jones-Gotman & Milner, 1977) and the Ruff Figural Fluency Test (RFFT) were examined using a sample of college students ($N = 89$ at time 1, $N = 44$ at time 2). Interrater agreement for DFT scores ranged from $r = .21$ (nameable errors) to $r = .98$ (total designs); RFFT coefficients were higher, ranging from $r = .98$ (total responses) to $r = .80$ (perseverations). DFT stability coefficients ranged from $r = .12$ (nameable errors) to $r = .70$ (total responses); RFFT correlations were higher, ranging from $r = .52$ (total perseverations) to $r = .83$ (total designs). Supplemental scoring procedures and rater training for the DFT are suggested for future research.
Correspondence: *Thomas P. Ross, Psychology Department, Wayne State University, 261 Mack Ave., Detroit, MI 48202, USA.*

J.S. MARTZKE, S. KAEGI, K.P. GOOD, & L.C. KOPALA. Normative Data for the Vancouver Unimanual Tactile Word Identification Test (VUTWIT).
Over the course of research examining olfactory agnosia in schizophrenia, we sought and developed an analogous, easily administered, unimanual tactile word recognition task. The task involves a 10-s tactile exposure to words consisting of three or four raised block letters, following which subjects select from among four typewritten alternatives the word they "felt." Analysis of normative data suggests performance on the task is unrelated to age or education, with mean item difficulty = .88. Split-half reliability was adequate ($r = .81$). Correlation of right-hand with left-hand performance was .58. There was no difference in mean scores, or cutoff for impairment, across hands or as a function of handedness. This task may have value in other experimental investigations of agnosia, with clinical application pending validation employing focal lesion groups.
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D.C. GLAHN, R.C. GUR, D.C. CENSITS, J.D. RAGLAND, & R.E. GUR. Study of Reliability, Construct Validity, and Learning Characteristics of the Penn Object Learning Exam (POLE).
A spatial learning and memory test was developed as an analogue to the California Verbal Learning Test (CVLT). The Penn Object Learning Exam (POLE) was given to 113 undergraduates (66 men, 47 women). In a series of three experiments, high levels of internal stability were shown (experiment 1), preliminary evidence of construct validity was established (experiment 2), and learning characteristics were explored (experiment 3). Evidence of learning was demonstrated by a positive slope, even when initial performance on block one was regressed out. Reaction time data indicated that efficiency increased over learning trials but decreased on the short delay. Savings scores of 95% for short delay and 97% for long delay were generated. Sensitivity and specificity scores suggested that response styles differ between learning and delay trials. These results encourage further development of the POLE.
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J.L. WOODARD, V.J. ROBERTS, F.C. GOLDSTEIN, R.E. GODSALL, & A.N. CLARK. A Comparison of Standard and Abbreviated Forms of the Judgment of Line Orientation Test.
The Judgment of Line Orientation Test (JOLO) is frequently used in geriatric assessment as a motor-free method of evaluating visuospatial reasoning. Because this test can sometimes be time-consuming for older patients, some clinicians have administered only even or odd items to shorten administration time. This study examined the relationship between the full and abbreviated JOLO in a mixed clinical sample. The two abbreviated forms (even items and odd items) correlated at a .9 level with the full version. However, only 70% (odd items) and 77% (even items) of the samples were within 2 points of their actual score. Thus, using only even or odd items of the JOLO carries a high potential for inaccuracy in clinical decision making.
Correspondence: *John L. Woodard, Department of Neurology, Emory University School of Medicine, 1841 Clifton Rd., NE, Atlanta, GA 30329, USA.*

G. SCHNIRMAN, M. WELSH, P. RETZLAFF, N. COOKSON, S. TOLBERT, & M. PALMER. Development of the Tower of London-Revised.
Disk-transfer tasks, such as the Tower of London (TOL) and Tower of Hanoi (TOH), are presumed to tap the executive functions of planning and working memory. Recent research has found these tasks to be sensitive to frontal lobe damage or dysfunction, although findings also have been contradictory. Equivocal research results may be due, in part, to the low reliability (α coefficient = .29) of the TOL, which we recently found in our laboratory. The current study revised the TOL by drawing the 30 most predictive items from a large item pool. When tested on an independent sample ($N = 50$), the internal consistency of the TOL-revised (TOL-R) increased substantially ($\alpha = .79$) and the TOL-R demonstrated convergent validity with the similar TOH task ($r = .61$). The reliability of the TOH also was quite high ($\alpha = .96$) Therefore, the TOL-R appears to be a reliable and potentially valid measure of executive function in the college population.
Correspondence: *G. Schnirman, Department of Psychology, University of Northern Colorado, Greeley, CO 80639, USA.*

T.P. ROSS. The Reliability and Validity of a Modified Cognitive Estimation Test.
The internal consistency, stability, and concurrent validity of a modified Cognitive Estimation Test (CET) was examined using a sample of college students ($N = 158$). The internal consistency of the 10-item scale was low (Cronbach's $\alpha = .36$) and inter-item correlations ranged from $r = -.16$ to $r = .30$. The coefficient of stability was modest at $r = .57$ ($N = 44$; mean testing interval = 35.5 d). Evidence for concurrent validity was lacking, as the correlations between CET scores and other putative measures of executive functioning ranged from $r = .03$ to $r = .27$. The present results indicate that the CET is in need of further refinement. The benefits of the continued development of the CET are highlighted, and suggestions for its improvement are presented.
Correspondence: *Thomas P. Ross, Department of Psychology, Wayne State University, 261 Mack Blvd., Detroit, MI 48202, USA.*

J. ANDRIKOPOULOS. The Development of a Recognition Index for Logical Memory and Visual Reproduction of the Wechsler Memory Scale-Revised: A Pilot Study.
A pilot study was undertaken to develop stimuli for a Logical Memory Recognition Index (LMRI) and Visual Reproduction Recognition Index (VRRI). The control group consisted of healthy subjects of ages 47–92 yr. The LMRI and the VRRI consisted of 20 items each. The main finding was that the LMRI and VRRI were performed at equivalent levels of accuracy. This suggests that the two proposed indices are of comparable difficulty and have the potential to be used in future normative studies. Corrections for age and education were required.
Correspondence: *Jim Andrikopoulos, Independent Practice, 1750 28th St., Suite 1, West Des Moines, IA 50266, USA.*

A.H. RISSER & J. ANDRIKOPOULOS. Regard's Five-Point Test: Adolescent Cohort Stability.
Regard's Five-Point Test (5PT) is a simple and short measure of design fluency. Adolescent cohort stability was examined to determine if the performance levels reported for the adolescents in the original 5PT study

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remained stable in a new sample of 6th, 7th, and 8th graders (they did). Original 5-min and modified 3-min 5PT versions were equivalent. Neurologically normal adolescents perform at levels consistent with those of neurologically normal adults.
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L.E. MORRISON, L.A. SMITH, & F.F-A. SARAZIN. Boston Naming Test: A French-Canadian Normative Study (Preliminary Analyses).
The Boston Naming Test (BNT), a widely used tool for assessing confrontational naming ability, was examined in two groups of French-speaking subjects: normal adults ($N = 27$) and those from a clinical population without aphasic impairment ($N = 79$). The present study was conducted to provide normative data using the BNT in a French-Canadian population and to examine the relative contributions of age, sex, education, and vocabulary skills to BNT performance. Significant effects were found for vocabulary and gender, although no aging effect was documented. Results indicated that higher vocabulary skills predicted superior naming, and that males outperformed females. This latter unexpected finding likely reflects differences in sample sizes.
Correspondence: *L.E. Morrison, Department of Psychology, Ottawa General Hospital, 501 Smyth Rd., Rm. 7300, Ottawa, Ontario K1H 8L6, Canada.*

G.D. BATEMAN & S. HALL. Development of a Neuropsychological Assessment Device: The Visual Sequential Paced Arithmetic Test (VSPAT).
The VSPAT, a modified version of the PASAT, which is presented visually via microcomputer, is a measure of information processing ability designed to evaluate mild TBI. The VSPAT (as well as an aural version, the ASPAT) was administered to 70 neurologically intact subjects. Preliminary results analysis indicates that the VSPAT is considerably easier than the ASPAT. Further comparisons with the PASAT are also made, suggesting that the VSPAT is easier and less stressful for subjects than the PASAT, and yet retains the characteristics of the PASAT that make it sensitive to the information processing deficits seen following mild TBI. The VSPAT is seen as a potentially less stressful alternative to the PASAT which may be useful for a broader range of patients. Further investigation is warranted.
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J. OLIN, C. CLARK, R. DOODY, S. FERRIS, J. MORRIS, B. REISBERG, F. SCHMITT, & L. SCHNEIDER. Reliability and Validity of a New Clinical Global Rating Scale for Alzheimer's Clinical Trials.
The NIA's Alzheimer's Disease Study Units clinical global impression of change (ADSU-CGIC) is a new method for making global ratings in Alzheimer's disease (AD) clinical trials. Unlike earlier nonstandardized scales that had little sensitivity to treatment effects, the ADUS-CGIC requires that clinicians separately interview patient and informant with worksheets covering 15 domains. Clinicians perform unstructured interviews using the worksheets as a guide, and incorporate mental status questions without a required instrument. After each interview a global rating is made on a 7-point scale for identification of the relative weight of each interview. The ADSU-CGIC has been given up to five times over a 12-month period to 141 AD patients. Stability at 1-month was evidenced by 86% of patients rated as "no change" or "mild worsening." Twelve-month ADSU-CGIC ratings correlated with change scores on the CDR ($r = .28$, $p = .003$) and MMSE ($r = -.52$, $p = .004$). Additionally, we found little evidence of bias from using informant information when making global ratings. Overall, the ADSU-CGIC shows promise as a global rating for AD clinical trials.
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D.L. NYENHUIS, R.A. STERN, C. YAMAMOTO, A. TERRIEN, A. PARMENTIER, T. LUCHETTA, & J.E. ARRUDA. A Standardization, Further Validation, and Principal Component Analysis of the Visual Analogue Mood Scales.
The Visual Analogue Mood Scales (VAMS) are being developed to better understand and assess mood disturbance in poststroke patients who, because of communication deficits, cannot complete more traditional measures of mood. In the present study, we (1) completed a standardization sample for the scales with 402 age-, gender-, and race-stratified adults; (2) further validated the VAMS by showing that each scale correlated highly (.55–.72) with traditional scales that measured similar mood domains; and (3) explored the underlying content of VAMS items using a principal component analysis. The present study will permit more accurate comparisons of mood disturbance in patient groups to that of the general population.
Correspondence: *David L. Nyenhuis, Department of Psychology, Rush-Presbyterian-St. Luke's Medical Center, 1653 W. Congress Pkwy., Chicago, IL 60612, USA.*

T. LUCHETTA, D.L. NYENHUIS, A. TERRIEN, & C. YAMAMOTO. Cross-Validation of the Multiscale Depression Inventory Using Confirmatory Factor Analysis.
Previous work, using principal component analysis, revealed a five-factor solution (mood, evaluative, fatigue/lethargy, sleep disturbance, cognitive inefficiency) for the Multiscale Depression Inventory (MDI). We now cross-validate this factor structure in a separate age-, gender-, and race-stratified sample ($N = 420$) using confirmatory factor analysis (CFA). Goodness-of-fit indices that were not sensitive to sample size supported the factor structure (Bentler & Bonett's NNFI: .92, Bentler's CFI: .93). Composite reliability (.90) supports the combination of the last three factors into a single vegetative scale. In summary, CFA supports and cross-validates MDI factor structure, and, more importantly, supports the independence of mood and nonmood scales.
Correspondence: *Tracy Luchetta, Human Development Unit, University of Wisconsin-Green Bay, Green Bay, WI 54711, USA.*

T. HANLON, D. BERRY, D. LAMB, R. PATEL, & C. EDWARDS. Preliminary Validity and Reliability Data on a New Motivational Procedure: The Letter Memory Test.
This report describes three studies investigating the Letter Memory Test (LMT). The LMT uses the first 10 consonants of the alphabet as stimuli, with three levels of stimulus length (three, four, or five letters) crossed with three levels of choice (two, three, or four choices) in a manipulation of face difficulty. Five trials are given in each of the nine cells with a 5-s delay from stimulus to recognition choices. In study 1, naive and coached analog malingerers scored significantly below noncompensation-seeking, moderate to severely injured closed-head-injured (CHI) patients whose scores were comparable to those obtained by normal controls. In study 2, mild CHI patients pursuing compensation scored significantly lower on the LMT than a second group of moderate to severely injured CHI patients who were not seeking compensation. In study 3, the internal consistency reliability of the LMT in analog malingerers was .92. These results provide promising initial support for the LMT, although further research is clearly needed to fully develop the test.
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LANGUAGE—1

A. LINDSAY, T. GOLDSMITH, & R. YEO. A Comparison of Cognitive Networks and Their Relationship to Global Cognition and Semantic Memory.
Recent evidence suggests that multivariate network techniques may be a powerful method for predicting global cognitive changes and semantic memory decline. Forty individuals were examined using two techniques—Coherence and Pathfinder Similarity Index—to determine

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the relationship between overall cognitive status on Mini-Mental Status Examination, semantic cuing, and semantic cuing response times. A linear multiple regression showed that Pathfinder Similarity and Coherence were significantly related to Mini-Mental Status scores. However, Coherence explained more variance on the global cognitive status measure and also proved to be a superior measure of semantic decline and response times on semantic cuing tasks.
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A. CHATTERJEE, R. YAPUNDICH, M. MENNEMEIER, J.M. MOUNTZ, C. INAMPUDI, J. PAN, & G.W. MITCHELL. Seams of Consciousness: Thalamic Regulation?
In 1890, William James observed that there are both substantive and transitive parts in subjective streams of consciousness. The neural structures mediating transitive parts, the ability to volitionally make contextually appropriate transitions between themes, are not known. We report a woman with a dense amnesia after a paramedian artery distribution thalamic stroke involving the mamillothalamic tract, intralaminar nuclei, and parts of the dorsomedial and ventral lateral nuclei bilaterally. Her conversational discourse was notable for relatively preserved linguistic microstructure (lexical selection, syntax), but was marked by macrostructure abnormalities. Specifically, she demonstrated unpredictable topical fragmentations, intrusions, and incoherent shifts. SPECT scan revealed perfusion abnormalities in projection sites of medial thalamic nuclei. Thalamo-cortical and thalamo-striatal circuits may regulate transitions in the content of consciousness, preserving coherence across volitional shifts in thought.
Correspondence: *Anjam Chatterjee, Department of Neurology, University of Alabama at Birmingham, 1720 7th Ave. South, Birmingham, AL 35294-0017, USA.*

C.S. WILSON, M.W. HAUT, & S.M. BLOOMFIELD. The Effects of Left Thalamic Stimulation on Language and Verbal Memory.
In a case study, we investigated the effect of different levels of electrical stimulation on language and verbal memory in a young woman who recently underwent neurosurgical implantation of a Medtronics Deep Brain Stimulator (DBS) into her left ventral posterior lateral nucleus of the thalamus for relief of chronic back pain. Repeated neurocognitive evaluations revealed that higher DBS settings led to increased word finding, reading, and verbal retention difficulties. Our findings suggest that DBS use has potential cognitive effects and may have implications for theoretical understanding of the role of the thalamus in cognition.
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A.L. FOUNDAS, S.K. DANIELS, & J. VASTERLING. The Posterior Insula Cortex and Language Functions: A Case Study.
Recent data suggest that the insula cortex may be important in language functions. We examined a patient who developed an anomic aphasia with lexical dysgraphia-dyslexia following a stroke to the left posterior insula cortex. Neuropsychological assessment within 2 wk of the acute event demonstrated mild verbal learning deficits with relative preservation of visuospatial memory and intact frontal lobe functions. Language testing demonstrated an anomic aphasia with intact semantics, and a lexical dysgraphia-dyslexia, without ideomotor apraxia. These findings suggest that lesions restricted to the posterior aspect of the insula cortex may produce relatively discrete disturbances in language functions. The posterior insula has reciprocal connections to the inferior parietal lobule. Therefore, by disconnection, a lesion to the left posterior insula may produce an anomic aphasia with dyslexia-dysgraphia as demonstrated in this case study.
Correspondence: *Anne L. Foundas, Department of Psychiatry and Neurology, Tulane University School of Medicine, 1415 Tulane Ave., New Orleans, LA 70112, USA.*

K.R. BIDDLE & P.J. ESLINGER. Normal Language with Impaired Discourse After Early Right Frontal Lobe Lesion.
Traditional language measures and experimental discourse tasks were used to assess development of complex and pragmatic language skills in an 11-yr-old boy 4 yr after early right dorsolateral prefrontal cortex lesion. Verbal cognitive, academic achievement, and lexical access measures were all above average, although neuropsychological tests disclosed impairment in spatial working memory, attentional control, organizational aspects of learning, and spatial planning. In the Test of Language Competence-Expanded, the subject showed difficulties in the recreating sentences task. Analysis of spontaneously generated personal narratives indicated simpler, less elaborate, and more repetitive narratives than controls, reflected by a higher redundancy ratio and a lower density ratio. Findings suggest developmental impairment in the executive processes that manage discourse production, particularly the planning, organization, flexibility, and monitoring of discourse after early right dorsolateral prefrontal cortex lesion.
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D. VAN LANCKER, N. PACHANA, J. CUMMINGS, C. ERICKSON, & J.J. SIDTIS. Dysprosodic Speech Following Basal Ganglia Stroke: Role of Frontosubcortical Circuits.
Behavioral, acoustic, and imaging data on two patients with dysprosodic speech following basal ganglia strokes led to a new account of some forms of acquired dysprosody. Both patients displayed neutral facial expression, reduction in facial gestures, monotone vocal expression, and mood changes (apathy and irritability, respectively). Comparison with premorbid speech samples confirmed postmorbid changes in intonation variability and verbal expressiveness. Evaluation of affective speech prosody using listeners' rating tasks as well as acoustic analyses indicated significant differences in repetition over spontaneous production, indicating little or no role of motor or cognitive programming in dysprosodic output. Subcortical damage differentially affecting frontosubcortical circuits involved in modulating motivation (apathy) and mood (irritability) may also account for changes in speech prosody.
Correspondence: *Diana Van Lancker, Department of Neurology, USC Medical School, 1510 San Pablo St., Suite 610, Los Angeles, CA 90033-4606, USA.*

D. KEMMERER & L. HERSHEY, Sentence Comprehension Deficits in Progressive Supranu-clear Palsy (PSP).
No studies of the sentence comprehension abilities of PSP patients have been conducted, even though the frontal dysfunction of these patients makes it likely that they have deficits. We investigated five mild PSP patients' comprehension of raising-to-subject sentences (e.g., "Susan seems to Bill to be nice" and "Susan is easy for Bill to catch") and their canonical counterparts (e.g., "It seems to Bill that Susan is nice" and "It's easy for Bill to catch Susan"). Two of the patients exhibited intact comprehension of all of the sentence types, but the other three patients performed significantly worse on the former sentence types than on the latter. Thus, some PSP patients do in fact have sentence comprehension deficits, although their nature remains to be clarified.
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L. BLOMERT. Recovery from Automatic Speech in Severely Aphasic Patients.
A very severe form of aphasia is presented by patients who can only produce speech automatisms—repetitive, invariant utterances inappropriate in their context. Prognosis for recovery of such patients in general is minimal to negative. In this study two patients producing almost only automatic speech 1 month postonset were again tested 1 yr later. If ana-

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lyzed in neurolinguistic terms, no progress could be detected in either of the patients. However, one patient, although not able to produce adequate speech voluntarily, improved considerably in his communicative effectiveness. It could be shown that this patient was able to use a presumed automatic reaction like echolalia in a selective meaningful way. Implications for models of speech automatism production are discussed.
Correspondence: *Leo Blomert, Department of Cognitive Sciences, University of California at Irvine, Irvine, CA 92717, USA.*

M. KATO, M. MIMURA, Y. INOMATA, & H. KASHIMA. Zigzag Writing: Involuntary Release of Two Alternate Writing Forms in the Left Medial Frontal and Callosal Lesions.
We present a patient with a novel dysgraphia unique to Japanese writing form. Japanese has two writing forms—horizontal and vertical—that will not alternate during one writing session. A 60-yr-old right-handed man with infarction involving the left medial frontal cortex and corpus callosum exhibited speech hesitation, disconnection syndrome, and diagnostic dyspraxia with his left hand. He also had alien hand signs with his right hand. On writing to command or dictation with the right hand, the horizontal and vertical writing form alternated in a sentence. He wrote the first three words from left to right, the next three words from top to bottom, and the last two words from left to right again. His writing appeared zigzag or stepwise. The neuropsychological tests demonstrated increased stuck in set perseverations, with few tonic perseverations. Zigzag writing may be an involuntary releasing phenomenon of writing form programs due to the dysfunction of the medial frontal inhibition system and hemispheric disconnection, and may be a novel type of agraphia due to an impaired allographic function.
Correspondence: *Motoichiro Kato, Department of Neuropsychiatry, Tokyo Dental College, Ichikawa General Hospital, 5-11-13, Sugama, Ichikawa, Chiba, 272, Japan.*

G.M. GRIMSHAW, A. ADELSTEIN, M.P. BRYDEN, & G.E. MACKINNON. First-Language Acquisition Beyond the Critical Period: A Case Study.
We describe the case of E.M., a young man who has been profoundly deaf since birth, and who was fitted with auditory aids at the age of 15. He received no formal education and had no contact with the deaf community. He is learning his first formal language in adolescence, and his case provides a test of the hypothesis that there is a critical period for first-language acquisition. After 34 months of experience with verbal Spanish, E.M. has demonstrated improvement in the comprehension of negation, plurals, modification, and comparatives. However, he has shown difficulty with comprehension of prepositions, pronouns, conjunctions, and verb tense. His development is consistent with the hypothesis that there is a critical period for first-language acquisition, especially with regard to syntax.
Correspondence: *Gina M. Grimshaw, Department of Psychology, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada.*

R. PEACH, P. VAN SLYKE, & F. MORRELL. Some Effects of Multiple Subpial Transection on Language Production in Children with Landau-Kleffner Syndrome.
Multiple subpial transection (MST) has been used for the surgical treatment of the seizure and language disorders arising in children with Landau-Kleffner syndrome (LKS). However, language outcome data following this approach have been lacking. Our analysis of the spontaneous speech samples from three LKS children prior to and at 2 to 7 months following MST showed increased maximum utterance lengths in morphemes, increased mean lengths of utterances in morphemes, advanced stages of linguistic development, and decreased need for revisions of simple utterances following surgery. These preliminary results support findings with adults and provide an optimistic outlook for managing the language disorder of LKS with MST.
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I. ROULEAU, J. ROBIDOUX, C. DENAULT, M. SAMMARITANO, J.M. SAINT-HILAIRE, & N. GIARD. Mutism as the Sole Manifestation of Status Epilepticus.
The role of the supplementary motor area (SMA) in speech initiation was studied in a right-handed epileptic patient with a left SMA focus documented with depth-electrode recording. Following an anterior callosotomy, the patient presented with an episode of status epilepticus of 30 min duration while she was monitored on video-EEG. Vigilance was normal throughout the status. Speech suppression was complete except for rare severely dysarthric utterances produced in repetition. In contrast, written expression and auditory-verbal comprehension were normal. There was no buccofacial, limb-kinetic, or ideomotor apraxia. Motor functions were preserved except for a mild right transient facial paralysis. The absence of language, motor, or praxic deficits during the speech suppression period is compatible with separate pathways for initiation of oral and written expression. This highlights the implication of the left SMA in speech control. The uncommon pattern noted during Amytal testing (speech arrest right more than left, but paraphasias after left injury only) will also be discussed.
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D. VAN LANCKER, & R. BELLA. The Relative Roles of Repetition and Sentence Completion Tasks in Revealing Superior Speech Abilities in Patients with Nonfluent Aphasia.
Patients with nonfluent aphasia have preserved abilities for overlearned or "automatic" speech, but little is understood about these abilities in different production modes. Furthermore, comprehension deficits for conventional expressions are seen in persons with right-hemisphere damage, but production has not been assessed. Thirty-one left- and right-hemisphere stroke subjects as well as nine normal-control subjects were tested on repetition, multiple-choice completion, and free-form sentence completion of speech formulas and idioms, compared with literal expressions. While the groups differed across tasks, only free-form sentence completion resulted in a significant interaction.
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C. RANDOLPH, A. LANSING, R.J. IVNIK, C.M. CULLUM, & B.P. HERMANN. Determinants of Confrontation Naming Performance.
Confrontation naming tests are commonly employed in neuropsychological assessment. Surprisingly little work has been done, however, to determine how various demographic, linguistic, and disease status variables influence patterns of performance on these tests. The present study examined data on the Boston Naming Test (BNT) from a total of 1,131 subjects, including 719 normals, 325 patients with Alzheimer's disease, and 87 patients with temporal lobe epilepsy. The effects of age, education, gender, and diagnostic group were examined with respect to overall scores, the influence of phonemic cuing, and performance on individual items. Profiles of scores on individual items were similar across diagnostic groups, suggesting that anomia is characterized by quantitative rather than qualitative changes in naming performance. Age and education systematically influenced scores. There was a significant effect of gender across diagnostic groups (males scoring higher than females), which appears to be due to performance on specific items. Phonemic cuing effects were similar across groups. The results are discussed with respect to the neuropsychological construct of confrontation naming and the clinical interpretation of performance on the BNT.
Correspondence: *Christopher Randolph, Departments of Psychiatry and Neurology, Northwestern University Medical School, 303 E. Superior, Suite 543, Chicago, IL 60611, USA.*

T. CONWAY, P. HEILMAN, L. GONZALEZ-ROTHI, A. ALEXANDER, J. ADAIR, K. HEILMAN, & B. CROSSON. Remediating Acquired Phonological Alexia.
Acquired phonological alexia is characterized by impairment of the "grapheme-phoneme conversion" system. Auditory Discrimination in

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Depth (ADD) is a treatment method used with developmental dyslexia and is reported to effectively train phonological awareness. Therefore, the ADD program appeared appropriate for remediating difficulty of accessing the phonological representations of printed words. We report on the efficacy of the use of the ADD program as a treatment for a patient with phonological alexia from a left-hemisphere infarction. A multiple-probe, within-subject research design provided rigorous experimental control of this patient's response to treatment. His favorable response to the treatment included gains in phonological awareness, word attack, word identification, and spelling.

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MEMORY—1

R.D. JONES & D. TRANEL. Retrograde Temporal Gradients in Autobiographical Memory Associated with Focal Brain Lesions.

Temporally graded retrograde memory loss has been reported primarily in progressive dementing conditions. Because dementia may involve defects in encoding prior to the onset of frank signs and symptoms, the question of whether retrograde temporal gradients are unique to dementia, and secondary to subtle encoding defects, has been raised. This study addressed this issue by assessing the extent to which a group of 15 subjects with focal, discrete-onset brain lesions that resulted in retrograde memory defects showed temporally graded loss. Using a measure of autobiographical memory, the results suggest a clear temporal gradient in target subjects, relative to controls. The findings suggest that retrograde temporal gradients may be a basic aspect of remote memory loss, rather than an artifact of an encoding defect.

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J.H. RICKER & B.D. HOUTLER. Relationship Between Language and Verbal Memory Following Stroke.

Language and verbal learning functions were examined in demographically matched patients with left-hemisphere perisylvian infarction ($N = 33$), right-hemisphere perisylvian infarction ($N = 36$), and in a control group of orthopaedic patients ($N = 21$). Expected group mean differences were found on most language and verbal learning measures, with the left-hemisphere group performing at the lowest levels. Expressive and receptive language abilities accounted for significant amounts of variance across most indices of verbal memory in the left-hemisphere group. These abilities were not as significantly correlated with performance in the other two groups of patients. Within the left-hemisphere group, receptive language abilities were found to correlate most strongly with verbal memory in patients with posterior perisylvian lesions. In patients with anterior lesions, however, both expressive and receptive language abilities were strongly associated with verbal memory. These results suggested that language functions must be considered when assessing verbal learning, and that the specific types of language impairments may be differentially associated with various aspects of verbal memory performance relative to the location of the area of infarction.

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P.J. ESLINGER. Verbal Learning and Memory After Partial and Complete Lesions of the Left Medial Temporal Lobe.

To investigate the role of different medial temporal lobe structures in verbal learning and memory, eight nonepileptic patients with partial and complete lesions to this system were studied with anatomic localization methods and neuropsychological measures. Results indicated no significant impairment in verbal declarative memory tasks after amygdala damage, consistent with findings in the primate model. Damage to the posterior hippocampal formation or to medial temporal cortices alone resulted in moderate learning and memory impairments. When all medial temporal structures were damaged, the most severe learning and memory impairments were evident, exacerbated further by basal forebrain damage in one case. Basal forebrain lesions alone resulted in intermediate levels of impairment. Findings indicate that partial lesions must involve the hippocampus, entorhinal cortex, or basal forebrain to produce significant memory impairment.

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J.E. HERRON, L.M. GRATTAN, J. CAROSELLI, M. SLOAN, & P.J. ESLINGER. Impairment in Source Memory Following Left Dorsomedial Thalamic Stroke.

It is well established that the thalamus mediates an important role in human learning and memory. However, the specific contributions of the dorsomedial nucleus (DMn), particularly after unilateral damage, remain controversial. A previous study raised the possibility that bilateral damage to the DMn results in disturbed temporal ordering. We studied a 21-yr-old woman patient, who had sustained unilateral left DMn damage as a result of stroke, with standard and experimental measures of declarative memory, temporal processing (recency), and source-contextual memory. Findings indicated normal performance on declarative memory and experimental and temporal ordering tasks, but impaired performance on the source-contextual memory task. In concert with the prefrontal cortex, with which it is reciprocally interconnected, the left DMn may subserve a specific role in processing source-contextual information.

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K. CARROLL, R. McGLINCHEY-BERROTH, M. VERFAELLIE, L. CERMAK, & R. BAUER. Psychophysiology of Amnesia: The Role of Novelty and Significance in the Orienting Reflex.

Response to stimulus significance and novelty was investigated in a recurrent detection paradigm with amnesic Korsakoff patients, alcoholic controls, medial temporal amnesics, and normal controls in two separate conditions. Subjects were to behaviorally respond to either the first (novelty) or the second (repeated) presentation of a significant item. In the repeated condition, behavioral recognition was significantly impaired in amnesics compared to their respective controls. Skin conductance response (SCR), a physiological measure of orienting, indicated orienting to the second presentation of significant stimuli. For amnesics, orienting occurred only for those items that were overtly recognized. In the novel condition, Korsakoff patients made significantly more errors of inclusion accompanied by faster response times and greater SCR. These results suggest that the deficit in recognition memory in amnesia is accompanied by deficits in physiological orienting and that Korsakoff's amnesia is accompanied by inhibitory difficulties.

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C.I. AMAYA-SCIACCA, J.C. SELLERS, & A.L. OSTERGAARD. The Biasing of Tone Judgment in Patients with Dementia of the Alzheimer's Type (DAT), Amnesia (AM), and Huntington's Disease (HD).

This study investigates the biasing of tone judgments in three patient groups: DAT patients, AM patients, HD patients, and their matched controls. The experiment consisted of two study conditions: high bias (HB) and low bias (LB), as well as a test trial immediately following each condition. For each study condition, subjects were either presented with 40 pairs of high-frequency tones (HB condition) or low-frequency tones (LB condition). Immediately following each study condition, the subjects were asked to rate 10 individually presented tones on a scale from 1 (extremely low pitch) to 9 (extremely high pitch). Biasing was reflected

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in the difference in mean rating between the LB and HB test trials. All patient groups made more errors than their matched controls during the two study conditions. Furthermore, all groups judged the standard set of tones as higher following the LB condition, and as lower following the HB condition.
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J.S. CAROSELLI, L.M. GRATTAN, M.B. VIGLIETTA, E.F. ALDRICH, & D. RIGAMONTI. The Relationship Between Immediate and Delayed Memory Performance After Aneurysm of the Anterior Communicating Artery.
Extant data suggest that anterior communicating aneurysm (ACoA) patients demonstrate relatively intact immediate memory functioning and profound deficits with delayed memory. However, studies have usually not looked directly at the relationship between these memory constructs within a group of ACoA patients. For this study, such a relationship was investigated utilizing a group of 18 ACoA patients. The findings suggest that delayed memory deficits of ACoA patients are significantly related to problems with the initial encoding of the to-be-remembered information.
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R.C. MARTIN, C.S. WILSON, & M.W. HAUT. Anterograde Amnesia in a Patient Following Autologous Bone Marrow Transplantation.
This study describes the case of a 47-yr-old woman who underwent autologous bone marrow transplantation and subsequently developed a profound selective anterograde amnesia. Neuropsychological evaluation revealed within-normal-limits performance on measures of visual perception, visual construction, language, executive functioning, and speeded processing. However, she displayed dramatic impairments for auditory and visually based immediate and delay explicit memory tasks. Her recognition performance was likewise severely impaired. She displayed intact priming and procedural learning. Overall, her performance was characterized by profound anterograde amnesia in which consolidation processes were severely impaired. Although no clear etiology was determined, neurotoxicity secondary to chemotherapeutic agents, anoxia, and/or compromised autoimmune functioning are possible mechanisms.
Correspondence: *Roy C. Martin, Department of Behavioral Medicine and Psychiatry, West Virginia University, 930 Chestnut Ridge Rd., Morgantown, WV 26505-2854, USA.*

T. SULLIVAN, K. HAWKINS, & E. CHOI. Memory Deficits in Schizophrenia: Disrupted Information Acquisition or True Amnesia?
Many experts argue that the memory deficits observed in schizophrenia are caused by hippocampal damage, whereas others stress the contribution of impaired attention/organization. Memory and intelligence scores for 17 schizophrenic patients were compared to those of 33 nonschizophrenic psychiatric inpatients. Both groups displayed significant difficulties in attention, but the scores of schizophrenic and control patients were quite similar. Both patient groups exhibited reasonable rates of retention following delay. The findings provide little support for the idea that schizophrenic patients exhibit especially pronounced new learning/memory deficits. Theories that the poor memory scores of schizophrenic patients are due to hippocampally based "amnesia" were not supported.
Correspondence: *Thomas E. Sullivan, Department of Psychology, Children's Hospital Medical Center, 3333 Burnet, Cincinnati, OH 45229-3039, USA.*

D. WEISS, G. KAY, & S. COHAN. Preservation of Procedural Memory in Multiple Sclerosis.
The distinction between procedural and declarative memory systems has been well established. In a number of amnestic disorders, procedural memory remains intact while declarative memory is severely impaired. At present, there is little known about procedural memory in multiple sclerosis (MS). This paper reports on the case of a 43-yr-old man with chronic progressive MS who was administered tests of declarative and procedural memory. On tests of declarative memory (immediate and delayed recall and recognition of verbal and nonverbal information) he was markedly impaired. In contrast, on a procedural memory procedure he demonstrated normal acquisition and retention, even after a 3-h delay. The preservation of skill-based procedural learning in MS may reflect sparing of basal ganglia structures and striatal/frontal connections.
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THURSDAY MORNING, FEBRUARY 15, 1996

Paper Session1/9:00–10:40 a.m.

LANGUAGE–2

L.L. MURRAY, A.L. HOLLAND, & P.M. BEESON. Grammaticality Judgments of Individuals with Aphasia Under Dual-Task Conditions: A Study of Resource Allocation.
We studied the grammaticality judgments of aphasic individuals under dual-task conditions to examine resource allocation in aphasia due to frontal versus posterior lesions. Aphasic and control individuals made auditory grammaticality judgments during isolation, focused, and divided attention conditions. Introduction of a secondary, distractor task resulted in greater dual-task interference for aphasic than control individuals. Frontal and posterior aphasic groups performed similarly. Inefficient resource allocation skills were indicated, given that aphasic individuals shared resources between the grammatical and distractor tasks rather than prioritized resources as task instructions explicitly requested and as the controls did. The lack of quantitative and qualitative differences between aphasic groups suggests that integrity of both frontal and posterior brain regions may be necessary for successful resource allocation.
Correspondence: *Laura Murray, Department of Speech and Hearing Sciences, Indiana University, Bloomington, IN 47405, USA.*

J.L. INGLES, C.C. MATE-KOLE, & J.F. CONNOLLY. Intact Spontaneous Speech Production in a Case of Fluent Aphasia: Evidence for an Alternative Output Route.
A case study is reported of a 23-yr-old woman who developed fluent aphasia with superior reading relative to auditory comprehension following herpes simplex encephalitis. Her language disturbance showed exceptional features: oral reading, repetition, and naming to confrontation were severely impaired, yet her spontaneous speech recovered to be relatively intact. These features are not consistent with any classic aphasic syndromes or previous case reports. These findings suggest the existence of an alternative route for spontaneous speech production that may be selectively spared. The cognitive mechanisms that may under-

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lie this deficit profile will be discussed with reference to other acquired language disorders.
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T. BLAXTON, A. MARTIN, E. HOFFMAN, & F. LALONDE. Dissociations in Semantic Priming Between Anomic Patient Groups.
Differences in semantic priming were explored between anomic groups with Alzheimer's disease (AD) and temporal lobe epilepsy (TLE) in a word reading task. Results revealed that, compared to elderly controls, AD patients showed hyperpriming in response times relative to an unrelated condition at short (250 ms) and medium (750 ms) SOAs, but no facilitation at a long (2 s) SOAs. The TLE patients showed the opposite pattern with semantic inhibition at short and medium SOAs and facilitation at the long SOAs relative to a group of younger controls. These results suggest that different mechanisms underlie the disturbances in access to semantic knowledge in these two anomic patient groups.
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R. HART, W. BEACH, J. TAYLOR, & E. PECK. A Case of Progressive Apraxia of Speech and Nonfluent Aphasia.
A 67-yr-old female presented with a progressive deficit over a 2–2.5-yr period characterized by apraxia of speech and mild nonfluent aphasia. Mild neuropsychological impairments were incompatible with dementia. Mild right upper-extremity motor impairment and SPECT findings were localizable to the left hemisphere. There was no identifiable cause for the progressive deficits in motor speech and expressive language. The patient's deficit appears to represent a variant of the recently described clinical presentation of progressive motor speech impairment.
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J.C. ADAIR, R.L. SCHWARTZ, D.J.G. WILLIAMSON, A.M. RAYMER, & K.M. HEILMAN. Articulatory Function and Phonological Dyslexia.
The process of grapheme-to-phoneme (GPC) conversion allows pronunciation of nonword letter strings and real words for which literate readers have no prior experience. While cross-modal association between visual (orthographic) and auditory (phonemic-input) representations may contribute to the GPC system, many cases of deep or phonological alexia result from injury to anterior perisylvian regions. Thus, the GPC route may rely upon associations between the orthographic and articulatory (phonemic-output) representations. Analysis of a patient with phonological alexia suggests that defective knowledge of the position and motion of the articulatory apparatus might contribute to impaired transcoding from letters to sounds.
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J.J. SIDTIS, S.C. STROTHER, J.R. ANDERSON, K. SCHAPER, & D.A. ROTTENBERG. Mapping Functional Connectivity of the Human Speech System.
Critical brain regions in the functional organization of the speech system are well known from lesion studies. Using a standard speech task, functional maps were acquired from 13 normal right-handed volunteer subjects (eight females and five males aged 43 ± 11 yr) using [^{15}O]water PET. Separate analyses using the standard subtraction technique and a regional covariance approach, the Scaled Subprofile Method, both revealed substantial regional cerebral blood flow increases in the cerebellum, superior temporal lobe, motor strip, and supplementary motor area. There are two striking aspects to these data: (1) bilaterality of the increases, especially in the cerebellum and motor strip; and (2) an asymmetry favoring the right side at the superior temporal lobe. When simply assuming that flow increases indicate critical involvement, the description of the functional organization for speech based on these [^{15}O]water PET results are at odds with the lesion data. Until the physiology reflected in functional imaging is better understood, brain maps should not rely on a single source of data.
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Paper Session 2/9:00–10:40 a.m.

MULTIPLE SCLEROSIS

J. ROSENBAUM, C.A. LEAVELL, & A.M. LASOSKI. Cognitive Predictors of Multiple Sclerosis Rehabilitation Outcome.
Predicting the recovery of function in rehabilitation is becoming increasingly important in today's changing health care environment. This study examines the association between rehabilitation outcome for 24 subjects' status post-multiple sclerosis exacerbation and several standard neuropsychological instruments tapping areas such as simple and sustained attention, as well as declarative and procedural learning/memory. Instrumentation included total FIM discharge-admission change score, WAIS-R Digit Span, Attention Capacity Test, 7/24 Spatial Recall Test, CVLT, and Rotary Pursuit Test. Zung and Geriatric Depression Scales were also used to rule out depression as a mediating variable. Results indicate that neuropsychological assessment can provide predictive information regarding who is likely to benefit from comprehensive acute rehabilitation efforts, and thereby assist with allocating rehabilitation funds and establishing appropriate rehabilitation goals.
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A.E. THORNTON, K.A. TUCKER, L. TARDUGNO, & N. RAZ. Memory in Multiple Sclerosis: Evidence of Deficits in Effortful Encoding.
Memory deficits in patients with multiple sclerosis (MS) have been attributed to retrieval failure, whereas encoding processes are presumed intact. However, support for this view comes from studies in which effortful encoding operations were not investigated systematically. We used an encoding specificity paradigm in which both encoding and retrieval demands were systematically manipulated. We hypothesized that MS subjects would evidence selective impairment in retrieving items from memory when required to form novel cue–target associations at encoding, but not when cues bear strong preexisting relationships to targets. The findings supported the hypotheses and suggest that MS patients exhibit deficits in binding novel contextual information to memory targets at encoding, while gaining access to memories effectively through preexisting associations organized in a semantic network.
Correspondence: *A.E. Thornton, Department of Psychology, The University of Memphis, Memphis, TN 38152, USA.*

D.X. CAPRUSO, L.M. JACOBS, & K. DES. HAMSHER. Memory for Recent U.S. Presidents in Multiple Sclerosis.
Memory for recent U.S. Presidents in patients with multiple sclerosis (MS; $N = 18$) was compared against patients with psychiatric disorder ($N = 22$). Mean memory performance of the MS group was significantly worse in Verbal Naming (free recall), Verbal Sequencing, and Photo Sequencing formats, but not in a Photo Naming format. Rates of defective performance (<5th percentile) were significantly worse for MS patients in the Photo Sequencing format. There were no qualitative differences in temporal gradients of recent memory between the groups for the 20-yr interval tested. Decreasing memory for more remote Presidents was apparent in all but the Photo Naming format, where a flat gradient was observed. For MS patients, degree of temporal disorientation emerged as the primary cognitive correlate of recent memory loss.
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R.H. PAUL, C.R. BLANCO, K.A. HAMES, & W.W. BEATTY. Autobiographical Memory in Multiple Sclerosis.

Autobiographical memory was studied in 44 multiple sclerosis (MS) patients and 19 normal controls with the Autobiographical Memory Interview (AMI). A recall test of past U.S. Presidents, a version of the Famous Faces Test (FFT), and a word list (WL) with immediate and delayed recall were also administered. Patients were impaired on the WL and FFT, but not on the Presidents test (PT). On the AMI, patients were impaired on the personal semantic schedule (PSS), but not on the autobiographical incident schedule (AIS).

Because the AMI tests information that subjects definitely once knew, these findings provide clear evidence for retrograde amnesia in MS. Failure to observe group differences on the PT and AIS is probably due to the brevity of these measures of remote memory.

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H.A. WISHART. Neuropsychological Aspects of Multiple Sclerosis: A Meta-Analytic Review.

Neuropsychological studies of multiple sclerosis, dating from the period 1974 to 1994, were reviewed using meta-analysis. Mean effect sizes (M_r) comparing multiple sclerosis (MS) and healthy control groups, categorized by neuropsychological domain, were generally moderate in magnitude; all were statistically significant (M_r = .18 (.10) to .37 (.21), z^+ = .18 to .39, all $p < .05$). Analyses employing M_r and the Common Language Effect Size Statistic (CL) indicated that impairment on the following variables was particularly characteristic of MS: cognitive screening tests, nonverbal intellectual ability, attention, executive ability, visuospatial ability, learning, recall and recognition, motor ability, interhemispheric transfer, and depressed mood (M_r = .24 (.11) to .46 (.30), z^+ = .20 to .48, all $p < .05$).

Correspondence: *Heather Wishart, Department of Psychology, P.O. Box 5050, University of New Brunswick, Saint John, New Brunswick E2L 4L5, Canada.*

P. ARNETT & S. RAO. Processing Speed and Long-Term Memory in MS.

Because of the significant working memory demands of processing speed measures used in previous research in multiple sclerosis (MS), it is possible that performance on these measures is correlated with memory performance because of their memory demands rather than processing speed demands. We compared a group of slow processing MS patients to a group of MS patients and a group of nonpatient controls with unimpaired processing speed on (1) two memory tasks presented at a rapid rate, and (2) a memory task on which subjects controlled rate of presentation. The slow processing MS group performed significantly worse on the long-term memory measures compared to the other groups. Our results indicate that some MS patients have difficulty with long-term memory tasks regardless of processing speed demands.

Correspondence: *Peter Arnett, Department of Psychology, Washington State University, Pullman, WA 99164-4820, USA.*

Paper Session 3/9:00–10:40 a.m.

ATTENTION – 1

P. PRATHER, H. BROWNELL, A. ALEXANDER, A. ESTIN, & D. ARAM. Developmental Trends and Right Hemisphere Contributions to Anticipation.

Developmental studies of attention and attention-deficit disorders have largely targeted ability to sustain, select, and inhibit areas that show clear developmental progression between the ages of 6 and 12. Independently of age, the right hemisphere appears to play a primary role in many aspects of attention. In the present research, ability to anticipate is examined both with respect to its normal development and with respect to whether the right hemisphere plays a primary role. In the first experiment, a simple target detection task was used to test ability to detect regular patterns and then use those patterns in a large group of children between the ages of 7 and 14. Across that age range, all groups noticed and actively used the embedded patterns to anticipate targets. In a second experiment, the same task was used to examine ability to notice and anticipate in groups of children between the ages of 12 and 16 with unilateral right- and left-hemisphere lesions, as well as in a group of age- and sex-matched controls. Both left-hemisphere-damaged and control subjects noticed patterns and anticipated targets; in contrast, although right-hemisphere-damaged subjects noticed the patterns, they did not use them to anticipate targets. It thus appears that as with many other aspects of attention, the right hemisphere is implicated in active anticipation.

Correspondence: *Penny Prather, Department of Psychiatry/Neuropsychology, Children's Hospital, 300 Longwood Ave., Boston, MA 02115, USA.*

M. MENNEMEIER, M. DILLON, & A. CHATTERJEE. The Influence of Convergence and Right Versus Left Eye Viewing on the Cross-over Effect in Spatial Neglect.

Patients with left-neglect bisect long lines right of center and short lines left of center (i.e., crossover). These patients failed tests of visual convergence that should result in double vision. Poor convergence could explain cross-over if the patients perceived elongated images of short lines. Alternatively, they would have to complete bisections based on information from one eye. To test these hypotheses, patients with and without neglect bisected short and long lines monocularly and binocularly. Crossover could not be explained by perceptual elongation because it occurred during monocular viewing. Instead, a pronounced crossover effect was observed for the left but not right eye in both patient groups, suggesting that the left eye predominantly accounted for the crossover effect.

Correspondence: *Mark Mennemeier, Department of Rehabilitation Medicine, University of Alabama, 1717 6th Ave. S, Birmingham, AL 35233-7330, USA.*

P. PRATHER, H. BROWNELL, & A. ALEXANDER. Contributions of the Left Versus Right Hemisphere to Selective Attention.

Although the right hemisphere generally is considered to play the primary mediating role in attention, both the right and left hemispheres are arguably implicated in selective attention. Respective roles of the right and left hemispheres in selective attention are examined in the present research using an adaptation of Treisman's conjunction search paradigm. Subjects were presented with stimulus arrays of varying set sizes (from 8 to 24 items) and asked to decide as quickly as possible if a specified target was present or absent. The target was always a striped circle, and distractors included striped and checkerboard squares and checkerboard circles. Speed of target search is reflected in the slope of reaction times as a function of set size. Subjects included 12 right-hemisphere-damaged (RHD) patients, 12 left-hemisphere-damaged (LHD) patients, and 20 young and 20 older normal control subjects. Normal control and RHD subjects showed slower search in the left than right visual field (i.e., slower processing in the right hemisphere); relative to controls, LHD subjects showed slow search in both hemispheres. It appears, then, that it is the left (not right) hemisphere that plays the primary mediating role in a conjunction search paradigm.

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D.H. WEISSMAN & M.T. BANICH. Interhemispheric Interaction Reduces Interference in a Global-Local Paradigm.

In the present study, we examined whether global and local aspects of hierarchical stimuli are indeed processed in distinct hemispheres and whether interhemispheric communication is necessary to produce global-local interference. Utilizing a paradigm that has been used to investi-

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gate differences between intra- and interhemispheric processing, we required subjects to indicate whether two hierarchical stimuli were identical at a predesignated level (e.g., global or local). Information at the unattended level could lead either to the same response or to a different response as information at the attended level. Contrary to other research, we found that interhemispheric communication reduced interference between the global and local levels.
Correspondence: *D.H. Weissman, Department of Psychology and the Beckman Institute, University of Illinois at Urbana-Champaign, 603 E. Daniel St., Champaign, IL 61820, USA.*

M.T. BANICH & A. PASSAROTTI. Encapsulation of Processing Within and Between the Hemispheres.
In this study we examined the effect of interhemispheric interaction in a selective attention paradigm. Subjects decided if a bottom item matched either of two top items with regard to shape (while ignoring color). We found that when the nonmatching item was presented in the opposite rather than the same visual field as the bottom item, interference engendered by incompatibility with regard to the nonattended attribute (i.e., color) was reduced. These findings suggest that processing within each hemisphere can be encapsulated. Furthermore, the findings are consistent with previous reports suggesting that whether the hemispheres process information separately or share information has important consequences for attentional processing.
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Poster Session 2/9:00 a.m.–12:00 p.m.

ALZHEIMER'S DISEASE–1

A.K. TROYER & M. MOSCOVITCH. Clustering and Switching on Verbal Fluency Tests: Evidence from Healthy Controls and Patients with Alzheimer's and Parkinson's Disease.
Verbal fluency is a frequently used neuropsychological test, yet little is known about its cognitive underpinnings. Two components of fluency, clustering and switching, were examined. Among healthy adults, number of words produced on a phonemic fluency task was significantly correlated with switching but not cluster size, whereas number of words produced on a semantic fluency task was correlated with both components. In comparison to controls, patients with Alzheimer's dementia produced smaller clusters on both tasks and switched less often on the semantic task, whereas patients with Parkinson's dementia produced normal cluster sizes but switched less often on both tasks. Findings support the idea that switching is related to frontal lobe functioning, whereas cluster size is related to nonfrontal, most likely temporal lobe, functioning.
Correspondence: *Angela K. Troyer, Rotman Research Institute, Baycrest Geriatric Centre, 3560 Bathurst St., North York, Ontario M6A 2E1, Canada.*

A. CHAN, N. BUTTERS, & D. SALMON. Deterioration of the Semantic Network in Patients with Alzheimer's Disease: A Cross-sectional Study.
Studies showed that the semantic networks of Alzheimer's disease (AD) patients are disrupted even in the early stage of the disease. The present study examined the semantic networks of 33 AD patients in different stages of disease to determine if the abnormality of their semantic networks increases as the disease progresses. Examining the properties of the semantic networks, including the dimensionality and strength of connections by multidimensional scaling and Pathfinder analyses, showed that as the AD patients become more demented, they focus less on an abstract attribute in categorizing concepts, and are less able to discriminate the relative strength of associations between concepts. These results support the hypothesis that the structure of semantic knowledge is deteriorating throughout the course of AD.
Correspondence: *Agnes Chan, School of Medicine, University of California, San Diego, CA 92126, USA.*

J. RAZANI, A. CHAN, S. NORDIN, D. GUTIRREZ, R. TEDROW, & C. MURPHY. A Comparison of Semantic Networks for Odors and Colors in Alzheimer's Patients and Normal Elderly.
Patients with Alzheimer's disease (AD) demonstrate a breakdown in the structure of semantic knowledge, including a deterioration in associations among concepts. It is unknown, however, whether networks of less conceptual and more sensory character, such as those for odors and colors, are also affected in AD. Due to decline in both sensory- and cognitive-based olfactory function in AD, we hypothesized that the semantic networks for the olfactory modality will differ in AD and normal elderly subjects. Because the visual modality is largely spared from functional changes in AD patients, one might suspect that the associative networks for colors would be relatively intact. In testing these hypotheses, the multidimensional (MDS) space of similarity judgments for odors and for colors was examined in triadic comparisons. MDS analyses revealed a difference in the spatial map of the AD patients compared to normal elderly for odors, but not for colors. The present findings suggest a breakdown in the semantic network for odors in AD patients, perhaps due to the central nervous system neuropathology found in areas associated with processing of olfactory information.
Correspondence: *Jill Razani, SDSU-UCSD Joint Doctoral Program in Clinical Psychology, San Diego, CA 92120, USA.*

A. LINDSAY, R. YEO, & T. GOLDSMITH. The Organization of Semantic Information in Senile Dementia Alzheimer's Type.
This study attempted to characterize the knowledge representation of individuals with senile dementia Alzheimer's type (SDAT). SDAT patients were found to have a selective loss of biological knowledge compared to human-made knowledge, yet they preserved superordinate biological and human-made knowledge. These findings were consistent with Shallice's semantic degradation syndrome. Findings from this study suggest that the semantic memory may be organized according to three different classes of semantic knowledge: sensory, superordinate/subordinate, and category-specific information. The presence of a category-specific semantic decline may represent one type of semantic impairment. Additionally, the presence of semantic degradation may be a possible diagnostic sign for recognizing individuals with SDAT.
Correspondence: *Allen Lindsay, 27 Chapman Blvd., Somers Point, NJ 08244, USA.*

K.K. LINDMAN. Gender Differences in Dementia of the Alzheimer's Type: Evidence for Differential Semantic Memory Degradation.
Dementia of the Alzheimer's type (DAT) is a progressive degenerative disorder with neuropsychological deficits marked by a deterioration in memory, language, visuospatial abilities, and executive functioning. Visual confrontation naming is one of the language abilities that is affected in DAT. In this study, gender differences in confrontation naming were examined in archival data obtained from 68 participants diagnosed with "probable" DAT (pDAT) and 80 normal controls. Results from a hierarchical analysis indicated that female pDAT patients performed significantly worse on the Boston Naming Test (BNT) than male pDAT patients. This gender difference in pDAT on the BNT was related to performance on a category verbal fluency test (animals). These results suggest greater semantic memory degradation in pDAT females than pDAT males.
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K.A. WELSH, S. MIRRA, G. FILLENBAUM, M. GEARING, D. BEEKLY, & S. EDLAND. Neuropsychological and Neuropathological Differentiation of Alzheimer's Disease from Other Dementias: The CERAD Experience.
The present study explored the neuropsychological profiles of the 166 clinically diagnosed Alzheimer's disease (AD) cases that came to autopsy in the CERAD multicenter study. There were four neuropathologically defined groups: AD alone ($N = 76$); AD/vascular changes (VaD; $N = 38$); AD/Parkinson disease (PD) changes ($N = 30$); non-AD dementia, a mix of mostly subcortical pathologies ($N = 22$). The results show that two groups (AD and AD/VaD) had more rapid forgetting rates on entry than did the other two ($F = 4.51$, $p < .005$). These results support our previous observations that rapid forgetting is a particularly sensitive neuropsychological index of AD, suggesting that this measure may help differentiate AD from dementias involving subcortical lesions.
Correspondence: *Kathleen A. Welsh, Bryan ADRC, Durham, NC 27705, USA.*

B. REED, K. PALLER, & D. MUNGAS. Rate of Forgetting for Visual Stimuli in Aging and Mild Dementia.
Evidence on rate of forgetting in Alzheimer's disease (AD) is contradictory and may depend in part on the timecourse of the measures of learning and forgetting. We devised a computer-driven test of visual recognition memory that measures forgetting at 10 min compared to a baseline of immediate recognition. Manipulation of initial exposure times of the targets allows for matching initial learning in memory-impaired and normal subjects. In this study we compared AD patients with age-matched healthy elderly controls. A significant number of patients could not accomplish the task despite exposure times three to four times longer than controls. The remaining AD subjects were equivalent to controls on immediate recognition, but recognized significantly fewer targets at 10 min, suggesting an abnormally rapid forgetting over this interval in AD patients.
Correspondence: *Bruce Reed, Department of Neurology, University of California at Davis, 2001 Dwight Way, Berkeley, CA 94704, USA.*

E. GROBER & C. KAWAS. Learning and Retention in Very Early AD.
Disagreement about the occurrence of accelerated forgetting in very early Alzheimer's disease (AD) was investigated by measuring acquisition and retention in 20 incident cases of AD at baseline and 3 yr later using free and cued selective reminding (FCSR), a test that maximizes learning by inducing deep semantic processing and by coordinating study and test conditions. AD patients recalled significantly fewer words at baseline than matched controls, indicating an impairment of learning; nonetheless, their retention was identical to controls. A retention deficit was documented at follow-up for AD patients but not for controls whose retention was still perfect. Thus, a retention deficit is not present in very early AD when hallmark learning deficits can be documented.
Correspondence: *Ellen Grober, Department of Neurology, Albert Einstein College of Medicine, 1300 Morris Park Ave., Bronx, NY 10461, USA.*

G. GLOSSER, R.B. FRIEDMAN, S.E. KOHN, & P.K. GRUGAN. Repetition of Single Words and Nonwords in Alzheimer's Disease.
Repetition of single words and pronounceable nonwords (pseudowords) was assessed in Alzheimer's disease (AD) patients to evaluate how phonological processing is accomplished when semantic and conceptual knowledge are impaired. Despite their semantic problems, AD patients, like healthy controls, showed a significant advantage for repeating real words compared to pseudowords. These results support the postulated existence of a lexical phonological system that processes linguistic information independent of its meaning. Both AD patients and healthy controls showed a significant advantage for repeating pseudowords with lexical analogies compared to pseudowords without analogies in English. These results further suggest that repetition is normally accomplished through automatic access to lexical phonological knowledge, rather than relying on a separate nonlexical processing mechanism. Taken together, the findings support the existence of a lexical phonological system that is relatively preserved in patients with mild-to-moderate AD and that processes both words and nonwords independent of semantic influences.
Correspondence: *Guila Glosser, Department of Neurology, Graduate Hospital, 1 Graduate Plaza, Philadelphia, PA 19146, USA.*

V.W. HENDERSON, B.J. CHERRY, & J.G. BUCKWALTER. Memory Span Procedures and Working Memory in Alzheimer's Disease.
Within a working memory framework, the digit span and visual memory span forward are conceptualized as involving subsidiary systems that maintain information for complex manipulations. Corresponding backward spans rely more on a central executive system (CES) that allocates processing resources. Forty-nine patients with probable Alzheimer's disease and 49 matched nondemented elderly control subjects were studied. As hypothesized, measures of CES derived from backward span procedures discriminated between groups and predicted dementia severity within the Alzheimer's group. Contrary to predictions, forward spans representing subsidiary working memory functions were also significant predictors of group. Of the individual span measures, visual memory span backward was the most significant predictor of both group membership and dementia severity, and together the two backward spans correctly classified 84% of Alzheimer's disease cases and 88% of control subjects.
Correspondence: *Victor Henderson, Departments of Neurology and Psychology, and the School of Gerontology, University of Southern California, 1200 N. State St., Los Angeles, CA 90033-1084, USA.*

B.J. CHERRY, J.G. BUCKWALTER, & V.W. HENDERSON. Episodic Memory in Alzheimer's Disease: Comparisons of Digit Span, Wordspan, and Immediate and Delayed Recall on a Supraspan Word List.
We compared performances on episodic verbal memory tasks for 20 subjects with probable Alzheimer's disease and 21 elderly nondemented controls. Short-term memory tasks were digit span (DS), wordspan (WS), and immediate recall (T1) of a supraspan word list, as well as measures of serial position (primacy, recency, and middle). Long-term memory was measured by delayed recall (DR) of the word list. Significant differences between WS and DS for both groups suggest that one part of the difference between DS and supraspan recall is the type of information recalled, with digits representing highly overlearned verbal material. However, as hypothesized, WS was greater than T1 for Alzheimer's disease subjects, but not control subjects, suggesting that deficits in information processing contribute to poor performance by these patients on the supraspan task. Serial position on the supraspan list confirmed a loss of primacy but also showed loss of recency for demented subjects. Between-group differences for short-term memory were largest for T1 and primacy. When a long term memory measure (DR) was included, DR best predicted group differences.
Correspondence: *Barbara Cherry, Andrus Gerontology Center, University of Southern California, Los Angeles, CA 90089-0191, USA.*

C.F. MURPHY & D.A. WHITE. Nonverbal Auditory Working Memory Deficits in Adults with Senile Dementia of the Alzheimer Type.
Previous research of working memory deficits in senile dementia of the Alzheimer type (SDAT) has relied heavily on verbal and spatial stimuli. Fifty adults diagnosed with very mild and mild SDAT and 20 controls matched for age and education were tested on measures of verbal and nonverbal auditory working memory and pitch discrimination. The ability to discriminate pitch in a simple task did not differ between the dementia and control groups. On a more complex auditory discrimination task that placed more demands on working memory, those with mild dementia performed worse than the control group. A similar pattern was found for verbal memory span tasks. These findings suggest that pitch discrimination may be intact in early stages of Alzheimer's disease and extend findings of working memory deficits in SDAT to tonal stimuli.
Correspondence: *Christopher Murphy, Department of Psychology, Washington University, St. Louis, MO 63130, USA.*

W.P. GOLDMAN. Life Transition Event Memories in Patients with Alzheimer's Disease.
The main goal of the present study was to determine if there are conditions in which remote autobiographical memory is spared in Alzheimer's disease (AD). Sixteen patients with AD and 16 elderly controls recalled and dated their marriage and the birth of their first child. These memories are referred to as "life transition event memories" and are typically well remembered by normal controls. AD patients recalled less in terms of the quantity of information provided. Patients frequently reported the facts surrounding the events and not the episodic detail characteristic of the accounts provided by controls. Additionally patients were impaired in their ability to date the events. Thus, memory for life transition events is not immune to the dementing process for AD patients.
Correspondence: *William Goldman, Department of Psychology, Emory University, Atlanta, GA 30322, USA.*

P.M. MAKI & D.S. KNOPMAN. Conceptual and Perceptual Implicit Memory in Alzheimer's Disease.
Previous studies suggested that perceptual implicit memory is spared in Alzheimer's disease (AD), whereas conceptual implicit memory is not. The present study investigated an alternative hypothesis, namely, that methodological differences in perceptual and conceptual implicit tests could account for differences in performance. Fourteen AD subjects, 16 elderly controls, and 16 younger controls participated in structurally parallel conceptual and perceptual tests of implicit memory that required production of studied items. Results showed normal perceptual and conceptual priming when subjects with AD had generated items at study, but impaired priming in both tests when they had merely repeated items at study. This pattern of results suggests that similarity of study and test procedures is more important than the type of information probed in the implicit test.
Correspondence: *Pauline M. Maki, Department of Psychiatry and Behavioral Sciences, The Johns Hopkins University, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287, USA.*

G. PEAVY, D. SALMON V. RICE & N. BUTTERS. Longitudinal Assessment of Severe Alzheimer's Dementia.
The present study examined the efficacy of the Severe Cognitive Impairment Profile (SCIP) for assessing cognitive decline in severely demented patients with probable Alzheimer's disease (AD). The SCIP, Mini-Mental State Exam, and Mattis Dementia Rating Scale were administered to 19 severely demented AD patients at two time points separated by approximately 1 yr. The SCIP was able to effectively measure longitudinal decline in cognitive functioning both globally and in specific cognitive domains. Because of its ability to avoid floor effects, the SCIP was found to be a better measure of cognitive decline in patients with severe dementia than traditional mental status examinations.
Correspondence: *Guerry M. Peavy, Department of Psychiatry, University of California, San Diego, 9500 Gilman Dr., La Jolla, CA 92093-0948, USA.*

D.X. RASMUSSON, K.A. CARSON, R. BROOKMEYER, C. KAWAS, & J. BRANDT. Predicting Rate of Cognitive Decline in Probable Alzheimer's Disease with a Random Effects Regression Model.
Recent attempts to identify predictors of rate of decline in Alzheimer's disease (AD) have varied in methodology and results. Many prior methodological limitations were overcome in this study by using a random effects regression model to seek predictors of decline on the Mini-Mental State Exam in 132 patients with probable AD reassessed every 6 months for up to 7.5 yr. Potential predictor variables were of three types: patient characteristics, clinical variables, and cognitive performances. The final multivariate analysis indicated that the following characteristics predicted more rapid cognitive decline: greater education, history of dementia in a first degree relative, non-right handedness, good object naming to confrontation, poor naming to verbal description, and poor visuospatial construction.
Correspondence: *Xeno Rasmusson, Johns Hopkins School of Medicine, Meyer 218, 600 N. Wolfe St., Baltimore, MD 21287-7218, USA.*

M. SANO, C. ERNESTO, M. KLAUBER, K. SCHAFER, P. WOODBURY, M. GRUNDMAN, L. THAL, & ALZHEIMER'S DISEASE COOPERATIVE STUDY. Using the ADAS to Assess Change Among Moderately and Severely Impaired AD Patients.
The Alzheimer's Disease Assessment Scale, cognitive portion (ADAScog) is often the primary outcome measure to assess efficacy in clinical trials for AD. We examined the ADAScog scores of patients with AD enrolled in a double-blind clinical trial to determine the feasibility of using this in AD patients with moderate-to-severe disease. Patients were stratified according to MMS status and followed for at least a year. Among the lowest strata, nearly 50% of the patients were unable to complete all task items. There was a significant inverse relationship between 1-yr ADAScog change scores and baseline MMS (i.e., those with the lowest baseline MMS scores showed the largest decline). These results suggest caution in interpreting changes in the ADAScog score in AD patients of moderate severity because of difficulty in completion and sensitivity to baseline severity.
Correspondence: *Mary Sano, Department of Neurology and G. H. Sergievsky Center, Columbia University College of Physicians and Surgeons, 630 W. 168th St., New York, NY 10032, USA.*

J.A. BARTOK, C.S. WILSON, B. GIORDANI, N. FOSTER, & S. BERENT. Longitudinal Investigation of Response Bias, Recall, and Recognition in Alzheimer's Disease
This longitudinal study considered changes in verbal retention in patients diagnosed with probable Alzheimer's disease (AD). Fifty-seven patients with AD were evaluated at least twice within 18–36 months with a 10-item, single-category word list learning task using selective reminding procedures. Individual growth curve analysis reveals free recall as more sensitive to dementia progression than signal detection parameters of recognition performance. Contrary to a previous report, response bias showed variability within patients with progressive dementia across testing sessions and was not consistently or progressively liberal. No significant relationship between response bias and other neurocognitive measures was observed.
Correspondence: *Christina Wilson, Department of Behavioral Medicine & Psychiatry, WVU School of Medicine, 930 Chestnut Ridge Rd., Morgantown, WV 26505-2854, USA.*

D.M. WHITESIDE, J. BARTOK, & L. BIELIAUSKAS. Factor Analytic Structure of Attention Measures in Dementia Patients.
Several aspects of attention/concentration have been identified in the literature including selective attention, capacity, and switching. However, research has not fully confirmed these hypothesized different components of attention. This study utilized a factor analytic approach to determine which aspects common to neuropsychological measures of attention (digit span, arithmetic [WAIS-R], mental control, trailmaking, reaction time, and serial sevens [Mini-Mental Status Examination]) are found in dementia patients. Results suggest that when composite scores are used, a one-factor solution is found, but when tests are divided into subcomponents (i.e., Digits Forward and Backward), a three-factor solution is found. Results broadly replicate the three-factor solution of others who studied mildly impaired patients.
Correspondence: *Douglas Whiteside, Department of Psychology, University of Nebraska Medical Center, 600 S. 42nd St., Omaha, NE 68137-5577, USA.*

A. RAMAGE, K. BAYLES, & N. HELM-ESTABROOKS. Frequency of Perseveration in Normal Versus Alzheimer's Disease Subjects: A Proposed Screening for Differential Diagnosis.
Perseveration, when pronounced, is said to be a sign of disturbed brain function. Nevertheless, normal individuals may perseverate on certain

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tasks, so the term "pronounced" must be quantified if perseveration is to be a marker of brain damage. The purposes of this study were to investigate the frequency of perseveration in normal subjects and to explore possible age effects. Young normal, older normal, and mild Alzheimer's disease (AD) subjects were given a Card Sorting task and a Generative Naming task and perseveration frequencies were compared. Perseveration ratio scores (perseverations/total responses) were found to differ significantly between normal and AD subjects. These ratios may be used as cutoff scores in screening for dementia.
Correspondence: *Amy E. Ramage, Center for Neurogenic Communication Disorders, University of Arizona, Tucson, AZ 85721, USA.*

M. MITRUSHINA, C.L. UCHIYAMA, P. SATZ, C. DREBING, W. VAN GORP, & A. CHERVINSKY. Cognitive Subtypes in Dementia of Alzheimer's Type.
The study explores the presence of distinct clinical subgroups in a sample of patients with diagnoses of possible/probable dementia of Alzheimer's type (DAT), as well as suspected DAT in patients referred for a neuropsychological evaluation. One hundred ten subjects ranged in age from 52 to 84 yr. Six clusters were extracted. Results are consistent with our previous findings reported on other elderly samples and support the following hypotheses of subtypes in DAT: (1) they can be viewed as extensions of distinct subtypes that are inherent in cognitive profiles of normal elderly; (2) different patterns of cognitive deficits are accounted for by differential effects of the process of degeneration on different brain areas.
Correspondence: *Maura Mitrushina, Psychiatry Department, UCLA/NPI, 760 Westwood Plaza, Los Angeles, CA 90024, USA.*

N. PACHANA, K. BOONE, B. MILLER, J.L. CUMMINGS & N. BERMAN. Comparison of Neuropsychological Functioning in Alzheimer's Disease and Fronto-Temporal Dementia.
Empirical verification of neuropsychological changes distinguishing Alzheimer's disease (AD) from fronto-temporal dementia (FTD) is lacking. Archival data on 15 FTD patients, 16 AD patients, and 16 matched controls were compared. Controls outperformed patient groups on verbal and nonverbal memory, executive ability, and constructional skill, with AD patients showing more widespread memory decline. No group differences were found on word retrieval, recognition memory, or basic attention. Profile of relative strengths and weaknesses on neuropsychological tests showed AD patients having greater impairment on memory and construction tasks, with executive tasks relatively spared; the opposite pattern characterized FTD patients. Findings suggest that examination of relative rankings of scores across cognitive domains may be more useful in differential diagnosis than analysis of individual neuropsychological scores.
Correspondence: *Nancy A. Pachana, Department of Psychiatry and Biobehavioral Sciences, UCLA-NPI, 760 Westwood Plaza, Los Angeles, CA 90024, USA.*

C.M. CULLUM, K.K. BREWER, M.F. WEINER, R.C. RISSER, C.L. WHITE III, L. HONIG, P.M. ADAMS, & R.N. ROSENBERG. Neuropsychological Performance of Histopathologically Confirmed Alzheimer's Disease and Lewy Body Disease Patients on the CERAD Battery.
Alzheimer's disease (AD) and the Lewy Body variant of AD (LBV) present with several distinguishing clinical and neuropsychological features. This study was designed to examine the utility of the CERAD neuropsychological battery in histopathologically confirmed cases of AD ($N = 13$) and LBV ($N = 7$). The groups were similar in mean age, education, disease duration, age at death, and level of dementia (MMSE = 17). Nonparametric analyses revealed no differences between groups on any of the CERAD subtests (verbal fluency, naming, graphomotor praxis, verbal learning, savings scores, recall errors, or recognition discriminability; all $p > .60$). These data suggest that briefer neuropsychological screening measures may be insufficiently sensitive to detect the qualitative and quantitative differences that have been reported between these types of dementia.
Correspondence: *C. Munro Cullum, Department of Psychiatry, University of Texas Southwestern Medical Center, 5161 Harry Hines Blvd., Dallas, TX 75235-8898, USA.*

J.M. LAFOSSE, B.R. REED, & S.B. STERLING. Vascular Dementia Compared to Alzheimer's Disease on Memory and Language Performance.
Many studies have suggested that there may be different patterns of neuropsychological performance between patients with vascular dementia (VaD) and those with Alzheimer's disease (AD). We compared well-diagnosed and well-matched VaD and AD patients on a limited number of language and memory tests that would be expected to elucidate differences between the groups. All subjects met CA-ADDTC criteria for probable ischemic vascular dementia or NINCDS criteria for Alzheimer's disease on the basis of a comprehensive diagnostic evaluation. As predicted, results showed VaD subjects to have reduced verbal fluency and fewer memory recall intrusion errors when compared to AD patients. These findings are discussed in relation to different general patterns of neuropathological involvement in both types of dementia.
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NEUROPSYCHIATRY—1

S. HUGHES, D. CROCKETT, H. SHINOTOH, B. SNOW, & D. CALNE. Neuropsychological Correlates of Striatal Dopaminergic Activity in Early Stage Parkinsonism.
Patients with early-stage Parkinson's disease (PD) often show poor performance on neuropsychological tests. The structural basis of this poor performance has remained unclear. This study examined the relationship between test scores and dopaminergic activity in the striatum. Positron emission tomography procedures were used to establish the striatal influx rate constant (Ki) of [^{18}F]-I-6-fluorodopa (F-DOPA) in 15 patients diagnosed with early stage PD. Influx values for putaman, caudate, and total striatum were compared with performance on neuropsychological tests. For these patients, test performance overall was in the average range except for reproduction and recall of a complex visual stimulus. F-DOPA influx correlated strongly with measures of motor functioning and scores on neuropsychological tests with large motoric components; however, F-DOPA influx in the putamen did not correlate strongly with cognitively oriented tests.
Correspondence: *Steven J. Hughes, University of Minnesota, Division of Pediatric Neuropsychology, Box 486, 516 Delaware St. SE, Minneapolis, MN 55455, USA.*

S. BROWN, H. KATZEN, N. NIEBLER, R. TOMER, & B. LEVIN. A Preliminary Analysis of the Relationship Between Motor and Affective Symptomatology in Parkinson's Disease.
In Parkinson's disease (PD), the predominant motor symptoms of tremor, rigidity, and bradykinesia relate differentially to cognitive impairments. It is not known whether affective changes in PD share a similar relationship to motor symptoms. We investigated (1) whether PD patients differed from controls on affective symptomatology, and (2) whether an association between motor and affective symptomatology exists in idiopathic PD. Significant differences were found between PD and control groups on the GDS ($p < .001$), LOT ($p < .001$), and the ZUNG ($p < .031$). None of the correlations between motor symptoms (bradykinesia, tremor rigidity) and affective symptoms proved to be significant. This study demonstrates that despite increased depression and anxiety in PD subjects relative to controls, the relationship between motor symptoms and affect does not parallel patterns found between the motor triad and cognition.
Correspondence: *Sharon L. Brown, Department of Neurology, Division of Neuropsychology, University of Miami, 1150 NW 14th St., Suite 715, Miami, FL 33106, USA.*

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K. ERDAL. Depressive Symptoms in Parkinson's Disease.
Parkinson's disease (PD) patients and control groups were compared on measures of depression to assess whether PD patients have a different depression experience from other patients. Control groups included a PD group with cognitive impairment (PD+CI), a disabled group, a cognitively impaired group (CI), and a healthy group. Comparisons were made between four factors of depression (cognitive, mood, somatic, motor). The PD group had an identical depressive symptom pattern to the disabled and healthy groups. The PD+CI group had a more similar depressive symptom pattern to the CI group than the PD group. Implications for the conceptualization of depression in older adults, particularly those with motor problems, were discussed.
Correspondence: *Kristi Erdal, Department of Psychology, Colorado College, 14 E. Cache La Poudre, Colorado Springs, CO 80903, USA.*

P. MASSMAN, J. SIMS, N. COOKE, L. HAVERKAMP, & S. APPEL. Heterogeneity of Neuropsychological Functioning in Amyotrophic Lateral Sclerosis.
A large cohort of patients with amyotrophic lateral sclerosis (ALS, $N = 118$) were administered a standardized battery of neuropsychological tests. Cluster analysis revealed three distinct subgroups of patients. The largest subgroup ($n = 93$) performed well within the average range on all measures. A second subgroup ($n = 21$) displayed evidence of frontal-subcortical system dysfunction, performing poorly on tests of attention/mental control, word generation, psychomotor speed, and problem-solving, but showing preserved naming and visuoperception. A small, third subgroup ($n = 4$) also exhibited frontal-subcortical deficits, but also performed very poorly on memory measures, showing an amnesic pattern of performance. Naming was also impaired in these patients.
Correspondence: *Paul Massman, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

S.R. BEERS, L. MORROW, C.M. RYAN, M.C. WASKO, J. RARIE, & S. MANZI. The Use of Information Processing Measures to Detect Cognitive Deficits in Systemic Lupus Erythematosus (SLE).
The cognitive function of SLE patients and the relationship between cognitive function and corticosteriod dose, disease activity level, and psychiatric symptoms were studied. Patients were classified by CNS activity (active CNS = 12, inactive CNS = 6, never CNS = 20). SLE groups and controls (RA = 11, healthy = 31) completed neuropsychological tests and measures of psychiatric symptomatology. No between-group differences were found on traditional neuropsychological tests. Response accuracy on a complex information processing test showed a significant group (SLE versus healthy controls) × trial interaction. Results suggest that SLE patients with mild disease severity show a decrease in cognitive efficiency under conditions of increased processing load. This finding might account for the subjective experience of memory and other cognitive problems frequently reported by SLE patients.
Correspondence: *Sue R. Beers, Department of Psychiatry, Western Psychiatric Institute and Clinic, 3811 O'Hara St., Pittsburgh, PA 15213, USA.*

P.J. ESLINGER, U. SATISH, & L.M. GRATTAN. Alterations in Cognitively- and Affectively-Based Empathy after Cerebral Damage.
The importance of empathic processes to social behavior and adaptation has been established on theoretical and empirical grounds. Consequences of cerebral damage on empathic measures have only recently begun to be studied. In a sample of 34 patients (23–70 yr of age; traumatic and vascular etiologies; 6 months–5 yr postonset), we examined effects of acquired cerebral damage on affectively-based and cognitively-based empathy measures. Results indicated that cerebral damage significantly affected both types of empathy scores, as reported by patients and family members. These alterations were predominantly reflected in loss of empathic behaviors, but a small sample exhibited empathic disinhibition. Furthermore, scores on the two measures did not correlate. Findings suggest varied forms of empathic change after cerebral damage, possibly involving different functional-anatomic mechanisms.
Correspondence: *Paul J. Eslinger, Division of Neurology, Penn State University, The Milton S. Hershey Medical Center, 500 University Dr., Hershey, PA 17033, USA.*

J. RIPPETH, S.B. ROURKE, L.M. KWON, & I. GRANT. Self-Reported Cognitive Complaints and Neuropsychological Performance in Alcoholics.
Recently detoxified alcoholics (RDA) report more cognitive complaints than controls, a phenomenon better explained by affective symptomatology and alcohol consumption than actual neuropsychological (NP) impairment. Little is known about self-reported cognitive complaints of long-term abstinent (LTA) alcoholics. We administered the Patient's Assessment of Own Functioning Inventory (PAOF), a battery of NP tests, and a measure of depression/anxiety of 24 RDA (length of abstinence [LOA] = 13 d), 39 LTA (LOA = 10 yr), and 37 nonalcoholic control male subjects (mean age = 52.4; mean education = 14.2). RDAs reported more cognitive complaints and were impaired on NP performance relative to LTAs and controls, who were indistinguishable from each other. Analyses revealed that alcohol consumption and a measure of depression/anxiety were significant predictors of cognitive complaints for RDAs, whereas length of abstinence and depression/anxiety were significant predictors for LTAs. We conclude that prolonged abstinence is associated with "normalization" of NP performance and frequency of self-reported cognitive complaints, although affective symptomatology may still be salient.
Correspondence: *Julie D. Rippeth, San Diego State University and University of California, San Diego Joint Doctoral Program in Clinical Psychology, Psychiatry Service, San Diego V.A. Medical Center and Department of Psychiatry, UCSD, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

L.M. KWON, D.C. DELIS, J.D. RIPPETH, S.B. ROURKE, & I. GRANT. Older Long-Term Abstinent Alcoholics Appear to Utilize Efficient Verbal Learning Strategies Similar to Age-Matched Controls.
We recently reported that older alcoholics, despite maintaining years of abstinence, demonstrate increased impairment with age on neuropsychological tests. Along these lines, we predicted that old long-term abstinent alcoholics (OLTA) would show verbal learning deficits based on failure to utilize an active learning strategy (semantic clustering) when compared to age-matched nonalcoholic controls on the California Verbal Learning Test. Our sample consisted of four groups matched on education, ANART IQ, and vocabulary: 15 young long-term abstinent alcoholics, 16 OLTAs, 16 young controls, and 15 old controls with a mean age of 46 ($SD = 2.5$), 62 ($SD = 4.6$), 45 ($SD = 10.1$), and 65 ($SD = 3.6$), respectively. We found that the older group of alcoholics and controls performed significantly worse than their younger counterparts on learning over five trials and semantic clustering. However, we found no evidence to indicate that the alcoholics differed from the controls in their use of semantic or serial clustering to learn a list of words. Thus, we conclude that OLTAs do not appear to differ from age-matched nonalcoholic controls in their use of an organizational strategy to learn novel verbal material.
Correspondence: *Lauren M. Kwon, San Diego State University and University of California, San Diego Joint Doctoral Program in Clinical Psychology, Psychiatry Service, San Diego V.A. Medical Center and Department of Psychiatry, UCSD, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

J.D. EVANS, J.S. PAULSEN, R.K. HEATON, R.L. ROMERO, T. PATTERSON, & D.V. JESTE. The Relationship of Neuropsychological Performance and Psychiatric Symptoms to Ratings of Everyday Functioning in Schizophrenia.
Sixty-four DSM-III-R schizophrenia patients were administered a neuropsychological (NP) battery and standardized clinical rating scales of psychopathology. Activities of daily living (ADL) were measured with the

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Pfeffer Outpatient Disability Scale (POD), the Physical Self Maintenance Scale (PSM), and the Quality of Well-Being Scale (QWB). All measures of ADL were significantly correlated with both NP performance and clinical symptoms. Multiple regression analyses demonstrated that NP performance was uniquely associated with basic self-care functions (PSM), whereas measures of psychopathology were distinctly associated with life satisfaction (QWB). Both NP and clinical symptoms were associated with dependence in broad social roles (i.e., POD). Further research is needed to examine how cognitive functions and clinical symptoms interact to affect the performance of activities of daily living.
Correspondence: *Jovier D. Evans, Geriatric Psychiatry Clinical Research Center, VA Medical Center (116A-1), UCSD, 3350 La Jolla Village Dr., San Diego, San Diego, CA 92161, USA.*

C. SCHRAMKE, R. STOWE, G. RATCLIFF, & G. GOLDSTEIN. Depression and Anxiety Following Stroke: Separating Distress from Affective and Anxiety Disorders.
This study suggests caution in using rating scales of depression and anxiety in neurologic patients and supports the notion such scales may be sensitive to distress rather than specific to identifying depressive and anxiety disorders. Right- and left-hemisphere stroke victims and a control group were administered a structured clinical interview, including ratings scales for anxiety and depression. The three groups did not differ in reports of distress, but left-hemisphere stroke was associated with depressive disorders. The rating scales were sensitive to anxiety and depressive disorders, but they lacked specificity in all groups. In controls there was a significant correlation between scales (supporting the idea that they measure a common factor), while in the stroke groups associations were weaker and less likely to be significant.
Correspondence: *C. Schramke, Psychology Service, HDVAMC, 7180 Highland Dr., Pittsburgh, PA 15206, USA.*

TRAUMATIC BRAIN INJURY

E.D. BIGLER, S.C. JOHNSON, C.V. ANDERSON, S.D. GALE, & D.D. BLATTER. Brain Morphology and Neuropsychological Relationships: Time Postinjury.
Time since traumatic brain injury (TBI) was examined as a variable in the development of atrophic brain changes, neuropsychological outcome and their interrelationship. Two groups were investigated: (1) TBI: early imaging (imaging and neuropsychological testing acquired prior to 90 d postinjury), and (2) TBI: late imaging (imaging and neuropsychological testing acquired after 90 d postinjury). Results demonstrated that even though significant atrophic changes had occurred within the first 90 d postinjury, morphologic changes did not relate to neuropsychological test results. In contrast, the quantitative morphometric changes detected after 90 d correlated significantly with neuropsychological outcome. Results have significant implications both clinically and methodologically for anatomic-neuropsychologic relationships, and suggest a timeframe for when imaging should be examined.
Correspondence: *Erin D. Bigler, Department of Psychology, Brigham Young University, Provo, UT 84602, USA.*

R. LINN, A LOCKWOOD, H. SZYMANSKI, R. MOSCATI, M. PAROSKI, M. COAD, & B. MURPHY. Cerebral Glucose Metabolism in Mild Traumatic Brain Injury: Initial and 3-Month Postinjury Changes.
Resting FDG PET scans, as well as neuropsychological, neurological, and psychiatric assessments, were obtained in five well-screened subjects with mild traumatic brain injury (MTBI) at 2 wk and 3 months postinjury, and compared to five matched controls. At initial evaluation, MTBI subjects demonstrated multiple areas of significant increases in glucose metabolism, including midline (e.g., cingulum), subcortical (e.g., basal ganglia), and posterior (e.g., dentate nucleus) structures. Decreases in glucose metabolism were present in cortical regions. At 3 months postinjury, fewer abnormalities were apparent, although significant glucose hypermetabolism was again present in subcortical and posterior structures, and glucose hypometabolism was again present in cortical regions.
Correspondence: *Richard T. Linn, Department of Rehabilitation Medicine, State University of New York at Buffalo, 462 Grider St., Buffalo, NY 14215, USA.*

N. MARSHALL, W. WHITING, L. DUKE, & T. NOVACK. Effects of CHI on Information Processing Speed and Access to Perceptual and Semantic Memory Representations During Spoken Word Recognition.
The information processing speed and memory performance of adults with severe closed-head injury (CHI) were examined several years postinjury employing Grojean's (1980) gated spoken word recognition task in three conditions: (1) perceptual cues only, (2) unassociated semantic primes, and (3) associated semantic primes. The findings suggest that the severe CHI survivors' and healthy case-matched participants' performance did not vary significantly regardless of test condition. These unexpected results will be discussed in the context of automatic versus effortful processing, modality specificity, and future research needs.
Correspondence: *Nancy B. Mashall, University of Alabama at Birmingham, Division of Gerontology and Geriatric Medicine, CHS Bldg. (218 S), Birmingham, AL 35294, USA.*

A. HALTINER, N. TEMKIN, & S. DIKMEN. The Impact of Head Injury Versus Posttraumatic Seizures on One Year Neuropsychological and Psychosocial Outcome.
This study examined the relationship of late posttraumatic seizures to neuropsychological performance and aspects of psychosocial functioning (Glasgow Outcome Scale ratings, return to independent living and work) in 210 adults who were prospectively followed and assessed 1 yr after traumatic head injury. As expected, the subjects who developed posttraumatic epilepsy were those with the most severe head injuries, and they were more impaired on all neuropsychological and psychosocial measures than those who remained seizure-free. However, after controlling for the effects of head injury severity, there were no significant differences in outcome at 1 yr as a function of seizures. Thus, poorer outcomes in patients with posttraumatic seizures at least at 1 yr after injury largely reflect the severity of the brain injury rather than the effects of seizures per se.
Correspondence: *Alan Haltiner, Department of Rehabilitation Medicine, University of Washington, Seattle, WA 98195, USA.*

W.M. HIGH, Jr., C. BOAKE, M.C. BARTHA, M.A. STRUCHEN, C.N. NEWTON, M. SHERER, B. SILVER, C. IVANHOE, & S. YABLON. Relationship of Social Role Functioning 1 to 5 Years Following Traumatic Brain Injury to Severity of Injury and Early Neuropsychological Functioning.
In this study, we investigated the usefulness of the Craig Handicap Assessment and Reporting Technique (CHART) for measuring social role functioning 1–5 yr following traumatic brain injury (TBI) and the usefulness of acute neuropsychological measures for predicting functioning on the CHART. Ninety-one persons with TBI were seen for annual neuropsychological and psychosocial follow-up evaluation. Average time since injury at follow-up was 2.5 ($SD = 1.4$) yr. Subjects had a mean age of 28.6 ($SD = 11.8$) yr and 12.4 ($SD = 2.4$) yr of education. Most participants had sustained very severe brain injuries (lowest GCS = 5.6, $SD = 2.7$). CHARTs were scored for each person on follow-up evaluation based on an interview with either the person with TBI or a family member. Correlations were computed for the demographic, neurologic, and acute neuropsychological measures with the CHART subscales and their average. The average CHART score was not related to age but was significantly related to education. The average CHART score was also significantly related to GCS, number of days until follows commands, and duration of PTA. The average CHART score was significantly related to COWA, Block Design, Grooved Pegboard time, Digits Forward, Digits Backward, Logical Memory-Immediate Recall,

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RAVLT Trials 1–5, SDMT—written, SDMT—oral, Trails A time, and similarities.
Correspondence: *Walter M. High, Jr., Brain Injury Research Center, Institute for Rehabilitation and Research, 4007 Bellaire Blvd., Ste. EE, Houston, TX 77025, USA.*

M.M. MACHULDA, L. SWEET, T.F. BERGQUIST, & V.Y. ITO. Symptom Complaint Following Minor Head Injury.
Specific diagnostic criteria were used to identify patients with minor head injury in a major university emergency room over a 15-month period. Participants were interviewed by phone three times during the first 10 months following injury. Based on the number of symptoms endorsed, participants were divided into low (0–5) versus high (>5) symptom complaint groups. At time one, individuals with evidence of concussion were more likely to be in the high symptom complaint group, while there was no such effect at the second and third interviews. At the third interview, participants with a preinjury history of head injury were more likely to be in the high complaint group. Results suggest injury-related variables better predict early outcome while historical factors better predict late outcome.
Correspondence: *Mary M. Machulda, Rehabilitation Institute of Chicago, Chicago, IL 60611, USA.*

M. SHERER, C. BOAKE, V. CLEMENT, E. LEVIN, & W. HIGH. Awareness of Deficits after Traumatic Brain Injury: Comparison of Patient, Family, and Clinician Ratings.
Impaired self-awareness of functional abilities is a frequent problem for traumatic brain injury survivors. Accurate assessment of impaired awareness is important so that the effect of unawareness on long-term outcome can be determined. The present study explored the use of patient/family discrepancies and clinician ratings from the Awareness Questionnaire in assessing degree of impaired awareness. Subjects were 47 traumatic brain injury survivors. Results provided support for the validity of the Awareness Questionnaire. Results also supported the use of patient/family differences in ratings of patient functioning as valid indices of degree of patient unawareness. Finally, findings showed that traumatic brain injury patients are more likely to show impaired awareness when rating their general functioning than when rating their functioning in specific situations.
Correspondence: *Mark Sherer, Neuropsychology Department, The Institute for Rehabilitation and Research, 1333 Moursund, Houston, TX 77030, USA.*

J.H. LOCKWOOD, D.O. MOULTON, L. PICON-NIETO, R.D. VANDERPLOEG, & C. OCHIPA. Visual Associative Agnosia: A Traumatic Brain Injury Case Without Typical Focal Anatomic Findings.
A case of visual associative agnosia following closed head injury is presented. The patient also had prosopagnosia, alexia, agraphia, and anomia. This case is unique in several respects. First, visual associative agnosia has rarely been reported following traumatic brain injury. Second, in most cases of visual associative agnosia, cortical lesions are reported in the occipital or occipital-temporal region usually on the left or bilaterally. This patient's neuroimaging studies (MRI, CT, and SPECT) show anterior bitemporal and left frontal lesions. Although the patient's right homonymous hemianopsia implicates the left occipital cortex, no anatomic lesions in this region are demonstrable on neuroimaging studies; therefore, the imaged anatomic correlates in the present case are more anterior than most previously reported cases. Third, assessment for agnosia in other aspects of the visual recognition system and in other sensory modalities showed relatively intact recognition of gestural, nonverbal auditory, and tactile stimuli. This patient's intact gesture recognition supports literature suggesting discrete visual recognition systems for objects and gestures. Finally, ongoing follow-up across the 5 months postinjury showed that the patient's alexia, agraphia, and naming improved, although all remain significantly impaired. While the patient's visual associate agnosia remained essentially unchanged, he became able to functionally identify various objects in his visual environment by making use of combined excellent visual feature detection abilities and relatively intact auditory recognition skills.
Correspondence: *J.H. Lockwood, Defense and Veterans Head Injury Project, Rehabilitation Medicine Service, James A. Haley V.A. Medical Center, 13000 Bruce B. Downs Blvd., Tampa, FL 33612, USA.*

S.A. BROWN & H.J. HANNAY. The Morris Water Maze and Head Injury: A Human Analog.
Declarative and procedural memory forms of a human analog of the Morris Water Maze were administered to control subjects and moderately and severely closed-head-injured patients. The groups were similar in age and education. The hypothesis that head-injured patients would show relatively more spared performance of the procedural as opposed to the declarative memory task was in part supported. Declarative but not procedural memory task performance was related to delayed recall of the Rey-Osterreith Complex Figure Test, thus supporting the hypothesis that performance on the declarative memory task would be more related to performance of other declarative memory tasks. Performance of both tasks was related to measures of verbal learning, visuospatial ability, and attention.
Correspondence: *S.A. Brown, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

E.M.S. SHERMAN, E. STRAUSS, & F. SPELLACY. Construct Validity of the Paced Auditory Serial Addition Task (PASAT) in Head-Injured Adults.
In general, both convergent and divergent evidence supported the construct validity of the PASAT as a measure of attention in 542 adults referred for evaluation of possible closed-head injury (mean age of 33 yr, $SD = 13.34$). However, the unique contribution of math-related tests to the prediction of PASAT performance underline the fact that the PASAT is significantly dependent on mathematical ability. Moderate correlations between the PASAT and general intellectual ability, verbal achievement, and complex motor skills may reflect a general cognitive/speed of processing dimension required for PASAT performance. The PASAT was not related to depression or head injury severity indices. Furthermore the results provided empirical corroboration to the clinical impression that the PASAT is suitable as an attention measure in high functioning patients with intact mathematics ability, general intellectual ability, verbal ability/achievement, and complex motor skills.
Correspondence: *E.M.S. Sherman, Department of Psychology, University of Victoria, Box 3050, Victoria V8W 3P5, Canada.*

B.K. SCHEFFT, A. BACKSCHEIDER, & M. O'DELL. The Effects of Self-Regulatory Procedures on Recognition Memory of Traumatically Brain-Injured Patients.
Effects of self-regulatory methods on memory were examined in a study involving 19 traumatically brain-injured (TBI) outpatients. A within subjects design was used to compare self-generation and didactic presentation conditions using paired-associate learning. In the didactic condition, subjects read both words that were provided for them (e.g., ship-boat). In the self-generation condition, subjects read the first word but had to generate the second member of the word pair based on knowledge of the rule that related the words and the first letter of the second member (e.g., ship-b). The results showed a significant effect for the self-generation condition on recognition memory, highlighting the potential utility of procedures based on self-regulatory methods for enhancing new learning of TBI patients.
Correspondence: *Bruce K. Schefft, Department of Psychology and Physical Medicine and Rehabilitation, 376 Dyer Hall, University of Cincinnati, Cincinnati, OH 45221-0376, USA.*

P. BERGLOFF, S. THOMPSON, T. PETROS, & F.R. FERRARO. Prose Recall Deficits in Mild Head Injury.
Subjects with severe closed-head injury (CHI), mild CHI, and control subjects matched on age and education level were tested for immediate

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and delayed recall of the prose passages from the Wechsler Memory Scale. The results indicated that control subjects recalled more than mild head-injured subjects at all levels of importance for both immediate and delayed recall, except for immediate recall of high importance. Also, mild head-injured subjects recall more than the severe group at all levels of importance for both immediate and delayed recall. The results indicate recall of prose passages from the Wechsler Memory Scale is a sensitive index of memory problems in mild head-injured individuals 1 yr after injury.
Correspondence: *P. Bergloff, Department of Psychology, P.O. Box 8380, University of North Dakota, Grand Forks, ND 58202-8380, USA.*

A. DRAKE, R. BIERLEY, J. BLOOM, E. DATE, & A. SALAZAR. The Effects of Alcohol Consumption at Time of Injury on Verbal Memory Performance Following Traumatic Brain Injury.
The pattern of California Verbal Learning Test (CVLT) performance for 44 subjects with moderate-to-severe head injuries was examined to determine the effects of concomitant alcohol use. Nineteen subjects had consumed alcohol prior to their injury, whereas the other 25 subjects had no alcohol consumption prior to injury. There were no group differences in the learning strategies or response discrimination on the CVLT. Subjects who were drinking prior to their injury performed worse on indices of learning and memory. These results may reflect differences due to premorbid alcohol abuse. Alternatively, blood alcohol levels interact with the neurochemical responses that occur following a traumatic brain injury. These findings emphasize the effects of co-morbid factors on outcome following traumatic brain injury.
Correspondence: *Angela I. Drake, Neurosciences Department, Naval Medical Center, San Diego, CA 92134-5000, USA.*

D.M. BERNSTEIN, S. LAWSON, & S.J. SEGALOWITZ. Subtle Cognitive Deficits in High-Functioning University Students with Mild Head Injury.
Despite having incurred a mild head injury (MHI), many high-functioning individuals fall within the normal range on neuropsychological tests. They may, however, still experience subtle long-term consequences. We tested 10 university students who had experienced a mild head injury (unconsciousness 20 min or less; mean = 5.3 min) some time in the past (mean time since injury = 6.4 yr), and a control group matched for age and sex. The two groups performed similarly on a series of neuropsychological tests, self-report cognitive failures questionnaires, and easy auditory discrimination tasks. However, those with MHI were significantly worse on discriminability in relatively difficult auditory detection tasks. Coupled with results reported elsewhere that their P300 ERPs to all these auditory stimuli are considerably reduced, we conclude that there are long-lasting reductions in attentional capacity after MHI, especially in difficult sustained attention tasks.
Correspondence: *D.M. Burnstein, Department of Psychology, Brock University, St. Catharines, Ontario L2S 3A1, Canada.*

Symposium 1/11:00 a.m.–12:30 p.m.

CLINICAL INTERVENTIONS WITH NEUROLOGICALLY IMPAIRED CHILDREN

Organizer and Chair: Robert W. Butler

R. BUTLER, Clinical Interventions with Neurologically Impaired Children.
Clinical interventions are becoming an increasingly important aspect of clinical neuropsychology. Neuropsychological evaluations can be viewed as a plan for therapeutic action, and treatments are being developed that are designed to improve cognitive and social functioning, promote psychological adjustment, relieve psychological symptomatology, and maximize educational/occupational attainment following brain injuries and damage. In addition to the comprehensive assessment of cortical functions, these activities are clearly in the domain of neuropsychology. This symposium presents several new and innovative approaches designed to improve psychosocial, familial, and educational/cognitive functioning in a very special population: children who have suffered central nervous system damage. These treatments and clinical interventions will be described in detail, and preliminary outcome data will be presented.
Correspondence: *Robert W. Butler, Departments of Pediatrics and Neurology, Memorial Sloan-Kettering Cancer Center, Box 181, 1275 York Ave., New York, NY 10021, USA.*

H.G. TAYLOR. Overview of Intervention Needs for Children with CNS Disorders.
Treatment of neurobehavioral impairments due to CNS insult or disease represents a complex challenge. Despite the many needs of children with CNS disorders, there is relatively little research on the efficacy of existing treatment methods. The present symposium represents an effort to begin to fill this void. A series of papers will review systematic studies of various approaches to intervention. In introducing this series of papers, a multidimensional treatment model will be presented. Results from a study of traumatic brain injury (TBI) in children will be reviewed to document needs for individual, family, and school interventions.
Correspondence: *H.G. Taylor, Department of Pediatrics, Rainbow Babies and Childrens Hospital, Cleveland, OH 44106-6038, USA.*

R. BUTLER, Cognitive Remediation of Attentional Deficits and Nonverbal Learning Disabilities Following Childhood CNS Disease.
Curative treatment for many childhood cancers has been obtained, in large part, by the introduction of cranial irradiation (CRT) and/or the intrathecal and systemic injection of chemotherapies. Unfortunately, these life-saving treatments can have a negative effect on school performance due to white matter disease-related impairment in attention and concentration, as well as nonverbal learning disabilities. The development, implementation, and pilot evaluation ($N = 9$) of a 6-month outpatient cognitive remediation program (CRP) designed to improve these impairments are described. The CRP and its evaluation have evolved over the course of pilot testing, and it now appears to offer promise as a potentially effective approach to improving quality of life in children with CNS disease.
Correspondence: *R. Butler, Departments of Pediatrics and Neurology, Memorial Sloan-Kettering Cancer Center, 1275 York Ave., New York, NY 10021, USA.*

R. LIGHT. Anosognosia and Insight in Children and Adolescents with Brain Injury: Clinical Implications.
Considerable attention has been focused on anosognosia after head injury in adults; however, very little research has been reported on children and adolescents. Anosognosia, defined as an impairment in awareness of deficits due to organic factors, can be a significant obstacle to brain injury rehabilitation. Recent research has indicated that consistency of reporting deficits on a molar versus molecular basis may be helpful in treating anosognosia in adults. The present study investigated whether this finding generalizes to children and adolescents. Preliminary analyses indicate that anosognosia is no less common in this younger sample (as compared to adult head injury patients), and may, in fact, be more pervasive and persistent. Implications regarding clinical treatment and directions for future research will be discussed.
Correspondence: *R. Light, Department of Rehabilitation Medicine, Daniel Freeman Memorial Hospital, 333 N. Prairie Ave., Inglewood, CA 90301, USA.*

D.R. COPELAND. A School Intervention and Liaison Program to Facilitate Educational Adjustment among Children with Neurological Problems.
Among all children with cancer, those with brain tumors are at greatest risk for educational problems. Despite considerable challenges, con-

sistent exposure to school and school-related activities for these children is one of the most effective means of assuring that they achieve up to their educational potential. Currently, more than 300 children with brain tumors are actively being followed at our center. This presentation will describe the structure of a program specifically designed to promote academic achievement in neurologically impaired children. Case examples will be used for illustration.
Correspondence: *D.R. Copeland, Department of Pediatrics, The University of Texas M.D. Anderson Cancer Center, 1515 Holcombe Blvd., Houston, TX 77030, USA.*

Symposium 2/11:00 a.m.–12:30 p.m.

VIEWING SCHIZOPHRENIA FROM A NEUROCOGNITIVE PERSPECTIVE

Organizer and Chair: Michael F. Green

M.F. GREEN. Viewing Schizophrenia from a Neurocognitive Perspective.
Neuropsychological approaches have contributed substantially to our understanding of schizophrenia. The symposium will present recent advances in the neuropsychology of schizophrenia, including (1) a model for understanding the relationship between neuroanatomic structural abnormalities and function; (2) a survey of psychophysiological procedures that have revealed specific abnormalities in attentional, informational, and linguistic processing; (3) an overview of promising indicators of genetic vulnerability to schizophrenia and their underlying neural substrates; (4) a comparison of neuropsychological deficits seen with schizophrenia and focal neurological syndromes; and (5) speculation on which neurocognitive deficits limit the functioning of patients in their daily life. The symposium will emphasize a diverse and innovative array of neuropsychological methods that have been highly informative about the nature and course of schizophrenia.
Correspondence: *Michael F. Green, UCLA Research Center, Box 6022, Camarillo, CA 93011, USA.*

R.M. BILDER. Structure-Function Relations in Schizophrenia.
Schizophrenia is marked by multiple neuropathologic findings, and in vivo neuroimaging has enabled correlation of anatomic abnormalities with neuropsychological (NP) dysfunction. Most efforts have focused on associations of gross structural abnormalities with diffuse NP deficit, but some more specific associations have been reported. This literature will be reviewed, with examples of findings from both chronic and first-episode schizophrenia samples. The findings are most consistent with the hypothesis that different morphologic abnormalities comprise independent risk factors for schizophrenia, and contribute uniquely to heterogeneity of NP dysfunction within the syndrome. The findings further highlight the importance of understanding structure-function relations in schizophrenia in a neurodevelopmental context. Among diverse abnormalities, failures in archicortical development may comprise a salient and sufficient risk factor for schizophrenia-like psychoses, accompanied by deficits in the projectional control of behavior.
Correspondence: *R.M. Bilder, Hillside Hospital-Research, 7559 263rd St., Glen Oaks, NY 11004, USA.*

S.R. STEINHAUER, R. CONDRAY, & G.G. DOUGHERTY, Jr. Psychophysiological Windows on Neurocognition in Schizophrenia.
Unique information on quantitative changes during cognitive processing in schizophrenia has been provided by measures such as event-related brain potentials, cardiac and pupillary activity, eye movements, and skin conductance. Findings have affected knowledge of attentional, informational, and linguistic processing in schizophrenia. In addition to implications for specific physiological systems, objective correlates of clinical state have been identified. Differential modes of processing have been identified for schizophrenic patients. Laboratory variables have provided an evaluation of vulnerability for the development of schizophrenia in high-risk populations. In reviewing current findings, the relationships with neuropsychological and neuroimaging data, and with emerging technologies, will be examined.
Correspondence: *S.R. Steinhauer, Veteran Affairs Medical Center, 7180 Highland Dr., Pittsburgh, PA 15206, USA.*

R.F. ASARNOW. Neuropsychological Indices of Vulnerability to Schizophrenia.
Progress in genetic studies of schizophrenia depends in part on refining the characterization of the phenotype of this disorder. Over the last two decades, family genetic studies have examined the sensitivity of various neuropsychological tasks to the genetic liability for schizophrenia. I will briefly review those studies and indicate which tasks appear to be particularly promising markers of vulnerability to schizophrenia. Some of the most promising tasks include measures of smooth pursuit eye movement and pre-pulse inhibition, certain measures of visual information processing, and motor functioning. I will discuss the common and divergent task demands of measures that appear to be indices of vulnerability to schizophrenia. The neural systems underlying certain common task demands will be discussed.
Correspondence: *R.F. Asarnow, Department of Psychiatry, UCLA School of Medicine, 48-240C NPI, 760 Westwood Plaza, Los Angeles, CA 90024-1759, USA.*

J.M. GOLD. Comparative Neuropsychological Studies of Schizophrenia.
The neuropsychological impairment of schizophrenia has been well documented, but the anatomic interpretation of the findings remains controversial. Some of the controversy in this area is likely attributable to methodological limitations involved in the comparison of normal controls with schizophrenic patients who demonstrate deficits on a wide variety of tests. This presentation will review several studies comparing the cognitive performance of patients with schizophrenia with that of patients with either frontal or temporal lobe epilepsy, patient groups with dysfunction in the two brain regions most often implicated in schizophrenia. The data reveal a series of dissociations that suggest that neither focal lesion comparison group provides an adequate model of schizophrenia, and suggest that the impairment in schizophrenia involves a widely distributed neural system.
Correspondence: *J.M. Gold, Maryland Psychiatric Research Center, Baltimore, MD 21228, USA.*

M.F. GREEN. Neurocognitive Deficits in Schizophrenia: Do They Matter?
Schizophrenia patients unquestionably suffer from a wide array of neurocognitive deficits. But how do these neurocognitive deficits influence the daily life of patients? This presentation will review studies that have assessed relationships between neurocognitive performance and functional outcome measures such as community (social and occupational) functioning, social problem solving, and psychosocial skill acquisition. Despite wide variability in the selection of measures, some commonalities emerged. Verbal memory and visual vigilance were consistently related to social problem solving and psychosocial skill acquisition. Verbal memory was also a reasonably strong predictor of subsequent community functioning. Surprisingly, psychotic symptoms were not generally associated with functional outcome. The results suggest that certain neurocognitive deficits may limit the functional outcome of patients.
Correspondence: *Michael F. Green, UCLA Research Center, P.O. Box 6022, Camarillo, CA 93011, USA.*

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Special Topics/11:00 a.m.–12:30 p.m.

MEMORY MECHANISMS IN CEREBRAL CORTEX

Chair: Leslie Ungerleider

L.G. UNGERLEIDER. Memory Mechanisms in Cerebral Cortex.
Recent functional brain imaging studies in humans indicate that learning and memory involve many of the same regions of cortex that process sensory information and control motor output. The forms of perceptual and motor learning that can occur without conscious recollection are mediated in part by contractions and expansions of representations in sensory and motor cortex. These same regions are also engaged during the conscious storage and retrieval of facts and events, but these types of memory additionally bring into play structures involved in the active maintenance of memories "one line" and in establishing associative links between the information stored in the different sensory areas. Although the picture of memory emerging from imaging studies in humans is consistent with physiological accounts in animals, there are puzzles and surprises that will need to be resolved.
Correspondence: *Leslie G. Ungerleider, National Institute of Mental Health, NIH, Bethesda, MD 20892, USA.*

THURSDAY AFTERNOON, FEBRUARY 15, 1996

Paper Session 4/1:30–3:20 p.m.

AGING–1

A.C. ROSEN, G.C. GILMORE, & C.W. THOMAS. Aging, Spatial Frequency Content, and Perceptually Organized Visual Search.
The role of spatial frequency (SF) content in a perceptually organized visual search task was explored in young and elderly adults. Young ($N = 24$) and elderly ($N = 24$) adults searched for a target letter in five-element letter arrays. Nontargets were either similar or dissimilar to one another as defined by an empirically derived metric. Both groups detected targets more rapidly among similar nontargets (i.e., context facilitation) when the images were intact and when the high SF amplitude was reduced. However, when low SF amplitude was reduced, context facilitation was nonsignificant. Elderly adults showed the same pattern of results despite relatively weaker high SF sensitivity. Therefore, the often described age-related high SF loss may impair cognitive functioning less if critical information is conveyed by low SF content.
Correspondence: *Allyson C. Rosen, Division of Neuropsychology, Department of Neurology, MCW Clinic at Froedtert, 9200 W. Wisconsin Ave., Milwaukee, WI 53226, USA.*

W.J. LOKEN, P.M. BUTLER, C.A. McGAVRAN, & N. RAZ. Working Memory as a Mediator of Spatial Filtering: Evidence from Normal Aging.
Extensive neural connections between anterior systems associated with working memory and posterior systems involved in visuospatial attention suggest that these systems are neuroanatomically related. Little is known, however, about the functional interaction between the two systems. To address this issue, we investigated effects of increasing working memory demands on a spatial filtering task in normal aging. Findings were consistent with the notion of spatial filtering as a resource-dependent process, particularly when filtering incongruent information is required. Thus, functions associated with the posterior attentional system can be affected by the manipulation of resources associated with anterior systems. Findings further indicate that spatial filtering is affected by availability of cognitive resources regardless of age.
Correspondence: *W.J. Loken, Department of Psychology, The University of Memphis, Memphis, TN 38152, USA.*

M. HARTMAN, E. BOLTON, & S.F. SWEENY. Working Memory, Aging, and the Wisconsin Card Sorting Test.
Although age differences on the Wisconsin Card Sorting Test (WCST) are well documented, the reason for poor performance by older adults has not been identified. Several lines of evidence are reported here indicating that the test's working memory demands can account for the age differences. First, older adults' errors occur most frequently when feedback from the previous sort does not provide complete information about the correct sorting principle (in other words, when memory for information from previous sorts is required to determine the current principle). Second, errors are more likely when identification of the sorting rule involves a higher working memory load, and for subjects whose pattern of performance results in higher working memory demands. These findings are discussed in relation to theories of frontal lobe function and aging.
Correspondence: *Marilyn Hartman, Department of Psychology, CB 3270 Davie Hall, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599-3270, USA.*

M.S. ALBERT & C.R. SAVAGE. Gender Differences in Cognitive Function Across the Adult Life Span.
This study examined gender differences on a comprehensive neuropsychological battery in 218 healthy men and women subjects, age 30–79 yr. Women outperformed men at all ages on tests of visual attention, verbal memory, and verbal fluency. Men outperformed women at all ages on measures of auditory attention, spatial ability, and abstraction. There was also a group of tests in which male–female differences did not emerge until after the age of 60. Elderly women performed lower than elderly men on measures of nonverbal memory, spatial problem-solving speed, and speeded mental control. Results suggest that cognitive change with aging does not always occur uniformly between men and women. Results are discussed in relation to studies examining hormonal influences on cognition in postmenopausal women.
Correspondence: *Cary R. Savage, Department of Psychiatry, 149-9102, Massachusetts General Hospital, Bldg. 149, 13th St., Charlestown, MA 02129-2060, USA.*

E. VAKIL, C. MOSAK, & M. ASHKENAZI. The Effect of Aging on Script Memory for Typical and Atypical Actions.
When typical or atypical information is presented, the latter is usually found to be better recognized. This phenomenon is referred to as the "typicality effect." Some researchers assume that this effect only involves automatic processes, whereas others assume the involvement of effortful processes as well. Automatic processes are least affected by age; therefore, the prediction whether typicality effect is affected by age is dependent on the theoretical assumption of which memory processes are involved. To test whether the typicality effect is preserved in older subjects, 25 older and 25 younger subjects listened to two scripts that consisted of typical and atypical activities. Results yielded a typicality effect for both age groups, consequently providing support for the theory that assumes the involvement of predominantly automatic processes in the typicality effect.
Correspondence: *Eli Vakil, Psychology Department, Bar-Ilan University, Ramat-Gan, 52900, Israel.*

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S.M. WILKNISS, C.A. MANNING, & M.G. JONES. Aging Effects on Contextual Spatial Memory.
Although the effects of aging on spatial memory remain unclear, ramifications of declining spatial memory are considerable. The present experiments used ecologically based tests to compare spatial abilities in healthy young and elderly adults. Subjects were tested on the ability to recall a route and recognize landmarks on that route. The elderly were significantly impaired in recall of the route, even when accounting for decreased motor speed and longer recall times. In a second experiment, the ability to memorize a route drawn on a map and to translate the information on the map onto three-dimensional space was examined in young and elderly adults. Older people had greater difficulty remembering the route and translating it into three-dimensional space. These findings indicate decreased abilities in the elderly.
Correspondence: *S.M. Wilkniss, Box 394, Department of Neurology, University of Virginia, Charlottesville, VA 22908, USA.*

B. GALLAGHER. Can Decline in Memory with Age Be Accounted for by Separate Memory Systems View or Processing View?
The purpose of this study was to determine if the decline in memory with age can be accounted for by the separate memory systems view or by the transfer appropriate processing view. One hundred eight young adults and 108 old adults studied word lists in three encoding conditions: no-context, context, and generate. Each subject completed one of four memory tests: general knowledge questions, word completions, semantic cued recall, and graphemic cued recall. Subjects who completed conceptually driven tests performed best with words presented in the generate condition. Subjects who completed data-driven tests performed best with words studied in the data-driven, no-context condition. These results replicated the findings that knowledge transfer was best when there was a match between processes required at test and those required at study. Between groups, a main effect of age was found on all four memory tests. Young adults outperformed old adults on both explicit and implicit tests of memory. Age differences were not explained in terms of either the episodic/semantic systems distinction or the conceptually driven/data-driven processing distinction. Results are discussed in terms of the notion of cognitive slowing and age differences in use of memory strategies.
Correspondence: *Brian Gallagher, 6608 Jonathon, Dearborn, MI 48126, USA.*

Paper Session 5/1:30–3:20 p.m.

LANGUAGE–3

S. BARRON & M. KORKMAN. The Relative Contributions of Reading Instruction and Age to the Development of Phonological Awareness.
Phonological awareness is considered either a prerequisite for or a result of learning to read. The aim of this study was to examine the relative contributions of age and reading instruction on phonological awareness. The subjects were 239 Finnish children (range 5–10 yr, 40 per age group). Phonological awareness was measured by the Changing Word Segment-subtest of NEPSY. Some development occurred already in kindergarten (ages 5 and 6), but reading instruction enhanced performance significantly. A developmental spurt was evident when the children had started school at ages 7 and 8. First-graders assessed in spring performed significantly better than first-graders of the same age assessed 5 months earlier in autumn. After the age of 8, no significant improvement in performance was observed.
Correspondence: *Sarianna Barron, Department of Psychology, Helsinki University, P.O.B. 4, 00014 Helsinki, Finland.*

A. SCHWEIGER & J.W. BROWN. Tacit Knowledge in Reading: A Case Study of Mixed Acquired Dyslexia.
Unconscious perception has been documented in a variety of brain-damaged patients and even in normals. This phenomenon presents a difficult paradox to traditional processing models of perception, since it implies semantic access of material whose physical attributes have not been sufficiently analyzed. We present a patient who sustained an extensive, hemorrhagic left parietal-occipital lesion and with evidence of small vessel disease. Clinically, D.M. exhibited right hemianopsia, fluent speech, and a word finding deficit. She presented with mixed dyslexia, always attempting to read in a letter-by-letter fashion but never successfully. She could not correctly identify single letters or numbers. In contrast, D.M. exhibited semantic access of words she denied being able to read. She could classify words into their correct categories. She performed lexical decision with minimal errors, and could judge grammaticality of sentences. On lexical decision with priming, she showed a strong priming effect, all the while denying knowledge of the words. This case study demonstrates that the reading process can (and we would insist, typically does) begin with semantic access, with lexical choice and phonology being realized later. It is argued that in this "inverted" process, consciousness is associated with a specific lexical choice and its phonology, but not necessarily with its semantic access.
Correspondence: *Avraham Schweiger, Center for Cognition, 952 5th Ave., New York, NY 10021, USA.*

L. BUCHANAN, N. HILDEBRANDT, & G.E. MacKINNON. Choosing Neighbors: Sensitivity Reductions in Deep Dyslexia.
All the errors associated with word-naming in deep dyslexia result from a single source of damage to the selection mechanism in the phonological output lexicon. This hypothesis gives rise to the prediction that words with many phonological and semantic neighbors will result in more errors than will words with few such neighbors. Naming data produced by three deep dyslexic patients test the validity of this prediction. Both semantic and phonological size are negatively correlated with performance. In contrast, orthographic neighborhood size, an effect assumed to arise early in the system, is positively correlated with performance. Taken together, these results support an output disorder view of deep dyslexia. This output disorder reflects a reduction in sensitivity of the mechanism responsible for selection during the final stages of word-naming.
Correspondence: *Lori Buchanan, Psychology Research Department, Toronto's Hospital for Sick Children, 555 University Ave., Toronto, Ontario M5G 1X8, Canada.*

S. NICHOLS & M. SALTZMAN. Developmental Trends on the Stroop Paradigm: Comparison of Traditional and Computer Versions.
The Stroop paradigm is widely used in studies of children as well as adults. Although numerous versions are in use, a direct comparison of developmental trends in performance on newer computer versions with traditional paper versions has not been done. In this study, 33 children ages 7–12 yr have thus far completed both paper-and-pencil and computer versions of the Stroop paradigm as well as other measures of executive functioning. Developmental trends on the two Stroop tasks differ considerably. The paper version produces a steady increase in interference effects over the age range included. In contrast, the computer version produces an increase, then decrease, in interference, and the opposite trend in facilitation. Methodological differences between the two tasks, as well as changes in strategy use with development, will be discussed; additionally, the relationship of performance on these tasks to other measures of executive functioning will be presented.
Correspondence: *Sharon L. Nichols, UCSD Medical Center, 9500 Gilman Dr., #0935, La Jolla, CA 92093-0935, USA.*

J. RUCKLIDGE, B. KAPLAN, & S. CRAWFORD. Developmental Differences Between Same-Sex and Opposite-Sex Twins.
Geschwind and Galaburda proposed that testosterone mediates development of immune disorders, developmental problems, and nonright-handedness, all of which have been reported to have a higher prevalence in males. In twins, females in opposite-sex (OS) pairs and males in same-sex (SS) pairs may be exposed to elevated levels of testosterone in utero, and thus they should be more "masculinized" than twins and singletons exposed to lower levels. Parents of 137 twin pairs and matched single-

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tons (8–20 yr) completed questionnaires concerning development. We found limited support for the proposed model (males in SS twins had more immune problems, and females in OS twins had more developmental problems). We conclude that testosterone's role may depend on the sex and the variable being studied and that the role of other hormones should be considered.
Correspondence: *Julia Rucklidge, Department of Psychology, University of Calgary and Alberta Children's Hospital, 1820 Richmond Rd., N.W., Calgary, Alberta T2T-5C7, Canada.*

J. RUMSEY, K. NACE, D. WISE, & P. ANDREASON. Localization of Phonologic and Orthographic Components of Reading in Developmental Dyslexia with ^{15}O PET.
Cerebral blood flow was measured with positron emission tomography in 17 dyslexic men (ages 18–40) and 14 controls during phonologic and orthographic pronunciation and lexical decision making and a baseline visual fixation control. Pronunciation activated the left superior temporal gyrus (near area 22), more so during phonologic, pseudoword reading than during orthographic, real word reading in controls. In contrast, dyslexics showed no differential activation of this region. Controls showed greater differential activation of a left lingual/parahippocampal region during orthographic, relative to phonologic, decision making than dyslexics. Both groups showed greater activation of a left inferior frontal region during phonologic, as compared with orthographic, lexical decision making. Thus, dyslexics differed from controls primarily in posterior, but not anterior, brain regions involved in reading.
Correspondence: *Judith M. Rumsey, Child Psychiatry Branch, Bldg. 10, Rm. 6N240, National Institute of Mental Health, Bethesda, MD 20892, USA.*

R.-A. MUELLER, R.D. ROTHERMEL, & H.T. CHUGANI. Distributivity of Language Functions in the Child Brain: Evidence from Clinical PET Studies.
The distributivity of higher cognitive functions such as language in the adult brain has become increasingly acknowledged in recent years. This study examines the development of distributivity for receptive and expressive language in children and adolescents with early unilateral brain damage. Functional mapping was performed by means of [^{15}O] H_2O positron emission tomography. Distributivity of language was generally high (mean number of regions activated per language task = 10). Activations for receptive language were more distributed in adolescents than in children. Patients with early left perisylvian lesion showed stronger activations in the rolandic cortex, the insula, the superior temporal lobe (for expressive language), and the basal ganglia than patients with other lesions. Low VIQ was not consistently related to any specific activity pattern.
Correspondence: *Ralph Axel Mueller, Children's Hospital of Michigan, Wayne State University, Detroit, MI 48201, USA.*

Paper Session 6/1:30–3:20 p.m.

SCHIZOPHRENIA – 1

L. SYMONDS, L. LINDAMER, T. JERNIGAN, R. HEATON, J. PAULSEN, D. BRAFF, S. ZISOOK, J. KUCK, & D. JESTE. Neuroanatomical Correlates (MRI) of CVLT Measures in Schizophrenia Patients.
This quantitative MRI study examined the neuroanatomical correlates of several measures of the California Verbal Learning Test (CVLT). We hypothesized that smaller volumes of thalamus, lenticular, and caudate nuclei would be correlated with poor performance on selected CVLT measures. Among the six CVLT measures examined, only the number of intrusions was significantly correlated with reduced thalamic and lenticular volumes. Number of intrusions also correlated at the trend level with reduced caudate volume. Post hoc analysis of the relationships of other brain regions with the same CVLT measures indicated that the number of intrusions is also related to reduced cortical gray matter, but is not related to measures of abnormal white matter or ventricular fluid. Results will be discussed in light of the role the thalamus and basal ganglia may play in learning and memory in schizophrenia with special attention to the subcortical-cortical circuits that link these brain areas.
Correspondence: *Laura L. Symonds, Department of Psychiatry, San Diego V.A. Medical Center, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

M. ALOIA, M. GOUROVITCH, J. GOLD, D. MISSAR, D. PICKAR, D. WEINBERGER, & T. GOLDBERG. The Relationship Between Semantic Priming and Thought Disorder in Patients with Schizophrenia.
Patients with schizophrenia have been shown to have difficulty on tasks of semantic memory and semantic priming. A dysfunction of semantic organization could account for some of the symptoms of thought disorder. To further address this issue, we tested 23 normal controls, 13 non-thought-disordered, and 10 thought-disordered patients on their ability to prime to same-category words varying in their degree of relatedness. Normal controls showed lawful priming effects over the three degrees of relatedness (high, medium, and low). Non-thought-disordered patients primed to all levels, but did not show a lawful differentiation across the levels. Thought-disordered patients did not show priming effects at any level of relatedness. These findings are discussed in terms of the contributions of semantic disorganization to thought disorder.
Correspondence: *Mark S. Aloia, 152 Foote St., Barrington, RI 02086, USA.*

J. TRACY, R. RESCH, R. JOSIASSEN, & B. OESTERLING. Diminished Automatic and Effortful Processes in a Verbal Memory Task in Schizophrenia.
Schizophrenia patients demonstrate deficits on tasks requiring cognitive effort and attentional resources, suggesting that schizophrenia predisposes to automatic processing. Data demonstrating a breakdown in automatic processing, however, also exist. Do schizophrenia patients show impaired effortful processing, automatic processing, or both? An episodic memory task with measures of word recall and frequency monitoring assessed effortful and automatic processing, respectively. Subjects were 13 adult, neuroleptic-medicated inpatients with a DSM-III-R diagnosis of chronic schizophrenia. Both automatic and effortful processing appeared diminished but not absent, a result consistent with prior schizophrenia studies. Such results indicate prior findings were not an artifact of using separate automatic and effortful tasks. The relevance to current cognitive hypotheses of schizophrenia are discussed.
Correspondence: *Joseph I. Tracy, Medical College of Pennsylvania/Hahnemann University, 3200 Henry Ave., Philadelphia, PA 19129, USA.*

J. BARTOK, J. SANDS, M. HARROW, E. MARTIN, T. JOBE, & M. GAVIRIA. Executive Functioning Deficits in Schizophrenic Patients 15 Years After Initial Hospitalization.
We evaluated 106 patients including 37 schizophrenic, 44 depressive, and 25 bipolar patients approximately 15 years after index hospitalization as part of the Chicago Follow-up Study. All patients were matched for age and education, and were administered the Wisconsin Card Sorting Test. The findings indicate clear impairment of executive function in schizophrenic patients 15 yr after the onset of the illness compared to bipolar and depressive patients. The presence of these deficits at this point in the course of the illness suggest that they are not simply secondary to acute disorganization, but rather a core component of the illness. Even when controlling for the effects of psychosis, performance deficits of the schizophrenic patients were found.
Correspondence: *John A. Bartok, Department of Psychiatry, University of Illinois at Chicago, 912 S. Wood St., Chicago, IL 60612, USA.*

S. ROBYN, M. W. HAUT, J.M. STEVENSON, & E.H. MAKELA. Working Memory Functions in Schizophrenia.
Frontal lobe dysfunction is thought to be a prominent disturbance of schizophrenia. Working memory (WM), a possible correlate of frontal lobe dysfunction, has not been researched extensively in schizophrenia using tasks specifically designed to assess WM. The purpose of this study is to examine WM in schizophrenia using a sentence span task, self-ordered pointing task (SOPT), and a prose recall task designed to manipulate demands on WM. Thirteen patients were compared to 13 control subjects. The groups were matched on age, education, and vocabulary. The patients demonstrated poorer performance on the sentence span task, SOPT, and prose recall relative to the control group. The results of this study demonstrate impaired WM in patients with schizophrenia. Implications and limitations of the findings are discussed.
Correspondence: *Staci Robyn, Department of Psychology, West Virginia University, 114 Oglebay Hall, Morgantown, WV 26506-6040, USA.*

P. ZUFFANTE, C.M. LEONARD, R.M. BAUER, J. HART, M. FORTUNATO, A.A. MANCUSO, & J.M. KULDAU. Dorsolateral Prefrontal Cortex Volumes and the Negative Symptoms of Schizophrenia.
Functional imaging and neuropsychological studies have implicated the dorsolateral prefrontal cortex (DLPFC) as a possible site of neuropathology in schizophrenia. We examined the relationship between specific positive and negative symptoms and DLPFC volume. Magnetic resonance images of 13 schizophrenics and 13 normal controls were obtained and volumetric measures were made of the middle frontal gyrus (MFG). Positive and negative symptoms were rated and IQ scores were obtained. While schizophrenics did not differ from controls in MFG volumes, blunted affect was significantly associated with decreased left MFG volumes ($r = -.638$, $p = .048$). Furthermore, IQ scores were positively correlated with both right and left MFG volumes. These results provide support for the involvement of the MFG in both the affective and cognitive deficits of schizophrenia.
Correspondence: *Paula Zuffante, Department of Clinical and Health Psychology, University of Florida, Gainesville, FL 32610, USA.*

S. BINKS & J. GOLD. The Neuropsychology of Schizophrenia-Revised.
Controversy concerning the interpretation of neuropsychological findings in schizophrenia can be attributed to the use of test instruments with widely varying sensitivity, specificity, and lack of accepted factor structure. The Woodcock-Johnson (WJ-R) provides seven cognitive factor scores and allows for the rigorous determination of individual strengths and weaknesses. We administered the WJ-R to 30 patients with schizophrenia along with a traditional battery. The schizophrenia WJ-R data suggest: (1) average premorbid achievement, (2) general decline across factors, (3) differential weaknesses in processing speed and memory, (4) substantial within subject heterogeneity across intracognitive factors, and (5) substantial similarity across subjects in intracognitive factors discrepancies. Examination of the seven intracognitive factors by traditional test batteries via stepwise regression procedures suggest the WJ-R has neuropsychological validity and psychometric advantages.
Correspondence: *Sidney Binks, Clinical Research Services Branch, NIMH, NIH, Washington, DC 20032, USA.*

Poster Session 3/1:30–4:30 p.m.

ADHD – 1

K.W. GREVE, M.C. WILLIAMS, & T.J. DICKENS, Jr. Concept Formation in Attention-Disordered Children.
The present study examined whether the difficulties in executive processing commonly exhibited by attention-disordered (AD) children on tasks such as the WCST are due to problems in concept formation or response execution. The California Card Sorting Test (CCST), which was specifically designed to make this type of distinction, was used. The AD children were impaired in all CCST conditions in which they were required to actually execute sorts; verbal description of presorted categories was unimpaired. This study showed that AD children can form and recognize concepts, but have difficulty converting those concepts into accurate sorts. This deficit is a consequence of impulsive responding. These findings have implications for our understanding of AD children's higher cognitive function and ability to learn.
Correspondence: *Kevin W. Greve, Department of Psychology, University of New Orleans, New Orleans, LA 70148, USA.*

K.R. KRULL & J. ELBERT. Event-Related Potentials During Selective Attention in Children with Attention Deficits and Familial Alcoholism.
Auditory and visual event-related potentials (ERPs) were collected from children during a bimodal selective attention task. Groups consisted of children with attention deficit disorder with (ADD^+) and without (ADD^-) hyperactivity and matched controls (CNT). Family history of alcoholism was provided through parental report. ERPs suggest better discrimination between target and nontarget stimuli in the CNT group compared to the $ADD^{+/-}$ groups. The CNT group appeared to process stimuli more efficiently, displaying appropriate responses to relevant stimuli and suppressions of irrelevant stimuli. This pattern between groups was also present when those children with a positive familial history of alcoholism were removed from the analyses. Consistent with previous findings, a positive family history of alcoholism was associated with a reduction in the P3 component of the ERP in all groups.
Correspondence: *Kevin R. Krull, Department of Psychiatry, University of Houston, Heyne Bldg., Suite 101, Houston, TX 77004, USA.*

C.A. LEAVELL & P. ENTWISTLE. The Relationship Between Sustained Attention, Response Inhibition, and Verbal Learning in Children with Learning/Attention Problems.
This study examines the relationship between sustained attention and response inhibition as tapped by the Continuous Performance Test (CPT) and a child's ability to engage in complex verbal learning on the California Verbal Learning Test-Children's Version. Consistent with prior findings, the CPT seems to be sensitive to attention and hyperactivity complaints in children. Findings also suggest that measures of sustained attention do relate to certain aspects of verbal learning, including overall ability to store and retrieve word lists. Additionally, the most marked relationships involved the CPT commissions with A followed by X, which has been considered a measure of response inhibition, lending credence to this factor as an important component of poor executive function.
Correspondence: *Carol A. Leavell, Neuropsychology Department, Braintree Hospital, 250 Pond St., Braintree, MA 02184, USA.*

D. ZELINSKY, S. HUGHES, R. RUMSEY, C. JORDAN, & E. SHAPIRO. The Early Childhood Vigilance Task: A New Technique for the Measurement of Attention in Very Young Children.
A computerized test of sustained attention in toddlers and preschoolers was developed and piloted to identify developmental changes in task performance. This Early Childhood Vigilance Task, modeled after Ruff's "puppet show" paradigm, was designed to assess vigilance in children too young to be administered continuous performance tests. Nineteen 12- to 46-month-old children watched cartoon characters appear and disappear from a large color monitor while a video camera recorded their looking behavior during the task. The videotapes were later coded for the total number of seconds that each child spent looking at the screen during the 6.5-min task. Duration of looking was correlated significantly with age and demonstrated sufficient variability to allow sensitivity to individual differences. We are currently collecting further normative information, test-retest reliability, and information about the relationship of this task to physiological, behavioral, and temperament characteristics.
Correspondence: *D. Zelinsky, Division of Pediatric Neurology, University of Minnesota Medical School, Minneapolis, MN 55455, USA.*

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R.L. OWNBY. A Computational Model of Attention Deficit-Hyperactivity Disorder.
The failures of attention seen in patients with attention deficit-hyperactivity disorder (ADHD) may be related to dysfunction in the neural network for directed attention proposed by Mesulam and others. The purpose of this study was to develop a computational model to simulate attentional deficits on the continuous performance test (CPT). Lesions to the network resulted in degraded performance. Changes in network performance were related to the degree of damage to the network but not to the location of the lesion. These results show that it is possible for a computational model to simulate CPT performance, and the lesions to the network result in performance decrements analogous to those of patients with ADHD.
Correspondence: *Raymond L. Ownby, Department of Psychiatry, University of Miami School of Medicine, Miami, FL 33101, USA.*

K. O'TOOLE, A. ABRAMOWITZ, R. MORRIS, & M. DULCAN. Effects of Methylphenidate on Attention and Nonverbal Learning in Children with Attention Deficit-Hyperactivity Disorder.
This study examined the effects of methylphenidate (MPH) doses on attention and learning tasks requiring different levels of processing in children with attention deficit-hyperactivity disorder (ADHD). Twenty-three children were evaluated on a continuous performance test (CPT) and two difficulty levels of a nonverbal learning task on two doses of MPH and placebo. Results showed that CPT commission errors were significantly reduced with low-dose MPH compared to placebo, whereas omission errors were not medication-sensitive. Performance on the nonverbal learning tasks was significantly improved with MPH. On the easy-level nonverbal task, performance improved equally well with low or moderate dose. On the hard level, performance was significantly better at moderate than placebo dose; there was no difference between moderate and low dose, except in memory recall trials. Learning curves for nonverbal learning tasks showed that MPH was effective by the middle of the learning trials. Results suggest that neuropsychological tests of varying complexity and demands can be useful in stimulant medication titration.
Correspondence: *Kathleen O'Toole, Department of Psychology, Georgia State University, University Plaza, Atlanta, GA 30303, USA.*

HIV—1

Y. STERN, X. LIU, & G. TODAK. Validation of Self-Reported Memory Changes in a Prospective Study of HIV$^+$ Men.
We previously reported a significant correlation between cognitive complaints and neuropsychological test performance in HIV$^+$ men, but others have not found this relationship. The current study addressed this issue prospectively. One hundred one HIV$^+$ gay men completed Squire et al.'s Self-Rating Scale of Memory Function at seven semiannual visits. We analyzed the relationship between self-reported change and measured change in three test domains: memory, attention, and language. Patients' reports of memory changes were significantly associated with actual changes in memory and attention scores, but not in language scores. These results indicate that patients' reports of changes in their cognitive capacity are accurate and that subtle changes in neuropsychological test performance in HIV$^+$ men reflect actual perceived changes in day-to-day memory functioning. This prospective approach should also be useful in other conditions where subtle cognitive problems are reported.
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W. BURNS, C. STARRATT, L. PETERSON, G. STARRATT, T. BELLIO, & S. WIDMAYER. HIV Sero-Reverted, Poly-Drug Exposed, Intraventricular Hemorrhage, Illness Control, and HIV-Positive Infants: Two- and Three-year Longitudinal Comparison.
One hundred fourteen high-risk infants were studied in a 2-yr longitudinal design across five types of birth complications: HIV$^+$, HIV sero-reverted, intraventricular hemorrhage (IVH), polydrug exposure, and mixed complications of prematurity and respiratory distress syndrome. A subsample of this group of 114 ($N = 46$) was tested at 36 months. Analysis of the Bayley at 6, 12, and 24 months and the Binet IQ at 36 months found no differences between groups at any age. When infants in each complication group were classified according to their PDI scores, Chi-square analysis revealed that significantly more HIV$^+$ and IVH children were in the <86 PDI category at the 6-month testing. At the 12-month testing, HIV$^+$, IVH, and sero-reverted had significantly higher proportions of children in the <86 PDI group than the other risk groups.
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J.A. SANCHEZ, J.T. BECKER, M.D. DEW, O.L. LOPEZ, S.K. DORST, & G. BANKS. Neuropsychological Abnormalities among Human Immunodeficiency Virus-Infected Individuals in a Community-Based Sample: Description of Initial Sample and Research Evaluation.
Neuropsychological abnormalities are a relatively common finding in HIV infection and AIDS. However, the site of evaluation is an important predictor of impairment, as is physical health status. The present report describes the sampling frame and initial results from a longitudinal study of HIV-infected individuals seeking primary medical care. Among the infected individuals, more than 30% were classified as impaired, a finding perhaps related to the overall poor physical health of the sample (60% AIDS). There was no significant association between education, recent drug or alcohol use, or history of major affective disorder and neuropsychological impairments. This sample also provides additional evidence of the high rate of affective disorder among infected individuals, and the predictive power of the development of neurological signs on subsequent cognitive loss.
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J. GICONI, O.L. LOPEZ, M.A. DEW, J.A. SANCHEZ, & J.T. BECKER. Mild Neurocognitive Disorder in a Community-Based Sample of HIV-Infected Individuals.
Individuals with HIV infection are at risk to develop cognitive impairment during the course of their illness. However, prior to the development of the more severe dementia syndrome, many patients will meet the diagnostic criteria for mild neurocognitive disorder (MNCD). MNCD is characterized by neuropsychological impairment sufficiently severe as to interfere with social and occupational function, as reported by the patient, but does not meet the criteria for another organic mental disorder. We report the prevalence and incidence of MNCD among a community-based sample of HIV-infected individuals seeking primary medical care (7% and 5%, respectively). Individuals with more advanced infection were more likely to have MNCD, but education and psychiatric factors did not alter the risk to develop the disorder. Of particular note, however, was the finding that only 26% of the HIV$^+$ individuals with measured neuropsychological impairment actually complained of functional impairment, thus precluding the MNCD diagnosis. Review of the various criteria for MNCD reveals the need for collateral information as well as serial assessment of cognitive function and its impact on social and occupational functioning.
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G. CANTLAY, K. DOYLE, O.L. LOPEZ, & J.T. BECKER. Central Executive Function as Revealed by Concurrent Task Performance in HIV-Infected Individuals.
The central executive system (CES) of working memory is impaired in various dementia syndromes. Patients with HIV infection can have significant impairments in memory and attentional processes, but the func-

tions of working memory have been little studied. In the present study, we evaluated the ability of HIV-infected individuals to perform Baddeley and Papagno's concurrent performance task. Relative to HIV^- controls, the vast majority of HIV^+ patients showed normal abilities to reallocate cognitive resources permitting optimum concurrent task performance. However, a subgroup of the HIV^+ patients had significantly impaired CES function. This subgroup of patients all had AIDS, and all had signs of diffuse encephalopathy. This pattern of impairments suggests that this subgroup may have cortical dysfunction, and may be a hallmark of an incipient dementia syndrome.
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B. ZELKOWICZ, O.L. LOPEZ, & J.T. BECKER. Dissociation Between Motor and Cognitive Dysfunction in HIV Infection and AIDS as Revealed by Motor and Word List Learning Tasks.
The qualitative aspects of word list learning and recall, as well as the ability to learn a motor task, are hallmarks of a subcortical etiology of a cognitive impairment. Among patients with HIV infection, 16% were impaired on one, but not both, tasks. Subjects in these subgroups were no more likely to have AIDS or a major psychotic diagnosis. However, correlations with specific neurological symptoms have been noted. These data are relevant to our understanding of the pathophysiology of HIV-related cognitive dysfunction.
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M.B. WISEMAN, M.A. MINTUN, O.L. LOPEZ, J.A. SANCHEZ, & J.T. BECKER. Patterns of Regional Cerebral Blood Flow in Mild Neurocognitive Disorder in HIV Infection.
Individuals infected with HIV are at an increased risk to develop cognitive impairment during the course of their disease. Although many patients develop an HIV-associated dementia, others may develop the less severe mild neurocognitive disorder (MNCD). In this study, regional cerebral blood flow (rCBF) was measured with PET in HIV^+ $MNCD^+$ patients, HIV^+ controls, and HIV^- controls. Analyses were performed using a Statistical Parametric Mapping (SPM94) method. Comparing a short-term memory task versus a rest state yielded activation in supplementary motor (SMA), parietal, and superior temporal regions in HIV^- controls. However, SMA did not activate in either HIV^+ group and parietal activation disappeared in the $MNCD^+$ patients. Comparing long- and short-term memory tasks yielded activation throughout the frontal cortex including BA46. The activation was extensive in the HIV^- controls, less marked in the HIV^+ controls, and even less marked in the MNCD patients. These data demonstrate that brain systems associated with lower-level, automatic processing are normal in HIV^+ $MNCD^+$ subjects. However, regions associated with effortful retrieval and organizational processes are impaired, perhaps reflecting decreased activation from subcortical structures.
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ASSESSMENT—2

R.C. MARTIN, M.D. FRANZEN, & S. OREY. Magnitude of Error as a Strategy to Detect Feigned Neuropsychological Impairment.
The present study introduced a magnitude of error method as a new malingering detection strategy. Selection likelihood values were calculated across multiple-choice items of two recognition memory tests and these scores were employed to identify analog and clinical malingerers. Results revealed that analog and suspected clinical malingerers were much more likely to select low probability multiple-choice items and often endorsed choices that neither controls or moderate-severe closed-head-injured patients endorsed. Likelihood value summed scores were able to classify 86% of the analog and 100% of the suspected clinical malingerers with 80% specificity for controls. These results provide preliminary support for the utility of the magnitude of error strategy in malingering detection. Cross-validation and employment of other tests warrant further investigation.
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D. SLICK, G. HOPP, E. STRAUSS, & F. SPELLACY. Validity Indices from the MMPI-2 and the VR-II in Healthy, Feigning, Compensation-Seeking and Non-Compensation-Seeking Samples.
Sensitivity and specificity of indices of malingering from the MMPI-2 (F, F-K, F(p), Obvious-Subtle, and Fake-Bad scales) and from the VR-II (a computer-administered, forced-choice recognition test of symptom validity) were evaluated in a sample of normal adults, healthy adults simulating postconcussive symptoms, compensation-seeking neuropsychological patients, and neuropsychological patients not seeking compensation. The most efficient scales from the MMPI-2 were F and F-K. The results also suggest that the cut-score for the Fake-Bad scale may be too low, and that the cut score for the F(P) scale may be too high. Hard items were the most efficient measure of malingering from the VR-II. Low-to-moderate intercorrelations of obtained validity scale classifications suggest that the validity scales evaluated in the study measure different aspects of dissimulation.
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H.S. RICHERT, M. HISCOCK, & J.S. CAROSELLI. The Emperor's Clothes Phenomenon: Implications for the Detection of Malingering.
A visual recognition task, described to subjects as a test of attention and concentration, was used to differentiate 32 normal adults who had been instructed to feign impairment from 32 honestly performing adults. The letter "O" was presented at fixation on each trial for a duration insufficient to allow discrimination from the letter "Q." Across five blocks of 20 trials, incorrect "Q" responses were reinforced on 100, 0, 80, 20, and 50% of trials. Honest subjects adjusted their responses across trial blocks so as to maximize positive feedback; simulators performed near the 50% level irrespective of feedback. An optimal cutoff score yielded a classification accuracy of .86. The procedure shows promise for development into an effective means of detecting malingering.
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L.M. REES & T.N. TOMBAUGH. Validation of the Test of Malingering/Motivation (TOMM) Using a Simulation Paradigm.
The Test of Malingering/Motivation (TOMM) is a newly developed, visual recognition test with good discriminant and face validity. Fifty drawings of common objects were shown at 4-s intervals, followed by a test trial employing a forced two-choice procedure. The test consists of two learning trials and one delay trial. The TOMM was administered as part of a battery of tests to students asked to perform either to the best of their ability or to simulate performance of a TBI patient in a realistic manner. Results indicate that the TOMM has high sensitivity (92%) and specificity (100%). Analysis of debriefing questions revealed that individuals did not perceive the TOMM as an obvious measure of malingering.
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L.A. HUMPHREY, V.L. BRUMM, W.J. McMULLEN, N.A. PACHANA, M. STODDARD, W.G. VAN GORP. Performances of Mild and Moderate TBI Patients Versus Probable Malingerers on Measures of Neuropsychological Functioning.
This study examined patterns of results on standard neuropsychological instruments measuring visual-perceptual functioning, visual mem-

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ory, language functioning, and motor functioning across three groups. The three groups included mild head injury patients, moderate head injury patients, and probable malingerers. Results indicated significant differences between probable malingerers and true brain-injured patients on Block Design, Object Assembly, and Visual Reproduction II. Implications of this cluster of findings as well as suggestions for future research are discussed.
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L. BLACKBURN. The Sensitivity and Specificity of the Test of Variables of Attention for Differential Diagnosis of Attention Deployment Problems.
The study was conducted to assess the ability of the Test of Variables of Attention (TOVA) to differentiate children presenting with attention problems secondary to emotional disorders (ED) from children with Attention Deficit-Hyperactivity Disorder (ADHD). The relationship between multiple responding and neurological dysfunction was also explored. While specificity scores were good, ranging from .72 to .87, sensitivity of response speed and error scores fell at or below chance levels. Variability in responding provided the best overall discriminability, yet resulted in a misclassification rate of 21%, supporting the need to interpret scores in the context of a complete assessment. Multiple button pressing was a poor indicator of neurological dysfunction, but showed promise as a measure of response inhibition.
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S. HUNTER, A. SIVAN, D. HARTMAN, H. KRAVITZ, & J. CAVANAUGH. When Low Average Means Impaired: Evaluating the Neuropsychological Status of Professionals.
We report on the sensitivity of a neuropsychological battery developed to assess cognitive functioning in executives referred for substance abuse and/or impaired judgment or behavioral difficulties. Fifteen professionals were administered components of a battery selected to measure subtle cognitive changes in higher-functioning individuals. Analyses indicated impairment in bilateral motor coordination and low average scores on verbal learning, immediate and delayed verbal prose recall, and inductive problem solving. Substance abusers demonstrated significantly worse performance on measures of immediate and delayed verbal memory. Results suggest that verbal memory, fine motor coordination, and inductive problem solving may be sensitive indicators of impaired performance in otherwise high-functioning professionals. Additionally, our data support suggestions that the use of standard norms without consideration of premorbid performance level may lead to misinterpretation of subtle deficits when evaluating fitness for duty.
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J.L. NANSON. Statistical Problems of Neuropsychological Assessment.
Although neuropsychologists are typically trained in rigorous empirical research methodologies, this level of rigor is seldom applied to clinical neuropsychological assessments. Three major statistical problems plague clinical neuropsychological assessment: type 1 error within assessments, multiple scoring formats, and inadequate norms. In this paper, each of these problems is outlined and illustrated with commonly used neuropsychological tests. Finally, some possible solutions and important caveats to test interpretation are proposed. Neuropsychologists need to apply the same level of empirical rigor to their assessment procedures as they do to research work.
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S.B. ROURKE, J.V. FILOTEO, & I. GRANT. The Influence of Age, Education, and Elapsed Time in Predicting Neuropsychological Changes in Controls Across Three Evaluations.
We administered a battery of 17 neuropsychological (NP) tests, including tests from the Halstead Reitan Battery, WAIS, and WMS, to 60 healthy controls screened for adverse medical conditions (mean age and education = 46.1 (10.3) and 14.2 (2.6) yr, respectively) and examined how NP at baseline, age, education, vocabulary, and time between evaluation affected their NP performance 1.3 (0.5) yr later. Using stepwise multiple regression (SMR), baseline NP was found to be a significant predictor of NP at evaluation 2 on all 17 tests, but age, education, vocabulary, and elapsed time were not found to contribute to cognitive test performance at evaluation 2. Of the original 60 subjects, 38 were tested a third time 5.1 (4.0) yr after the second testing. Using SMR to predict NP at evaluation 3, NP at evaluations 1 and 2 were found to vary in their contribution, age and elapsed time were more salient than at first follow-up, whereas education and vocabulary were not significant predictors on any of the cognitive tests at evaluation 3.
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T.D. MARCOTTE, W.G. VAN GORP, C.H. HINKIN, & S. OSATO. Validity of the Neurobehavioral Cognitive Status Exam Subtests Utilizing a Diverse Clinical Cohort.
The Neurobehavioral Cognitive Status Exam (NCSE) is a brief screening measure designed to increase sensitivity by including detailed assessment of numerous cognitive domains. Fifty-four patients (26 demented, 28 nondemented) referred for clinical neuropsychological (NP) evaluations were administered the NCSE and common NP tests. Although each of the subtests was significantly correlated with the NP tests assessing similar domains, only two of the subtests accounted for greater than 50% of the variance in the NP tests. Using impairment on individual NP tests as the gold standard, the NCSE subtests classified impaired and unimpaired patients at a much lower than expected rate. The results of this study draw into question the efficacy of the NCSE subtests in delineating domain-specific cognitive functioning.
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M. RAGUET, D. CAMPBELL, D. BERRY, F. SCHMITT, & G. SMITH. The Reliability and Stability of Intelligence and Intellectual Correlates in Older Persons.
A neuropsychological evaluation is typically conducted to identify declines in an individual's level of cognitive functioning. To determine the nature of the declines, the level of prior functioning must also be identified either through objective test data obtained at a prior time or through methods designed to estimate the prior level of functioning. The psychometric characteristics of these estimation techniques have received relatively little attention in the literature. In the present study, intellectual test data and several predictor variables were obtained concurrently in a sample of healthy, older adults on two testing occasions, approximately a year apart. The data supported the reliability and stability of the individual and combined intellectual predictor variables in an older population over a 1-yr period.
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M.M. BRULOT, E.H. STRAUSS, & F. SPELLACY. The Validity of MMPI-2 Head Injury Scales.
Endorsement of certain MMPI-2 items is thought to artificially inflate some standard clinical scales in patients with closed head injury (CHI). Correction scales have been established by comparing item endorsement by patients with CHI to that of controls, and selecting items unique to

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the CHI population. This study aimed to assess the validity of CHI scales by relating these to indices of HI severity and to scores on standard neuropsychological measures. Results revealed no correlation between CHI scales and measures of severity of CHI (LOC, PTA) or with performance on neuropsychological tests. Significant correlations were found, however, between CHI scales and the MMPI-2 depression content scale despite the fact that item overlap among scales was minimal. These results raise the suggestion that the CHI scales are more sensitive to emotional distress than to CHI.
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D. WILLIAMSON, J. SCOTT, & K. KRULL. Premorbid IQ Estimation: Comparing the OPIE and USF Equations in Clinical Samples.
Estimation of premorbid intellectual ability is critical to the interpretation of neuropsychological data and the formation of rehabilitation goals. Two recently introduced methods, the Oklahoma Premorbid Intelligence Estimate (OPIE) and Vanderploeg and Schinka's equations from the University of South Florida, use multiple regression to combine current WAIS-R and demographic data to estimate premorbid IQ. Both sets of equations have been shown to yield estimates with favorable psychometric characteristics, but they have yet to be compared in clinical populations. The results of this study suggest that, when comparing across TBI, CVA, dementia, cardiovascular disease, seizure disorder, and tumor populations, the most consistent estimates are obtained when either set of equations is used in algorithmic fashion, with the estimate being based on either the Vocabulary or Picture Completion subtest.
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H. JIN, S.B. ROURKE, & I. GRANT. A History of Neuromedical Risks and Deviant Personality Characteristics, But Not Neuropsychological Test Performance, Predicts Resumption of Drinking in Long-Term Abstinent Alcoholics.
Predictors of relapse in stable long-term abstinent alcoholics (LTA) greater than 18 months' sobriety are largely unknown. Few attempts have been made to follow up LTA past a period of 5 yr to determine if there is a different set of predictors for this population than more commonly studied recently detoxified alcoholics. In present study, we enrolled 73 male alcoholics with at least 18 months of abstinence [sample age, education, and length of alcoholism, mean (SD): 42.1 (9.2), 13.5 (2.9), and 13.7 (7.8) yr], and assessed whether information collected at enrollment (past alcohol consumption [ALC], behavioral indicators of alcoholism [BEH], neuropsychological performance [NP], personality characteristics [MMPI], and neuromedical risks [NMR]) predicted resumed drinking over mean follow-up period of 11 yr (range 1–18). Of the 73 alcoholics, 20 relapsed at a mean of 4.4 yr after enrollment, whereas 53 remained sober; groups did not differ in age, education, and ALC. However, resumed drinkers had more BEH, higher NMR (particularly head injury and neurotoxic risks), elevations on MMPI (particularly Scale 4), but were not different on NP. Using logistic regression, Scale 4 from MMPI and head injury risk were the only significant variables to enter model, with Scale 4 accounting for most of variance. Overall, the model resulted in correct classification of 80.3% of the alcoholics.
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D.L. NYENHUIS, T. LUCHETTA, C. YAMAMOTO, A. TERRIEN, & D.C. GARRON. The Standardization and Continued Validation of the Multiscale Depression Inventory.
We report on the continued development of the Multiscale Depression Inventory (MDI). The MDI, with its separate mood, evaluative, and vegetative subscales, is designed specifically to be used with medical and neurological patient groups. In the present study we administered the MDI to 874 adults (age range 18–89) in the general population. We completed principal component analyses with 454 of the subjects to make final item selection, and standardized the scale with 420 additional age-, education-, and gender-stratified subjects. MDI scales correlated significantly with other established depression measures, thus showing convergent validity. In a companion study, we will cross-validate the MDI subscale factor structure.
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J. HAYES, D. HALE, & W. GOUVIER. Do Several Common Tests of Malingering Accurately Discriminate Between Pretrial, Malingering, and Not Guilty by Reason of Insanity Mentally Retarded Defendants?
Malingering been studied extensively, yet investigations into this subject using mentally retarded (MR) patients have been virtually ignored. Approximately 16% of murder/insanity defendants are MR; therefore, the importance of determining whether tests of malingering discriminate between the honest MR patient and the simulator is critical. The Dot Counting Test, MFIT, and the M-Test were given to pretrial MR patients who were not malingering, MR patients found not guilty by reason of insanity, and MR individuals previously and independently identified as malingerers. Multiple discriminant function analysis correctly classified 70% of patients across groups and varied from 72% of NGBRI patients to 66% of malingerers. These measures should not be used alone to predict malingering in MR patients, as the false-positive error rate is unacceptably high.
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L.J. BUXBAUM, S.S. LEE, & M.F. SCHWARTZ. Object Selection and Use in Ideational Apraxia: The Role of Distractors.
The traditional diagnostic criterion for ideational apraxia (IA) is impaired performance on tests of sequential action with multiple objects. Such tests confound requirements to organize complex action and to disambiguate numerous semantically and functionally related items in an array. If IA reflects deficits in semantic and associational knowledge, it should persist on multiple-objects tests even when simple gestures are required. Additionally, performance should be strongly disrupted by semantically and/or visually related distractors, and less so by unrelated distractors. The performance of C.R., a patient with severe IA, demonstrated such effects both in action errors and in latencies to reach to target objects. This suggests that IA is not a failure to conceptually organize complex action, but rather reflects a deficit in object selection and use that is sensitive to the visual and semantic features of objects.
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A.M. RAYMER, L.M. MAHER, A. FOUNDAS, K.M. HEILMAN, & L.J.G. ROTHI. The Significance of Body Part as Tool Errors in Limb Apraxia.
When pantomiming to command, left-hemisphere-damaged (LBD) patients may produce errors where they use a body part as if it were the tool (BPT). Some clinicians question the significance of this error because normal subjects also make BPT responses. We analyzed BPTs in LBD and normal subjects who were reinstructed when BPTs occurred. They were also compared to normal subjects who were not reinstructed. Whereas LBD subjects produced significantly more BPTs than normals who were reinstructed, they were not different from normals who were not reinstructed. When reinstructed, normal controls correctly modified virtually all BPTs, whereas LBD subjects did not modify BPTs. These findings underscore the need for reinstruction when a BPT occurs to determine whether it represents a true BPT error, a pathognomic sign of limb apraxia.
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R.L. SCHWARTZ, J.C. ADAIR, D.J.G. WILLIAMSON & K.M. HEILMAN. Handedness and Hemispace: Hemispheric Asymmetry of Attention and Intention.

To learn if each hand has a bias to work in its own hemispace and whether this bias may be influenced by attentional (ATT) or intentional (INT) systems, we studied normal subjects performing a vertical circle bisection task in two conditions. In the indirect condition, we used a new technique that dissociates ATT and INT bias. We studied the influence of these biases on the interactions of hemispace and handedness. Results indicated that in the indirect condition, each hand has a bias to work in its own hemispace, right hand greater than left Because subjects did not make errors in the direct condition, we could not learn if the bias was ATT or INT, but suspect that ATT was influencing INT. Handedness had no effect.

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M. LENEMAN, L. BUCHANAN, & J. ROVET. Rey-Osterrieth Revisited: Capturing the "What" and "Where" Distinctions in the Rey-Osterrieth Complex Figure.

The Rey-Osterrieth Complex Figure (ROCF) test is a valuable neuropsychological tool for assessing perceptual organization and visual memory. However, traditional scoring methods do not take into account the dissociation between spatial and visual information processing, both of which are required by this task. An alternate scoring method is proposed that independently evaluates spatial and visual capacities. When this method was applied to a dataset of children with congenital hypothyroidism, it was found to be a more sensitive indicator of their spatial deficit than the Denman. Furthermore, the Spatial Analysis score was a stronger predictor of performance on psychometric tasks of spatial ability, whereas the Visual Detail Analysis score was a stronger predictor of visual perceptual tasks. Our scoring method provides a useful alternative for scoring the ROCF that is consistent with current theoretical notions of "what" and "where" pathways for visual processing.

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J. BARTOK, B. AXELROD, & E. ABRAHAM. Clinical Utility of the Tower of London Test.

We investigated the usefulness of the Tower of London (TOL) test as a neuropsychological measure of planning ability in a sample of 60 patients referred for neuropsychological evaluation. The usefulness of the TOL may be improved if the test were shortened to the six most difficult items, since it would considerably reduce the administration time, while providing essentially equivalent information as the entire test. In terms of specificity, the TOL successfully differentiated between groups divided according to level of functioning on the WCST, another test associated with executive functioning. Furthermore, correlational studies showed that TOL performance is clearly related to visual-spatial, attention/concentration, and planning or reasoning abilities.

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F.E. ROSE, M.H. KRENGEL, & R.F. WHITE. Evaluation of Two Recognition Tasks on the California Verbal Learning Test.

The California Verbal Learning Test (CVLT) is a commonly used test of verbal learning and memory that employs a recognition task at its conclusion. However, certain subject response styles, such as a positive response bias, make interpretation difficult. The present study examined the utility of administering a forced-choice recognition task following standardized administration of the CVLT. Subjects were 63 neurological and psychiatric patients divided into groups of high and low false-positive responses on the CVLT Recognition task. Patients with low false-positive rates did not differ in their scores on the CVLT Recognition task and the Forced-Choice task. However, subjects with high false-positive rates on the CVLT Recognition task demonstrated a significant drop in recognition score on the Forced-Choice task. Implications and limitations of this method are discussed.

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G. LEE, E. STRAUSS, L. McCLOSKEY, D. LORING, & D. DRANE. Localization of Frontal Lobe Lesions Using Verbal and Nonverbal Fluency Measures.

Seventy-three patients with focal cerebral lesions were administered associative word and figural fluency measures to determine their efficacy in localizing anterior lesions. Using an index based on these tests (word minus design fluency), right frontal and right temporal lobe patients produced significantly fewer designs than words compared to left temporal lobe patients, but did not differ from individuals with left frontal lesions. The fluency index did not distinguish frontal from temporal patients, but did differentiate between patients with right and left hemisphere lesions. When individual tests were examined, figural fluency was superior to word fluency in determining lesion site. Results suggest that figural fluency on the Five-Point Test is a useful measure in helping to detect anterior cerebral lesions, especially on the right.

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J. ANDRIKOPOULOS. Consistent Abnormal Verbal-Visual Differences on the Wechsler Memory Scale-Revised.

The present study consisted of 60 patients divided into four different groups (psychiatric, compensable mild head injury, moderate-to-severe head injury, and Alzheimer's disease) each consisting of 15 consecutive patients. The scores from all the verbal subtests and their visual analogues were compared for each group and for the sample as a whole. There appeared to be a lack of equivalence between the verbal and visual subtests. Most of the visual subtests were easier than were their verbal analogues for each of the four groups. The present findings add to the current research amassed on the limitations of the WMS-R.

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C. BOAKE & L. MEANS. False-Positive Errors on the Rey 15-Item Test.

Rey 15-Item Test scores of 98 patients with moderate-to-severe head injuries were studied to characterize patients who scored below standard cutoff scores. The large majority of the 15% of patients who scored below the seven-item cutoff and 30% who scored below the three-row cutoff had neurologic deficits detectable on the physical examination. Thus, most of these patients would be easily identifiable as false-positives and would not have been misclassified as poorly motivated. The three-row cutoff may be preferable with head-injured patients. The Rey 15-Item Test may have questionable validity in head-injured patients with preexisting cognitive problems.

Correspondence: *Corwin Boake, Department of Physical Medicine and Rehabilitation, University of Texas-Houston Medical School, Houston, TX 77030, USA.*

R.D. PALMERTON & S.A. WINGENFELD. Effects of Number Practice and Strategy Training on Paced Auditory Serial Addition Task Performance.

The Paced Auditory Serial Addition Task (PASAT) was administered to 85 college students ages 18–23 yr. Participants were randomly assigned to one of five conditions: number practice, rehearsal, number skipping, combined rehearsal skipping, and a control group. In the experimental conditions, training to improve PASAT performance was provided. The control group completed a verbal fluency task for the same period. Analyses of variance revealed no significant differences among experimental conditions, indicating similar performance for all conditions. Mean performance for each PASAT trial, however, was higher than expected from PASAT norms for all conditions. Results suggest that the

interventions had nonspecific effects, raising questions about the extent to which PASAT performance is also influenced by arousal and affective variables.
Correspondence: *R.D. Palmerton, 216 Memorial, Department of Psychology, University of Arkansas, Fayetteville, AR 72701-1201, USA.*

G.A. GIOIA, P.K. ISQUITH, & L. KENWORTHY. The Boston Naming Test with Children: Is It Time to Reengineer?
To examine the clinical utility of the Boston Naming Test (BNT) for children with its recently compiled norms, and to explore the influence of sociodemographic variables on these scores, the BNT and a comparison naming task, the Beery Picture Vocabulary Test (PVT), were administered to a clinical sample ($N = 65$). Scores on the BNT were significantly below the PVT and other measures of verbal ability. Furthermore, African-American children, but not Caucasian children, scored significantly lower (21 points) on the BNT than the PVT after SES and vocabulary knowledge were controlled for. We conclude that the BNT with its present norms should be reconsidered as a valid measure of naming in children, particularly African-Americans.
Correspondence: *Gerard A. Gioia, Division of Pediatric Neuropsychology, Mt. Washington Pediatric Hospital, 1708 W. Rogers Ave., Baltimore, MD 21209, USA.*

INTER-HEMISPHERIC

C.M. DUNN & W.S. BROWN. Bilateral Field Advantage and Interhemispheric Transmission Time: Test of Asymmetric Homologous Enhancement.
Recent studies of the corpus callosum have investigated the relationship of evoked potentials measures of interhemispheric transmission time (IHTT) and the ability to integrate visual information between the hemispheres (i.e., the bilateral field advantage [BFA]). This study hypothesized that an IHTT-BFA correlation (for IHTT from the left to right) would be apparent at a short presentation time (60 ms), but that this correlation would disappear for a longer presentation time (200 ms), suggesting the necessity of rapid interhemispheric transfer for more difficult bilateral field comparisons. IHTT and BFA were measured from a letter-matching task in 20 adults using long (200 ms) and short (60 ms) presentation times. While a significant BFA and IHTT were found for either presentation times, in neither case were IHTT and BFA correlated. The results do not support the Asymmetric Homologous Enhancement theory of Brown and Jeeves.
Correspondence: *C.M. Dunn, Travis Institute and Graduate School of Psychology, 180 N. Oakland Ave., Pasadena, CA 91101, USA.*

M.D. BJERKE, G.C. GALBRAITH, & W.S. BROWN. Evoked Potential Measures of Interhemispheric Transfer: Latency Adjusted Averaging.
Evoked potentials (EPs) are proving to be of increasing value in studying the corpus callosum and its contributions to human cognition. As an alternative to time-locked averaging of visual EPs, this study used a combination of latency compensation and cross-correlation averaging (latency adjusted averaging [LAA]) to determine interhemispheric transfer times (IHTTs), EP lag variances, and signal to noise (S/N) ratios. Subjects included 20 normal controls, two commissurotomy patients, and 2 callosal agenesis patients. Results showed that LAA successfully detected IHTT in controls. Additionally, within the normal group, S/N ratios derived from LAA were significantly higher for direct versus cross-callosal EPs and for the left versus right hemisphere electrodes. Latency variability was generally higher and S/N ratios were generally lower for cross-callosal EPs in commissurotomy and agenesis patients.
Correspondence: *M.D. Bjerke, Fuller Graduate School of Psychology, 180 N. Oakland Ave., Pasadena, CA 91101, USA.*

S.A. COPELAND & E. ZAIDEL. Contributions to the Bilateral Distribution Advantage.
When two visual items are compared, presentation of each to a different hemisphere may result in superior performance (bilateral distribution advantage [BDA]) by permitting each hemisphere to partially process stimuli, leaving more resources for the decision. A three-item task fails to equate perceptual load in the hemispheres. We introduced (1) blocking, which averted left-to-right scanning and left perceptual load (automatic stimulus registration) and cognitive load (controlled identification and comparison) as independent contributors to the BDA, and (2) symmetric perceptual load, so that the remaining BDA must have been due to asymmetry in cognitive load. Different callosal channels may maintain independence in initial processing and mediate interhemispheric transfer for the final comparison. Furthermore, the BDA may not depend on overall task difficulty, but on the number of "computational steps," each perhaps involving a horserace between the hemispheres.
Correspondence: *Sarah A. Copeland, Department of Psychology, University of California at Los Angeles, Los Angeles, CA 90095, USA.*

J.B. HELLIGE & G.B. SCOTT. Output Order Does Not Determine Qualitative Hemispheric Differences for Processing Letter Trigrams.
Observers identified consonant-vowel-consonant trigrams with the letters arranged vertically by pronouncing the stimulus (treating the bottom letter as the first letter) and spelling it from bottom to top. On each trail, the trigram was presented to the left visual field/right hemisphere (LVF/RH), the right visual field/left hemisphere (RVF/LH), or to both visual fields simultaneously (bilateral trials). Quantitative and qualitative visual field differences were identical to those found when observers used a more natural response output order, treating the top letter of the trigram as the first letter. The results suggest that, regardless of output order, attention is distributed across the three letters in a relatively slow, top-to-bottom fashion on LVF/RH and bilateral trials, whereas attention is distributed more rapidly and evenly across the three letters on RVF/LH trials.
Correspondence: *Joseph Hellige, Department of Psychology, University of Southern California, Los Angeles, CA 90089-1061, USA.*

N. ALI & C. CIMINO. Hemispheric Lateralization of Perception and Memory for Emotional Verbal Stimuli in Normals.
This study purports to (1) extend existing literature concerning lateralization of perception of emotional verbal stimuli in normals to include a test of both right hemisphere and valence models of emotional lateralization, and (2) investigate predictions from these models regarding lateralization of memory for emotional verbal stimuli in normals, an area unexplored to date. Seventy-nine college students were tachistoscopically presented lateralized positive, negative, and neutral English words and nonwords. Subjects were then asked to freely recall and, after a delay, to recognize the presented words. Results of accuracy perception data, free recall, and, recognition memory data all provide support for the valence model. Results are discussed in relation to the existing bodies of literature on emotional lateralization using verbal and nonverbal stimuli.
Correspondence: *Nadia Ali, Department of Psychology, Veterans Administration Medical Center, 1601 SW Archer Rd., Gainesville, FL 32608, USA.*

K.E. LUH. Cerebral Asymmetries in Processing Strategies for Consonant and Symbol Trigrams.
Previous work has shown that pronounceable letter strings (CVCs) are processed holistically in the superior right visual field (RVF) and sequentially in the left visual field (LVF). Consonant and symbol trigrams yield similar RVF advantages, which may reflect the left hemisphere's bias for local processing, but this bias does not result in similar strategies. Strategies for consonants are identical in the LVF and RVF when subjects spell them, and differ only slightly when subjects pronounce them. Pronounceability of consonant trigrams, assessed with ratings and vocal reaction times, is predicted by orthographic regularity. Subjects chunk,

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and therefore more accurately recall, consonant strings as bigrams. Symbols, which cannot be chunked either phonetically or orthographically, are processed more holistically in the LVR than in the RVF, but in a linear fashion in both.
Correspondence: *Karen E. Luh, Department of Psychology, University of Wisconsin, 1202 W. Johnson St., Madison, WI 53706-1696, USA.*

E.D. BERTKE & W.S. BROWN. The Interhemispheric Stroop Effect in Agenesis of the Corpus Callosum.
The demonstration of a cross-visual-field Stroop interference effect has provided an important tool for the study of interhemispheric interaction. Four normals and two acallosals (with anterior commissures) were given a computerized version of the interhemispheric Stroop task, using verbal reaction times. An interhemispheric Stroop effect was found for both normal and acallosal subjects. Significant effects were found for condition (interference/facilitation) but not for position (unilateral/bilateral), indicating that the Stroop effect crossed the midline in both normals and controls. Given the reduced interhemispheric Stroop effect report earlier in an acallosal without an anterior commissure, these results suggest the importance of the anterior commissure for transmission of the semantic information and the interhemispheric Stroop effect.
Correspondence: *E.D. Bertke, Fuller Graduate School of Psychology, 180 N. Oakland, Pasadena, CA 91101, USA.*

J. FREIDEN, R. PUSAKULICH, & J. WARD. Tactile and Visual Pretreatment Effects on Finger Maze Learning.
A finger maze was used to study the effects of tactile and visual pretreatments on 177 blindfolded, dextral subjects to assess what influence these pretreatments might have in explaining left hand-right hemisphere advantages found in many spatial tasks. Contrary to expectations, the tactile pretreatment hindered right-hand learning rather than facilitating left-hand learning. The visual pretreatment inoculated right-hand learning from the effects of the tactile pretreatment. It is postulated that this might be the result of an "attentional shift" between cerebral hemispheres.
Correspondence: *Robert Pusakulich, VA Medical Center (116B), 1030 Jefferson, Memphis, TN 38104, USA.*

C. NIEBAUER & S. CHRISTMAN. Upper and Lower Visual Field Differences in Categorical and Coordinate Judgments.
It has been theorized that the left versus right hemispheres differ in processing categorical and coordinate spatial relationships, respectively. Others have hypothesized that the upper and lower visual fields are functionally specialized for visual search and visuomotor manipulations, respectively. In the current study, subjects made either categorical or coordinate judgments to stimuli in either the upper left, upper right, lower left, or lower right visual fields. For categorical judgments, subjects responded equally fast to all visual fields, except the lower left, which was slower. For coordinate judgments, subjects responded equally fast in all visual fields, except the lower left, which was quickest.
Correspondence: *C. Niebauer, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

P.J. SUTER, W.F. McKEEVER, & L.J. CERONE. Unsuspected Profound Impairment of Report of Left Hemisphere Stimuli Following Left Middle Cerebral Artery Stroke, in a Right Hemisphere Language-Dominant Sinistral.
A 39-yr-old left-handed man suffered a left middle cerebral artery stroke. Despite making a good recovery, with no aphasic symptoms at any time, lateralized language tasks revealed an extreme impairment of his ability to report right ear syllables or right visual field stimuli. This deficit could not be attributed to sensory defect, neglect, or disruption of interhemispheric pathways. The possibility is considered that such a defect might be more likely in a right hemisphere-specialized person if subtle early left damage had figured in his/her becoming right hemisphere dominant in the first place.
Correspondence: *P.J. Suter, Department of Psychology, University of Toledo, Toledo, OH 43606, USA.*

M.B. CASEY, E. PEZARIS, S. MAXWELL, & R. NUTTALL. Further Support for the Geschwind/Behan/Galaburda Model of Brain Laterality: Decreased Preference for Feminine Games/Activities in Anomalous-Dominant Girls.
The Geschwind/Behan/Galaburda (GBG) model of cerebral laterality successfully predicted differences on a Tomboy Scale among girls of two-handedness subtypes. Fifth-grade girls who fit GBG's broad definition of anomalous dominance rated themselves lower in interest on feminine games and activities than did females with standard dominance. The anomalous-dominant group included left-handed and ambidextrous girls as well as right-handed girls with first-degree non-right-handed relatives. The standard dominant group included right-handed girls with all right-handed first-degree relatives. These findings are consistent with GBG's view that there should be increased masculinization and/or decreased feminization among anomalous-dominant females. The findings also reinforce our prior results, which showed a similar pattern of findings when adult college women were asked to reflect back to their childhood experiences.
Correspondence: *M. Beth Casey, Department of Counseling and Developmental Psychology and Research Methods, 201 Campion, Boston College, Chestnut Hill, MA 02167, USA.*

N.Y. WEEKES & E. ZAIDEL. The Effects of Steroid Hormones on Hemispheric Specialization, Interhemispheric Interaction, and Learning in a Bilateral Lexical Decision.
There is mounting evidence that the steroid hormones affect general cognitive ability as well as hemispheric specialization and interhemispheric interaction. Recently, the role of these hormones in learning and memory has also received a great deal of attention. The present study further investigates the influence of estrogen on each of these functions. Thirty-two women were tested on a bilateral lexical decision task across two different stages of the menstrual cycle. Estrogen levels did not affect overall performance or hemispheric specialization for the task, but did affect interhemispheric interaction. Furthermore, we found that the groups differed in the amount of learning they showed both between the two hemispheres and between and within the two testing sessions.
Correspondence: *Nicole Y. Weekes, Department of Psychology, UCLA, 1282 Franz Hall, 405 Hilgard Ave., Los Angeles, CA 90095, USA.*

Paper Session 7/3:40–5:30 p.m.

ALZHEIMER'S DISEASE—2

N.J. FISHER, B.P. ROURKE, L.A. BIELIAUSKAS, B. GIORDANI, S. BERENT, & N.L. FOSTER. Neuropsychological Subgroups of Patients with Alzheimer's Disease.
Neuropsychological data from 134 patients with probable Alzheimer's disease were studied to investigate whether subgroups of patients with qualitatively distinct profiles could be identified. Three empirical classification approaches were undertaken in this regard: Q-type factor analysis, hierarchical agglomerative cluster analysis, and iterative partitioning. Three subgroups were consistently identified across the clustering methods. Subgroup 1, comprising approximately half of the sample, is marked by severe anomia accompanied by moderate-to-severe constructional dyspraxia. Individuals in subgroup 2 displayed relatively spared visual-perceptual/constructional functioning, in the face of severe anomia. Members of subgroup 3 exhibit intact naming and nonverbal reasoning, with moderate difficulty copying overlapping figures. The

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three subgroups did not differ with respect to age, age at onset, duration of illness, educational level, or Hamilton depression rating.
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T. DEMADURA, M. ROMAN, S. SQUIBB, E. FORD, D. DELIS, D. SALMON, & N. BUTTERS. Performance of Subtypes of Alzheimer's Disease Patients on Traditional Verbal and Visual Memory Tasks.
This study evaluated performance on traditional verbal and visual memory tasks in subgroups of Alzheimer's disease (AD) patients with relative weaknesses in either visuospatial or verbal skills. Subjects with either deficient naming relative to block construction skills ("High Spatial" subjects) or deficient block construction skills relative to naming ("High Verbal" subjects) were compared on selected indices from the CVLT and the Design Memory Test (WMS-Heaton Version). Results indicated that AD subtypes differed in their verbal memory performance, with High Verbal subjects obtaining higher scores than High Spatial subjects in total recall during learning trials and in recall after a long delay. High Verbal subjects' retention of verbal material was not relatively spared, however, as indicated by savings scores. No group differences were found in visual memory performance.
Correspondence: *Thersa L. Demadura, Psychology Service, San Diego V.A. Medical Center, 3350 LaJolla Village Dr., San Diego, CA 92161, USA.*

M. ROMAN, T. DEMADURA, D. DELIS, V. FILOTEO, D. EVELYN, E. FORD, D. SALMON, & N. BUTTERS. Performance of Subtypes of Alzheimer's Disease Patients on a Global-Local Memory Task.
This study employed a global-local task to examine spatial learning and memory in subgroups of patients with Alzheimer's disease (AD) who had relative weaknesses on traditional tests of either visuospatial or verbal skills. Although all AD subjects displayed deficits in learning, retention, and recognition of complex visual stimuli, regardless of their area of cognitive weakness, the AD subgroups displayed distinct patterns of visual memory deficit. "High Spatial" subjects (those with deficient naming relative to block constructions) had greater difficulty recalling local (i.e., detail) stimulus features during learning trials. "High Verbal" subjects (those with deficient block constructions relative to naming) had greater difficulty recalling global (i.e., configural) stimulus features during learning and delayed recall trials, and produced false-positive responses on recognition testing, suggesting better retention of the local stimulus features of target stimuli. These findings suggest that subgroups of AD patients with asymmetric cognitive performance on nonmemory tasks may also exhibit differential performance at the level of memory function as well.
Correspondence: *Mary J. Roman, Psychology Service, San Diego V.A. Medical Center, 3350 LaJolla Village Dr., San Diego, CA 92161, USA.*

B.L. PLASSMAN, D.C. STEFFENS, M.J. HELMS, K.A. WELSH, & J.C.S. BREITNER. Depression and APOE Genotype as Risk Factors for Alzheimer's Disease.
In a population-based study of dementia in twins, we examined the association of major depression and genotype for apolipoprotein ϵ (APOE) genotype with Alzheimer's disease (AD) in 134 subjects. Using time-dependent proportional hazard models, we estimated risk of AD in relation to history of major depression (prior to onset of dementia) and to number of $\epsilon 4$ alleles at APOE. Both history of late-onset depression (initial onset after age 44) and increasing number of $\epsilon 4$ alleles increased the risk of AD. The two variables had similar independent risk ratios. Their effects were additive, such that the relative risk was 7.393 ($p < .05$) for individuals with two APOE $\epsilon 4$ alleles and a history of late-onset depression. Our results suggest that late-onset depression carried a relative risk similar to that of two $\epsilon 4$ alleles.
Correspondence: *Brenda L. Plassman, Department of Psychiatry, Duke University Medical Center, Box 3925, Durham, NC 27710, USA.*

S. HALE, B.M. LAWRENCE, J. MYERSON, & J. CHEN. Processing Efficiency and Working Memory Function in Dementia of the Alzheimer's Type.
Twenty-one individuals with very mild or mild dementia of the Alzheimer's type (DAT) and 28 age-matched controls performed three lexical and three nonlexical reaction-time (RT) tasks and two verbal and two spatial working memory tasks. Compared to the control group, the very mild and mild DATA groups were approximately 1.6 and 2.2 times slower, respectively, on all RT tasks. There were no differences between the degree of slowing on lexical and nonlexical tasks for either DAT group. Both DAT groups had smaller verbal and spatial memory spans than the control group. However, there were no differences in span between the two DAT groups, and only the mild DAT group showed larger effects of interference by secondary tasks than the control group.
Correspondence: *Sandra Hale, Department of Psychology, Campus Box 1125, Washington University, St. Louis, MO 63130, USA.*

D. GILLEY, D. BENNETT, R. JOGLEKAR, A. HALPER, & E. COCHRAN. Neuropathological Correlates of Behavioral Disturbances in Alzheimer's Disease.
Neuropathological correlates of behavioral disturbances were examined in 34 cases with clinically typical and autopsy-confirmed Alzheimer's disease (AD). Data on behavioral disturbances were collected through structured interview 2-12 months prior to death. Neuropathological evaluation consisted of frequency ratings of neuritic plaques (NP), neurofibrillary tangles (NFT), and Lewy bodies (LB) in three neocortical regions, mesolimbic structure, and midbrain aminergic nuclei. Psychomotor agitation, including wandering, was significantly correlated with NFT and NP density in the neocortex, hippocampus, and entorhinal cortex. No correlates were identified for aggressive behavior. Hallucinations were correlated with NFT and NP density in temporal and parietal cortex and with LB in the substantia nigra. Delusions were inversely correlated with NFT and NP in the hippocampus and temporal cortex.
Correspondence: *David W. Gilley, Departments of Psychology, Neurology, and Pathology, Rush-Presbyterian-St. Luke's Medical Center, 1645 W. Jackson Blvd., Suite 675, Chicago, IL 60612, USA.*

V. RICE, D. SALMON, D. GALASKO, D. CONNOR, L. THAL, & N. BUTTERS. Neuropsychological Deficits in Patients with Clinically Diagnosed Lewy Body Variant of Alzheimer's Disease.
Patients with probable or possible Alzheimer's disease (AD) and clinically diagnosed probable Lewy Body variant (LBV) of AD were compared on neuropsychological tests of memory, language, attention executive functioning, and visuospatial abilities. Although the groups did not differ in level of global dementia, or in severity of language, memory, or visuospatial deficits, the probable LBV patients performed significantly worse than AD patients on measures of verbal fluency and perseveration. These results suggest that probable LBV and AD patients are equally impaired on cognitive tests prominently affected by AD, and that LBV patients are disproportionately impaired on tests that may be mediated by frontostriatal circuits that are damaged concomitantly in LBV.
Correspondence: *Valerie A. Rice, Department of Neurosciences, University of California at San Diego, 9500 Gilman Dr., La Jolla, California, 92093-0948, USA.*

Paper Session 8/3:40–5:30 p.m.

NEUROPSYCHIATRY – 2

H.A. DEMAREE & D.W. HARRISON. Physiological and Neuropsychological Correlates of Hostility.
This experiment tested two hypotheses linking right cerebral arousal and physiological activity. A replication of previous research supporting

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heightened physiological (SBP, DBP, and HR) reactivity among high-hostile subjects was partially successful. Hemispheric lateralization of cerebral activity in response to stress was also measured. Low- and high-hostile subjects were identified using the Cook-Medley Hostility Scale (CMHS). Physiological measures were recorded and dichotic listening procedures were administered before and after administration of the cold-pressor paradigm. The primary finding of this research was greater right cerebral activation to stress among high-hostile subjects, as indicated by their enhanced intention to the left ear. Data further supported previous findings of heightened physiological reactivity to stress among high-hostiles and suggested a positive relationship between right cerebral activity and cardiovascular arousal.
Correspondence: *Heath A. Demaree, Department of Psychology, Virginia Tech, Blacksburg, VA 24061, USA.*

P.M. MAKI, Y. SMITH, D. SCHRETLEN, J.K. ZUBIETA, J. BRANDT, & H.Z. ZUCAR. Relations among Estrogen, Neuropsychological Test Performance, and Mood.
Although the influence of sex steroid hormones on mood has long been a topic of investigation, their influence on neuropsychological test performance has only recently been systematically investigated. We sought to replicate previous findings of a significant negative correlation between estradiol and visuospatial cognition. Instead of determining estradiol level based on day of menstrual cycle, we used a more precise radioimmunoassay technique. Correlational analyses of data collected on 10 young women revealed a significant negative relationship between estradiol and performance on two visuospatial tests, one a learning test and the other a mental folding task. Estradiol also correlated significantly with negative, but not positive, affectivity. These results corroborate previous findings on the effects of estradiol on visuospatial cognition and mood.
Correspondence: *Pauline M. Maki, Department of Psychiatry and Behavioral Sciences, The Johns Hopkins University, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

G. LEE, D. SHARON, T. BROWN, M. REED, R. DENNIS, D. LORING, & D. DRANE. Quantitative Electroencephalographic Asymmetries in Depression: Comparison with Normals and Patients with Other Psychiatric Diagnoses.
Investigations comparing the EEGs of depressed patients to normals have suggested relative hyperactivation of right, and hypoactivation of left, frontal brain regions within the alpha frequency band. To determine if these findings are specific to depression, we compared the resting quantitative EEGs of 25 depressed patients, 15 nondepressed patients with other psychiatric disorders, and 11 normal controls. Patients with depression showed more total absolute power across frequency bands than other psychiatric patients and normals to a statistically significant degree. There were no statistically significant differences between groups on any one frequency band. Depressed patients showed greater right than left hemisphere activation across most electrode sites, although only the right temporal (T_4) electrode site reached statistical significance. These results are consistent with relative right hemisphere activation in depression.
Correspondence: *Gregory P. Lee, Section of Neurosurgery, Medical College of Georgia, Augusta, GA 30912-4010, USA.*

A.I. TRÖSTER, L. DABERKOW STALP, J.A. FIELDS, A.M. PAOLO, & W.C. KOLLER. Depression Influences Severity Rather Than Quality of Cognitive Impairment in Parkinson's Disease.
Prior studies indicate that depression exacerbates cognitive, and particularly memory, impairment in Parkinson's disease (PD). Limitation of prior studies include the use of only brief cognitive screening examinations and the confounding of disease variables. This study compared performances of normal control (NC; N = 46), PD (N = 46), and PD with depression (PDD; N = 46) groups matched for age, education, and gender on a battery of tests tapping attention, problem solving, language, and verbal memory. Compared to NC, the PD and PDD groups (matched for age at onset, disease duration, and disease severity) demonstrated impairments in problem solving, semantic verbal fluency, and immediate and delayed recall of prose passages. Only PDD demonstrated impairments in visual confrontation naming, letter fluency, and attention. However, once PD and PDD groups were also equated for overall severity of cognitive impairment, the two groups' cognitive impairments were similar. Depression thus impacts predominantly the severity rather than quality of cognitive impairment in PD.
Correspondence: *Alexander I. Tröster, Department of Neurology, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, KS 66160-7314, USA.*

J. CORWIN, E. PESELOW, R. FIEVE, & J. ROTROSEN. Memory in Depression and Relapse: Imipramine and Symptom Effects at 1 and 6 Months.
We evaluated cognitive processes as a function of mood, response to treatment, and plasma levels of imipramine and reported side effects in patients with unipolar depression who either responded, failed to respond, and/or relapsed. Forty-five acutely depressed outpatients and 21 controls were assessed at baseline and 1 month of treatment; 23 drug responders and 13 controls were reassessed at 6 months. Assessments included rating scales for symptoms and side effects, a cognitive battery, and plasma imipramine levels. Key results were (1) task difficulty differentiated among diagnostic and response groups at all times; (2) symptom severity predicted memory performance; (3) imipramine levels did not correlate with memory task performance and correlated with side effects in responders only at 1 month; (4) anticholinergic effects were more prominent at 6 months; and (5) relapsers' response bias returned to abnormally conservative.
Correspondence: *June Corwin, Psychiatry Service, NYVAMC, 423 East 23rd St., New York, NY 10010, USA.*

S. PARADISO, G.J. LAMBERTY, M.J. GARVEY, & R.G. ROBINSON. Recovered Major Depression, But Not Bipolar Male Patients Show Executive Function Deficits on Standard Neuropsychological Tests.
Patients with a history of major depressive disorder (MDD) and bipolar affective disorder (BP), who were not currently symptomatic, and healthy male controls were administered the Stroop test, Trail Making test, Digit Symbol subtest, and the CERAD word list memory test to assess executive abilities and immediate verbal memory. It was hypothesized that remitted mood disorder patients would show signs of frontal lobe-type impairment compared to normals. MDD patients were more impaired than normals on measures of executive function and immediate memory. MDD patients were also more impaired than BP patients on trail B and CERAD trial 1. Differences between BP patients and normals did not reach significance in any of the selected measures. A prefrontal-type pattern of cognitive impairment is present in recovered MDD, but is less so in BP male patients.
Correspondence: *Sergio Paradiso, Department of Psychiatry, Medical Education Bldg., University of Iowa, Iowa City, IA 52242, USA.*

D. SCHRETLEN, E. EATON, R. BENEDICT T. WYNKOOP, & T. HEITZMAN. Affective Distress and Memory Impairment in Depressed versus Demented Elderly Adults.
We compared depressed, demented, and normal elderly adults in terms of self-rated depressive symptoms and memory test performance. The three groups differed in self-rated depression and on every measure of learning and memory except decision bias. Elderly depressed patients obtained scores that were intermediate and about equidistant between those of normal and demented subjects on various measures of recall and recognition memory. These findings do not support the hypothesis

that patients with depression are best distinguished from others with dementia by virtue of their relatively better recognition than recall memory test performance. Rather, self-reported symptoms of depression distinguish these two patient groups from each other more effectively than any cognitive measure.
Correspondence: *David J. Schretlen, Department of Psychiatry and Behavioral Sciences, Johns Hopkins University, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

PAPER SESSION 9/3:40–5:30 p.m.

PEDIATRIC NEUROPSYCHOLOGY – 1

V. ANDERSON, T. GODBER, D. ANDERSON, E. SIMBERT, & H. EKERT. Specific Attentional Deficits Following Cranial Irradiation for the Treatment of Childhood Leukemia.
Cranial irradiation (CRT) is used in the treatment of childhood cancers. Despite having little impact on adult patients, children have been reported to suffer a variety of cognitive and educational deficits following CRT. Thirty-five healthy controls and 35 children treated with CRT matched for age, gender, and SES were compared on measures of sustained and focused attention and the ability to shift attention. Intellectual and education abilities were also evaluated. Results suggested that children treated with CRT exhibit deficits in focusing and shifting attention. However, processing speed and sustained attention skills were not different from healthy controls. Results will be discussed with reference to developmental and functional implications.
Correspondence: *Vicki Anderson, Department of Psychology, University of Melbourne, Parkville, VIC, 3052, Australia.*

D. DEWEY, S. CRAWFORD, D. CREIGHTON, & R. SAUVE. Do Very-Low-Birthweight Infants Display Deficits in Motor Abilities?
The main purpose of this study was to investigate motor abilities of very-low-birthweight (VLBW) children free of sensorineural impairments. Subjects included 25 VLBW children identified at age 3 as "suspect" for development problems, 22 VLBW children identified at age 3 as developing normally, and 30 normal birthweight (NBW) full-term peers. Results showed that the VLBW children in the "suspect" group performed significantly poorer on measures of basic neuromotor skills, fine motor skills, gross motor skills, and praxis skills compared to NBW peers and to VLBW children in the "normally developing" group. These findings suggest that not all VLBW children free of sensorineural impairments display deficits in motor abilities compared to NBW peers. Rather, VLBW children appear to fall into two groups – those that show a generalized impairment in motor abilities and those that do not.
Correspondence: *Deborah Dewey, Department of Pediatrics, University of Calgary, and Alberta Children's Hospital, 1820 Richmond Rd., SW, Calgary, Alberta T2T 5C7, Canada.*

C.M. RYAN, G. RICHARDSON, L. GOLDSCHMIDT, N. ROBLES, & N. DAY. The Effects of Prenatal and Current Substance Use on Children's Memory.
We are following a birth cohort of 763 offspring to study the long-term effects of maternal substance use on children's functioning. We now report on the first 150 children (average IQ = 93) who completed the Wide Range Assessment of Memory and Learning (WRAML) Memory Screening Index (MSI) at age 10. Mean MSI for this group was somewhat below average (87.6 ± 12.4). Results from stepwise multiple regression analyses demonstrated that a significant amount of variance in MSI score was explained by three maternal variables: race, current marijuana use, and second trimester alcohol use (all $p < .025$). Adding child's IQ to the model increase R^2 from 14% to 34%. This work is consistent with other research that indicates that maternal second trimester alcohol use adversely affects cognitive functioning. Furthermore, it demonstrates that environmental factors, as well as prenatal factors, affect children's memory efficiency. This suggests that when evaluating children exposed to substances in utero, one should consider the possibility that the current environment also may have an impact on performance.
Correspondence: *Christopher Ryan, Western Psychiatric Institute and Clinic, 3811 O'Hara St., Pittsburgh, PA 15213, USA.*

K.A. ESPY, D.J. FRANCIS, & M.L. RIESE. Prenatal Exposure to Cocaine and Alcohol: Effects on the Developing Neonatal Nervous System.
Head size is an index of brain development. Although the effect of prenatal cocaine exposure on birth head size is well known, previous studies have not addressed the impact on head size growth. Head circumference of 20 preterm cocaine-exposed infants and 20 matched illicit-drug-free preterm infants were measured daily (548 observations). Individual growth curve design was used, revealing a 1.25-cm reduction in head size due to cocaine exposure. Although rates of head size change did not vary with prenatal substance exposure, acceleration of head size growth was related to prenatal cocaine and amount of alcohol exposure. Acceleration of head size growth was positive for each substance but negative for cocaine and alcohol combined. These findings suggest that infants are able to "close the gap" in head size when exposed to either cocaine or alcohol compared to nonexposed peers. With dual exposure, infants "lose ground," presumably related to neurochemical changes in brain development.
Correspondence: *Kimberly Andrews Espy, University of Arizona College of Medicine, Department of Pediatrics, 1501 N. Campbell Ave., Tucson, AZ 85724, USA.*

T. SPEVACK, E. FENNELL, S. JOHNSON, & M. CLARK. A Longitudinal Study of Cognitive Performance in Children with Early Versus Late Onset of Insulin-Dependent Diabetes Mellitus.
The present study examined the effects of time on cognitive functioning of individuals with early versus late onset of diabetes. Longitudinal data were obtained by conducting follow-up testing in a sample of 24 subjects (ages 12–22 yr) who had been evaluated 6 yr previously. It was hypothesized that the decrements in attentional and right hemisphere abilities associated with early disease onset in the first study would persist over time, and that as disease duration increased, left hemisphere decrements would be exhibited. Repeated-measures ANOVAs demonstrated an increased risk of decrements on right hemisphere abilities across groups, and nonsignificantly lower scores on left hemisphere tests in the late onset group. Increasing illness duration was associated with lower scores on measures of right hemisphere abilities and motor speed.
Correspondence: *Tara V. Spevack, Department of Clinical and Health Psychology, Box J-165, JHMHC, University of Florida, Gainesville, FL 32610, USA.*

K. EVANKOVICH, L. CHAPIESKI, M. HISCOCK, & D. GLAZE. The Effect of Seizure Type on Memory and Attention in Children with Epilepsy.
This study investigated attention and memory in 38 children with well-controlled, idiopathic epilepsy (ages 6–16 yr). Children were divided into three groups based on seizure type: (1) generalized tonic-clonic seizures, (2) complex partial seizures with left temporal foci, and (3) right temporal lobe foci. The neuropsychological battery included measures of intelligence, attention, verbal memory, and nonverbal memory. Both children with generalized tonic-clonic seizures and complex partial seizures demonstrated attention problems. Only children with complex partial seizures demonstrated memory impairments. With respect to children with complex partial seizures, those with left temporal foci demonstrated verbal memory problems whereas those with right temporal foci exhibited nonverbal memory deficits. Possible explanations for the current

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findings and their implications are explored. Limitations of the current study and directions of future research are discussed.
Correspondence: *Karen Evankovich, Texas Children's Hospital, 6621 Fannin St., MC 3-2340, Houston, TX 77030-2399, USA.*

C. BOLIEK, K. GREEN, K. FOHR, & J. OBRZUT. Auditory-Visual Perception of Speech in Children with Learning Disabilities: The McGurk Effect.
This study investigated auditory-visual perception of speech (i.e., intermodal organization) in children with learning disabilities (LD) by use of the McGurk paradigm. A total of 20 LD and 20 normal controls (younger = 6 to 9 yr of age, older = 10–12 yr of age) matched for sex and age participated. They were administered via a video monitor (visual) and video cassette (auditory) 40 trials of congruent (female face and voice) and 40 trials of incongruent (female face, male voice) auditory-visual stimuli. Analyses indicated that the expected McGurk effect was found for all groups and that older controls had a stronger effect than the younger control and the younger and older LD subjects. The findings support a developmental lag hypothesis for the integration of auditory-visual speech signals in LD children that might be related to their overall language processing deficits.
Correspondence: *Carol A. Boliek, Center for Neurogenic Communication Disorders, Department of Speech and Hearing Sciences, University of Arizona, Tucson, AZ 85721, USA.*

Presidential Address/6:00 p.m.

A FRIENDLY CRITIQUE OF THE PROCESS APPROACH TO NEUROPSYCHOLOGICAL ASSESSMENT

Gerald R. Goldstein

FRIDAY MORNING, FEBRUARY 16, 1996

Paper Session 10/9:00–10:40 a.m.

IMAGING—1

R. O'SULLIVAN, S. RAUCH, H. BREITER, I. GRACHEV, L. BAER, D. KENNEDY, N. KEUTHEN, C. SAVAGE, V. CAVINESS, & M. JENIKE. Reduced Basal Ganglia Volumes & Trichotillomania by Morphometric MRI.
A pilot morphometric MRI study compared basal ganglia brain volumes in 10 female subjects with trichotillomania (repetitive hair-pulling) versus 10 female normal controls matched for age, handedness, and education. Three-dimensional volumetric scans were blindly normalized and segmented using well-characterized semiautomated intensity contour algorithms. Our a priori hypothesized difference in left putamen volume between trichotillomania subjects and normal controls was confirmed, with trichotillomania subjects showing significantly smaller left putamen volume. These results suggest that structural brain abnormalities in trichotillomania are similar to those found in Tourette's syndrome, but unlike those found in obsessive-compulsive disorder. This is the first report of a structural brain abnormality in trichotillomania. Results are discussed in terms of putative relationships between trichotillomania and obsessive-compulsive spectrum disorders.
Correspondence: *Richard L. O'Sullivan, Departments of Psychiatry and Radiology, Massachusetts General Hospital, Harvard Medical School, 13th St., Bldg. 149, OCD Clinic, 9th Floor, Charlestown, MA 02129, USA.*

R.O. HOPKINS, T.J. ABILDSKOV, E.D. BIGLER, S.D. GALE, S.C. JOHNSON, C.V. ANDERSEN, D.D. BLATTER, & L.K. WEAVER. Three-Dimensional Image Analysis of Hippocampal Atrophy and Neuropathological Changes Following Anoxia and Traumatic Brain Injury.
Anoxia may result in cognitive deficits and neuropathologic changes, including hippocampal atrophy. We have evaluated four male subjects (two subjects following anoxia and 2 following traumatic brain injury [TBI]). A neuropsychological test battery was administered and quantitative analysis of magnetic resonance (MR) scans were carried out. Three-dimensional MR images were used to isolate the cortex, ventricles, and hippocampus. All four subjects exhibited severe memory impairments. Both subjects with TBI also exhibited global cognitive decline. Quantitative MR analysis revealed nonspecific neuroanatomical atrophy, marked increases in the ventricle-to-brain ratio, and hippocampal atrophy. The use of three-dimensional MR imaging techniques allows for visualization of the pathologic changes that occur following neural injuries. Three-dimensional imaging techniques in conjunction with quantitative MR analysis and neuropsychological assessment provide greater specificity in detecting and understanding neuropathological changes and the cognitive impairments that occur following brain injures.
Correspondence: *Ramona O. Hopkins, Department of Hyperbaric Medicine, LDS Hospital, 8th Ave. and C St., Salt Lake City, UT 84143, USA.*

E.V. SULLIVAN, A. DESHMUKH, J.E. DESMOND, B. LANE, JR., B. LANE, P.K. SHEAR, & A. PFEFFERBAUM. Volumetric MRI Analysis of Cerebellar Hemispheres and Vermis in Chronic Alcoholics: Relationship to Ataxia.
Neuropathological studies report shrinkage of the anterior superior cerebellar vermis in chronic alcoholics. We questioned whether volume deficits of the cerebellar hemispheres and vermis could be detected in vivo in detoxified, chronic alcoholics, with or without amnesia, and whether this dysmorphology would correlate with scores on a quantitative ataxia test. MRI revealed significant tissue volume loss in vermal lobules I–VII (including the anterior superior vermis) and gray matter of both hemispheres in both alcoholic groups, relative to controls. Furthermore, cerebellar hemisphere gray matter showed an exacerbated decline with age in chronic alcoholics. Finally, anterior superior vermal volumes correlated with balance scores. Thus, these MRI and ataxia data suggest that the aging alcoholic is vulnerable to accelerated cerebellar dysmorphology, which may underlie postural instability.
Correspondence: *Edith V. Sullivan, Psychiatry Service, V.A. Palo Alto Health Care System, 3801 Miranda Ave., Palo Alto, CA 94304, USA.*

P.K. SHEAR, E.V. SULLIVAN, B. LANE, & A. PFEFFERBAUM. Mammillary Body and Cerebellar Shrinkage in Chronic Alcoholics with and without Amnesia.
We examined whether shrinkage in the mammillary bodies and cerebellum is present consistently in amnesic chronic alcoholics (AMN) and whether the degree of abnormality in these patients differs from that in nonamnesic alcoholics (ALC). Accordingly, the severity of mammillary body, cerebellar hemisphere, and vermis shrinkage visualized on MRI films of 33 ALC, 10 AMN, and 20 normal controls (NC) was rated on a three-point scale. The ALC and AMN had significant shrinkage of the three brain structures, relative to the NC; the ratings in the ALC

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and AMN were equivalent. These results indicate that alcoholism is associated with tissue volume loss in mammillary bodies and cerebellum, and provide no evidence that amnesic alcoholics show a higher incidence or more marked atrophy than amnesic patients.
Correspondence: *Paula K. Shear, Departments of Psychiatry and Behavioral Sciences and Radiology, Stanford University School of Medicine, 401 Quarry, Stanford, CA 94305, USA.*

R. FAMA, E.V. SULLIVAN, P.K. SHEAR, J.A. YESAVAGE, J.R. TINKLENBERG, & A. PFEFFERBAUM. Relationships Between the Mattis Dementia Rating Scale and MRI Brain Volumes in Alzheimer's Disease (AD).
The Mattis Dementia Rating Scale (DRS) is commonly used to assess selective areas of cognitive functioning in AD. It is unclear, however, whether compromised performance on the DRS is associated with specific structural brain abnormalities. Accordingly, we examined relationships between cognitive performance of AD patients on the DRS and regional MRI brain volumes. The total DRS score of the group of 50 AD patients was 106.9 ± 15.3. Poorer scores on Attention/Concentration and Initiation/Perseveration correlated with greater volume abnormalities in prefrontal sulci and white matter. These DRS subscales require planning, set formation and maintenance, verbal fluency, and attention, which are generally considered executive functions. Thus, certain subscales of the DRS are sensitive to neuropathological changes, observed in vivo, in circumscribed brain regions.
Correspondence: *Rosemary Fama, Psychiatry Service, V.A. Palo Alto Health Care System, 3801 Miranda Ave., Palo Alto, CA 94304, USA.*

Paper Session 11/9:00–10:40 a.m.

HUNTINGTON'S DISEASE

J.M. HAMILTON, M.W. BONDI, J.S. PAULSEN, Z. TAWFIK-REEDY, J.H. DELAPENA, D.P. SALMON, N. BUTTERS, M.R. SWENSON, & N.R. SWERDLOW. Cortical and Subcortical Dementia: Do Qualitative Differences in Verbal Learning and Memory Exist Prior to the Presence of Dementia?
The performance of 12 preclinical Alzheimer's disease (preAD) subjects and 12 nondemented Huntington's disease (ndHD) patients were compared on quantitative and qualitative variables of the California Verbal Learning Test (CVLT). Qualitative measures of intrusion and false-positive errors were found to be most sensitive in differentiating the two groups. Additionally, logistic regression analyses demonstrated that quantitative and qualitative variables were equally effective in predicting preAD group membership (67%), but only qualitative variables accurately classified the ndHD group (92%). Thus, qualitative indices of performance on tests of verbal learning and memory may be more effective in identifying and differentiating patients in the earliest stages of these prototypical cortical and subcortical dementing illnesses.
Correspondence: *Joanne M. Hamilton, Psychology Service, DVAMC, 3350 LaJolla Village Dr., San Diego, CA 92161-2410, USA.*

J.C. STOUT, J.S. PAULSEN, Z. TAWFIK-REEDY, R.L. ROMERO, J.H. DELAPENA, M.R. SWENSON, D.P. SALMON, & N. BUTTERS. The Nature of Problem Solving Deficits in Patients with Early Huntington's Disease.
The performance of 20 Huntington's disease (HD) subjects was compared to that of 15 normal controls (NC) on a problem solving task that required the generation of a series of questions for the solution of object and digit/letter identification problems. The NC subjects asked "constraint-seeking" questions, whereas the HD subjects utilized the far less efficient strategy of asking "hypothesis-scanning" and "pseudo-constraint" questions. These results suggest that HD subjects are deficient in employing planning and sequencing strategies, suggesting that this problem solving task is sensitive to a dorsolateral frontal syndrome. Additionally, bivariate correlations revealed that question inefficiency was significantly associated with irritability, possibly linking neuropsychological performance and psychiatric symptoms to a shared underlying pathophysiology.
Correspondence: *Julie C. Stout, Psychology Service DVAMC, 3350 LaJolla Village Dr., San Diego, CA 92161, USA.*

J.S. PAULSEN, P. COMO, G. REY, F. BYLSMA, R. JONES, J. SAINT-SYR, G. STEBBINS, & THE HUNTINGTON STUDY GROUP. The Clinical Utility of the Stroop Test in a Multicenter Study of Huntington's Disease.
Four hundred five patients with a diagnosis of Huntington's disease (HD) were recruited from 20 Huntington Study Group sites in North America and Europe. Based upon Total Functional Capacity score, 248 patients were in the mild stage of HD and 157 patients were in the moderate-to-severe stage of HD. The Stroop test was administered as part of the cognitive assessment for the Unified HD Rating Scale. On every Stroop variable examined, the moderately-to-severely, impaired HD group performed worse than the mildly impaired HD group, who performed worse compared to normative standards. Stroop measures assessing slowed information processing were associated with measures of functional capacity and motor impairment, whereas measures assessing interference were associated with depressed mood and obsessive-compulsive behavior. These findings may reflect shared pathophysiology for cognitive and psychiatric behavior in HD. The Stroop test appears applicable to conduct of clinical trials in HD.
Correspondence: *Jane S. Paulsen, Psychology Service, DVAMC, 3350 LaJolla Village Dr., San Diego, CA 92161, USA.*

F.W. BYLSMA, P. COMO, J. PAULSEN, R. JONES, G. REY, J. SAINT.-CYR, G. STEBBINS, & THE HUNTINGTON STUDY GROUP. Noncognitive Symptoms in Huntington's Disease.
The prevalence of depression, delusion, and hallucination was determined in a large group ($N > 650$) of Huntington's disease (HD) patients. Depression was the most common symptom, affecting 26.5% of patients. Delusion was next most frequently reported (6.4%); hallucination was least frequently noted (1.7% of cases). There was an inverse relationship between symptom frequency and its impact on clinical presentation. Depressed patients were less motorically impaired than nondepressed patients; deluded patients showed slightly greater motor, functional, and cognitive impairment than nondeluded patients; hallucinated patients were younger and much more motorically, functionally, and cognitively impaired than nonhallucinated patients. Directed treatment of these symptoms may reduce the degree impairment in these patients, delaying the need for placement in skilled nursing facilities.
Correspondence: *Frederick W. Bylsma, Department of Psychiatry and Behavioral Sciences, The Johns Hopkins University School of Medicine, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

J.R. CAMPODONICO, A.M. CODORI, & J. BRANDT. Longitudinal Changes in Carriers of the Genetic Mutation for Huntington's Disease.
It is well established that patients with Huntington's disease (HD) show progressive declines in cognitive functioning. Whether these changes are present well before the onset of chorea is not known. The present study examined the longitudinal neuropsychological performance of persons who carry the HD gene but who are not yet clinically symptomatic. Twenty-two "gene-positive" and 37 "gene-negative" subjects had three annual assessments. Repeated-measures ANOVAs failed to show any cognitive or emotional differences between the two groups, even using liberal criteria. Additionally, there were no meaningful associations between the degree of genetic mutation (size of the CAG repeat) or estimated time to disease onset, and cognitive tests and emotional rating

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scales. Our findings argue against the presence of neuropsychological deficits in asymptomatic persons carrying the HD gene.
Correspondence: *Jeffrey R. Campodonico, Department of Psychiatry, The Johns Hopkins University School of Medicine, 600 N. Wolfe, Meyer 218, Baltimore, MD 21287-7218, USA.*

A.W. BACON, C. MURPHY, & L.J. RAZANI. A Test of Odor Fluency in Patients with Alzheimer's and Huntington's Disease.
Much research has been done examining differences in performance of people with Alzheimer's disease (AD), Huntington's disease (HD), and normal controls (NC) on tests of verbal fluency, including both category and letter fluency. Such studies have found that fluency tasks aid in the detection and diagnosis of various forms of dementia. Changes in the ability to perceive, recognize, identify, and recall odors have also been documented in both AD and HD. Because neuropathological changes in patients with AD have been reported in areas of the brain involved in processing olfactory information, we were interested in investigating whether these changes lead to a breakdown in the association network for olfaction. Thus, in the present study, an olfactory analog to the verbal fluency tests was designed and applied to patients with dementia. Results show significantly reduced production on both odor fluency measures for AD patients compared to controls.
Correspondence: *Anna W. Bacon, San Diego State University/University of California, San Diego Joint Doctoral Program in Clinical Psychology, Lifespan Human Senses Lab., 6363 Alvarado Ct., Suite 101, San Diego, CA 92120-4913, USA.*

Paper Session 12/9:00–10:40 a.m.

CROSS-CULTURAL

C. RIGALT, F. OSTROSKY, S. PALACIOS, J. MARCOS, A. ARDILA, H. CHÁVEZ, G. LEYVA, & B. GONZÁLEZ. Language Deficits in Spanish: A Neurolinguistic Study in Aphasics.
Information regarding syntactic comprehension in Spanish aphasic subjects is limited. The purpose of the present study was to investigate sentence comprehension in Spanish-speaking aphasics, focusing on the function of word order and morphosyntactic cues. Eight Broca's aphasics were tested. Subjects were presented with a sentence–picture matching task. Since different levels of syntactic processing are impaired, the results seems to indicate that there is a deficit in several aspects of syntactic analysis and not only subparts of the syntactic processing.
Correspondence: *C. Rigalt, Department of Psychophysiology, National University of Mexico, Ave. Universidad 3004, México.*

J. OLAZARAN, D.M. JACOBS, & Y. STERN. Verbal and Visual Span in English and Spanish Speakers: Testing a Linguistic Hypothesis.
To test the hypothesis that differences in digit span performance between English and Spanish speakers are due to the greater number of syllables per digit in the Spanish language, we compared the performance of English- and Spanish-speaking elders on the Digit Span Subtest of the WAIS-R (a modified digit span test that was linguistically comparable for both languages) and the Corsi Block Test. English speakers scored significantly higher than Spanish speakers on both the WAIS-R and modified Digit Span Forward, although group differences were attenuated on the modified version. English and Spanish speakers scored comparably on Digit Span Backward (WAIS-R and modified) and Visual Span. In addition to linguistic distinctions, cultural factors appear to contribute to the observed differences between English and Spanish speakers on Digit Span Forward.
Correspondence: *J. Olazaran, Department of Neurology and G. H. Sergievsky Center, Columbia University College of Physicians and Surgeons, 630 West 168th St., New York, NY 10032, USA.*

D.M. JACOBS, M. SANO, & Y. STERN. Cross-Cultural Neuropsychological Assessment: 'Nonverbal' Does Not Mean 'Culture-Fair'.
Performance of English- and Spanish-speaking older adults was compared on a brief but comprehensive neuropsychological test battery. Subjects were drawn from a community-based random sample, and matched for age and educational attainment. English and Spanish speakers scored comparably on many language-based tasks, including the Selective Reminding Test, Boston Naming Test, and WAIS-R Similarities, but Spanish speakers scored significantly lower on almost all of our "nonverbal" measures. Significant group differences were observed on multiple-choice matching and recognition memory for stimuli from the Benton Visual Retention Test, Identities and Oddities from the Mattis Dementia Rating Scale, category fluency, and Complex Ideational Material from the BDAE. Results suggest that caution is warranted when using nonverbal measures to assess non-English speaking individuals.
Correspondence: *Diane M. Jacobs, Department of Neurology and G. H. Sergievsky Center, Columbia University College of Physicians and Surgeons, 630 West 168th St., New York, NY 10032, USA.*

M. ROSSELLI & A. ARDILA. Normative Data in Some Verbal and Memory Tests in Spanish-Speaking Children.
Three verbal tests (Boston Naming, the Token test and the verbal fluency test) and two memory tests (Wechsler Memory Scale and a sequential verbal memory test) were given to 233 normal Spanish-speaking children aged 5–12 yr. Participants were balanced according to age (5–6, 7–8, 9–10, and 11–12 yr old), socioeconomic level (high or low), and gender. Age was a significant variable for all tests. Sex of subjects was a significant variable in the Boston Naming Test, and ROCF and socioeconomic level was significant in all tests. A factor analysis of the Wechsler Memory Scale disclosed three main factors: a general memory factor, and a verbal memory factor. There were some statistically significant correlations between performance in neuropsychological tests and academic performance. Normative scores are analyzed.
Correspondence: *Monica Rosselli, Miami Institute of Psychology, 8180 NW 36 Street, Miami, FL 33166, USA.*

E. GROBER, M. KATZ, & R. LIPTON. Assessment of Memory in Elderly African-Americans.
Performance on many tests used to assess cognitive status and to diagnose dementia is influenced by race. We present a case-finding method previously shown to accurately distinguish mild dementia from age-associated cognitive change that is unbiased by race. Free and cued-selective reminding (FCSR) was administered to 432 Caucasian and 73 African-American community-residing participants in our aging and dementia projects. A series of multiple regression models indicated that performance on FCSR was not affected by race, as was verbal IQ. This suggests that FCSR is an unbiased test of memory that can be used in racially mixed groups to determine dementia status without adjusting for race.
Correspondence: *Ellen Grober, Department of Neurology, Albert Einstein College of Medicine, 1300 Morris Park Ave., Bronx, NY 10461, USA.*

V. NELL, Toward an International Compendium of Neuropsychological Test Norms for the Developing Countries: Proposal and Call for Collaboration.
In the developing countries of sub-Saharan Africa and Latin America, scores on most psychological tests are significantly lower than those of matched samples of Western Europe and North America. The competing explanatory hypotheses, usually nativist and environmentalist, do not address the underlying issues of construct validity, cognitive style, and "test-wiseness." A two-phase program is proposed: (1) publication of a compendium of norms, and (2) a coordinated international program to determine cross-national patterns of construct validity and also norms for a wide range of neuropsychological tests.
Correspondence: *Victor Nell, 44 Alexander St., #D1, Princeton, NJ 08540, USA.*

Poster Session 4/9:00 a.m.–12:00 p.m.

ATTENTION—2

M. PETRY, B. CROSSON, I. FISCHLER, L. GONZALEZ ROTHI, E. FENNELL, R. BAUER, & A. AGRESTI. The Effect of Language on Visual Spatial Attention: Implications for Theories of Selective Attention.

Twenty-nine right-handed undergraduates completed the covert orienting of visual attention task (COVAT) alone and paired with two lexical tasks (reading aloud single words and generating semantic associations to written words). Subjects responded fastest to the COVAT alone, intermediate to the COVAT–Reading condition, and considerably slower to the COVAT–Semantic Association task. Because of left-hemisphere dominance for language, differences between left and right visual field responses were expected, but none were found. The high degree of interference for semantic processing on spatial attention in both visual fields suggests that spatial attention and semantic processing share a common mechanism in normal subjects.

Correspondence: *Margaret C. Petry, Department of Clinical and Health Psychology, Health Science Center, P.O. Box 100165, University of Florida, Gainesville, FL 32610-0165, USA.*

A. MAJDAN, V. SZIKLAS, & M. JONES-GOTMAN. Performance of Healthy Francophone and Anglophone Subjects and Patients with Resection from the Temporal Lobe on Matched Tests of Verbal and Visuoperceptual Learning.

We examined the equivalence of three forms of English and French versions of the Rey Auditory Verbal Learning Test (RAVLT) and of a new nonverbal analog, the Aggie Figures Learning Test (AFLT). One hundred fourteen subjects received the English version, and 102 the French version. In both populations the three forms proved well matched, and essentially no performance differences were found comparing the English and French versions. Furthermore, overall performance on the AFLT was very similar to that on the RAVLT. To validate the tasks, we administered them to patients with resection from the left or right temporal lobe (ATL). The right ATL patients were impaired on the learning trials of the AFLT, whereas the left ATL patients showed severe forgetting of words compared to figures.

Correspondence: *A. Majdan, Montreal Neurological Institute, 3801 University St., Montreal, Quebec H3A 2B4, Canada.*

A. ASBJØRNSEN, A. LUND, A. HAMMER, K. HUGDAHL, & A. RONESS. Attentional Effects on Dichotic Listening in Major Depression.

This study investigated the effect of forced attention on dichotic listening performance in major depression. Fourteen patients referred to electroconvulsive treatment (ECT), 17 patients suffering from frequent or recurring depressions, and 12 patients with their first depressive episode were tested with a CV-syllables dichotic listening test with the additional tasks of forced attention. The testing was repeated three times during the course of their illness, in addition to a 6-month follow-up. All groups showed a significant improvement of the depression during the 6-month period. The patients with first depressive episode showed a weak right ear advantage, but were able to perform the tasks of forced attention. The ECT group showed neither an ear advantage nor any effect of forced attention, while the chronic group did show the expected ear advantage, but was not able to perform the forced left task. Performance on dichotic listening did not change with improvement of depression. The results are interpreted as showing persisting cognitive deficits following frequent depressive episodes.

Correspondence: *Arve Asbjørnsen, Department of Psychosocial Sciences, University of Bergen, Oisteinsgt. 3, N-5007 Bergen, Norway.*

S. WOOD, M. HISCOCK, D. PEARSON, B. BREITMEYER, B. FOREMAN, & P. ADAMS. The Effect of Focused Attention on the Lag Effect in Dichotic Listening.

It has been reported that the lagging consonant-vowel (CV) syllable in dichotic listening was processed preferentially when the sound was delayed by 30–60 ms. In experiment 1, we replicated this effect with 60 normal, right-handed subjects; however, the effect was found up to 90 ms. Experiment 2 used a selective listening procedure. Results from experiment 2 suggest that selective attention overrides the lag effect. The lag effect was seen at the unattended ear, but not at the attended ear. Thus, these effects apparently are not hard-wired characteristics of the auditory system.

Correspondence: *S. Wood, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

M.V. OLIVERI, K.O. SIEBER, K.A. SANDS, & L.A. GOTTLIEB. Attention and Information Processing Factors Based on Demographic Correction.

Previous attempts to explore the factor structure of attention- and information-processing measures have been criticized on both clinical and statistical grounds. The purpose of the current study was to address these criticisms by using clinically relevant demographic corrections on neuropsychological measures prior to conducting a methodologically strict factor analysis. This study used archival data from 107 neurologically impaired patients. Using demographic corrections, raw scores on 10 measures of attention and information processing were first converted to standard scores, and were then subjected to a principal components factor analysis. The following four factors accounted for 70.4% of the variance: (1) Visuo-Motor Processing, (2) Encoding, (3) Mental Control, and (4) Divided Attention. This factor structure may be useful in measuring and delineating the putative disorders of attention and information processing.

Correspondence: *Michael V. Oliveri, Rehabilitation and Neurosciences, St. John's Mercy Medical Center, 615 S. New Ballas Rd., St. Louis, MO 63141, USA.*

D. VELIKONJA & S.J. SEGALOWITZ. Effects of Caffeine on ERP and EEG Indices of Attention.

The effect of caffeine on two levels of selective and sustained attention tasks were examined using ERP and EEG measures. Twenty-seven undergraduate students went through two identical sessions of cognitive ERP testing 1 wk apart. In each session, they received a decaffeinated coffee mixture, once with tasteless and colourless caffeine powder (3 mg/kg). During the simple selective (auditory oddball) and sustained (CNV) attention tasks, there was a significant reduction in the latencies of all ERP components (N1, P2, N2, P3), but there were no effects of caffeine on amplitudes. During the demanding selective attention tasks, there were significant effects on the amplitude of the ERP components without similar effects on latency. The motivated CNV task produced a significant increase in amplitude over standard CNV during the no-caffeine condition, which was reduced with caffeine. These results demonstrate that increased arousal affects attentional processing when attentional demands become difficult. Regional cortical activation (EEG coherence) during the different attentional tasks are also discussed.

Correspondence: *Diana Velikonja, Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada.*

J.C. ADAIR, R.L. SCHWARTZ, D.J.G. WILLIAMSON, R.L. GILMORE, S.N. ROPER, & K.M. HEILMAN. Bisection Bias with Parietal and Occipital Cortical Stimulation.

After unilateral cerebral injury, patients with hemispatial neglect fail to orient toward contralateral space. In contrast, neglect of upper and lower space follows damage to ventral and dorsal visual pathways, respectively. However, specific anatomic correlates of the neglect syndrome remain incompletely defined. Thus, we stimulated discrete regions in a patient's right parietal and occipital lobes, attempting to locate which components produced spatial bias when inactivated. Parietal cortical

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stimulation (CS) resulted in modest upward displacement of bisection marks, whereas occipital CS displaced marks downward; no site contributed disproportionately to the effect. Anterior parietal CS caused the patient to experience a compulsion to regard left space; bisection error shifted modestly toward the left. Posterior parietal CS produced no subjective sensation but resulted in bisection bias toward the right.
Correspondence: *John C. Adair, Department of Neurology, Box 100236, University of Florida, Gainesville, FL 32610, USA.*

M.R. BASSO. Sex and Anxiety Effects Upon Global-Local Visual Processing.
One model of cerebral asymmetry that has received considerable support holds that global-configural aspects of a stimulus are processed by the right hemisphere, whereas local-detail characteristics are processed in the left. Despite support for this hypothesis, contradictory results have surfaced, leading some to suggest that individual differences may account for these inconsistent findings. In a test of this assertion, the present study examined whether anxiety and sex account for significant variance in global-local visual processing. Consistent with predictions, anxiety was related to a diminished global bias. A distinct sex difference was also observed, with women having a greater global processing bias than men. Explanations of these findings are suggested, and implications for future research are discussed.
Correspondence: *M.R. Basso, Neuropsychology Program, The Ohio State University, 473 West 12th Ave., Columbus, OH 43210-1228, USA.*

R.L. OWNBY. A Computational Model of Stroke-Related Hemineglect.
It has been proposed that directed attention in primates depends on a neural network comprising interconnected cell assemblies in frontal, parietal, and cingulate cortexes and that neglect phenomena may result from damage to any part of this network. The purpose of this study was to develop further a computational model of this network and to determine whether after lesioning it would behave similarly to patients with neglect. A backpropagation network was constructed and trained. Lesions resulted in degraded network performance similar to that observed among patients with neglect. Results show that a network model can simulate hemineglect. The usefulness of this simulation for further study of neglect phenomena is discussed.
Correspondence: *Raymond L. Ownby, Department of Psychiatry, University of Miami School of Medicine, Miami, FL 33101, USA.*

M. MENNEMEIER, S.Z. RAPCSAK, E. VEZEY, & M. DILLON. Focal and Global Processing in Spatial Neglect: Comparing Plane Bisection with Line Cancellation in Right- and Left-Hemisphere-Lesioned Subjects.
Right hemisphere lesions (RHL) may induce focal processing biases and neglect that is localized in one area of space, whereas left hemisphere lesions (LHL) may induce global biases and neglect that is not confined to one area. We predicted that both RHL and LHL subjects with neglect would be unable to report, respond, or act on a "complete" stimulus array, but that neglect severity and locations would differ between groups. Twenty-one RHL, 11 LHL, and 10 age-matched controls performed plane bisection and cancellation tasks that varied in size and number of items to be canceled. Whereas RHL patients committed errors in a localized area of space on both tasks, LHL subjects did not. Furthermore, RHL patients reversed the direction of their errors as bisection and cancellation tasks increased in size. LHL patients did not.
Correspondence: *Mark Mennemeier, Department of Rehabilitation Medicine, University of Alabama, 530 SRC, 1717 6th Ave. S., Birmingham, AL 35233-7330, USA.*

M. MENNEMEIER, A. CHATTERJEE, M. DILLON, J. BARRETT, & J. BROWN. Attentional symmetries in Peripheral Vision: Troxler Fading During Binocular and Monocular Viewing.
Attention to visual stimuli is sustained longer and extended farther along the horizontal than vertical meridian. Combined fields of the horizontal retina encompass a wider visual angle than combined vertical fields. If binocular viewing accounts for asymmetries in sustained attention, these asymmetries should be eliminated during monocular viewing. However, if attentional factors are operative, then asymmetries should continue to be observed. To test these hypotheses, 30 normal subjects fixated on a central image and reported the fading of dots in peripheral vision (i.e., Troxler fading) during monocular and binocular viewing. Asymmetries were observed in both conditions, supporting the role of central attentional factors. Right and left eye-sightedness were associated with different fading asymmetry patterns. Eye dominance may be a marker for differences in the organization of spatial attention.
Correspondence: *Mark Mennemeier, Department of Rehabilitation Medicine, University of Alabama, 530 SRC, 1717 6th Ave. S., Birmingham, AL 35233-7330, USA.*

D. MANOACH, M. O'CONNOR, & S. WEINTRAUB. Absence of Neglect for Mental Representations During the Intracarotid Amobarbital Procedure (IAP).
We investigated whether neglect of mental representations of extrapersonal space occurs during the IAP. Prior to the IAP, 16 subjects drew a room from their homes. Following the right injection, subjects were tested for exploratory motor neglect using a random letter cancellation task and then were asked to report items from their mental image of the room. Ten subjects showed exploratory motor neglect, but only one showed representational neglect of the left side of the mental image. These results replicate previous findings of exploratory motor neglect during the IAP, but fail to show concurrent neglect for mental representations. They provide further evidence of the multiplicity and dissociability of the behavioral manifestations and neuroanatomic underpinnings of neglect.
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PEDIATRIC NEUROPSYCHOLOGY—2

L. OBERG & L. TURKSTRA. Vocabulary Learning after Childhood Traumatic Brain Injury.
While verbal learning and memory deficits commonly are described after pediatric traumatic brain injury, relatively few data exist regarding remediation of the resulting long-term deficits in acquired linguistic knowledge. In the present study, the effects of specific encoding strategies on vocabulary learning after traumatic brain injury were investigated in two single-case experiments. Elaborative encoding, spaced stimulus presentation, and other techniques derived from research on normal and learning disabled individuals were found to facilitate the acquisition of age-appropriate vocabulary in two brain-injured adolescents with significant verbal memory impairments. A comprehensive assessment approach revealed word knowledge that was not apparent on confrontational tests requiring vocabulary definitions. The results are discussed in terms of rehabilitation and age at injury.
Correspondence: *Laura Oberg, National Center for Neurogenic Communication Disorders, Department of Speech and Hearing, University of Arizona, Tucson, AZ 85721, USA.*

J. FARMER, J. HAUT, J. WILLIAMS, C. KAPILA, B. JOHNSTONE, & K. KIRK. Memory Functioning in Children with Traumatic Brain Injury and Premorbid Learning Problems.
We examined memory functioning in children with learning problems prior to traumatic brain injury (LD/TBI, $N = 25$) compared to children without preinjury problems (TBI, $N = 48$) and noninjured children (Control, $N = 18$). The three groups differed significantly in overall memory functioning and new learning abilities, with noninjured subjects showing the strongest abilities and the LD/TBI group most impaired. LD/TBI subjects demonstrated decreased verbal memory compared to the TBI and control groups, possibly due to premorbid language processing weaknesses. Both TBI groups showed impaired visual memory compared to controls. Researchers must separately examine children with

and without preinjury learning problems in order to understand recovery from TBI, assess the effectiveness of interventions, and define long-term outcomes.
Correspondence: *Janet Farmer, Department of Physical Medicine and Rehabilitation, University of Missouri School of Medicine, Rusk Rehabilitation Center, One Hospital Dr., Columbia, MO 65212, USA.*

J. SCHATZ, S. CRAFT, M. KOBY, & T.S. PARK. Associative Learning in Children with Perinatal Brain Injury: Correlates with Severity and Location of Injury.
Paired associate learning for visual-spatial (VS) and auditory-verbal (AV) items was examined in 17 children with perinatal brain injury (mean age 8.3 yr) resulting in spastic diplegic cerebral palsy (SDCP) and 28 age-matched children without SDCP (mean age 8.2 yr). SDCP children showed poorer performance relative to the comparison group for VS-paired associates and for combinations of VS- and AV-paired associates. Magnetic resonance examinations for the SDCP children were rated for severity of white matter abnormalities in the trigonal, body, and frontal regions. When statistically controlling for lesion severity in other locations, performance on VS stimulus-response pairs correlated with lesion severity in the peritrigonal region; stimulus-response pairs that included VS and AV items correlated with severity of frontal injury. These findings support previous studies linking peritrigonal injury to VS deficits in SDCP, and further indicate frontal injury may disrupt the formation of heteromodal associations important for higher-level cognitive skills such as conditional associative learning.
Correspondence: *Jeffrey C. Schatz, Department of Psychology, Washington University, 758 Kingsland 3N, St. Louis, MO 63130, USA.*

J. ANDRIKOPOULOS. Qualitative Observations on the Visual Reproduction Subtest in Compensable Mild Head Injury.
Two groups of patients were compared on the Wechsler Memory Scale-Revised Visual Reproduction (VR) subtest. The Compensation Group (CG) consisted of 17 consecutive patients who claimed a compensable mild head injury and whose test performance was of questionable validity. The Head Injury Group (HG) consisted of 17 consecutive patients with moderate-to-severe closed head injury. Both groups had equivalent scores on both VR I and VR II when scored in the standard fashion. There were, however, qualitatively significant differences. Unlike the HG, the CG tended to reproduce the same errors on VR II as they did on VRI.
Correspondence: *Jim Andrikopoulos, Independent Practice, 1750 28th St., Suite 1, West Des Moines, IA 50266, USA.*

K.B. FUERST, B.P. ROURKE, D.R. FUERST, & J.L. FISK. Subtyping the Psychosocial Sequelae of Pediatric Closed Head Injury.
A Personality Inventory for Children-Revised (PIC-R)-based psychosocial typology of 115 children with closed head injury (CHI) was derived using cluster analysis. When replicated with three additional clustering techniques, seven distinct subtypes were identified: Cognitive Deficit, Somatic Concern, Mild Anxiety, Internalized Psychopathology, Antisocial, Social Isolation, and Normal. The first four CHI subtypes replicated subtypes found previously in samples of children with learning disabilities. Statistically significant relationships were found between subtype membership and age at injury and injury severity. The results suggested that psychosocial deficits following pediatric CHI are heterogeneous and, to some extent, predictable.
Correspondence: *Katy B. Fuerst, Department of Psychology, University of Windsor, Windsor, Ontario N8Y 1T2, Canada.*

G.A. STALLINGS, L. EWING-COBBS, D.J. FRANCIS, & J.M. FLETCHER. Prediction of Academic Placement after Pediatric Head Injury Using Neurological, Demographic, and Neuropsychological Variables.
Academic placement during the first 2 yr after closed head injury (CHI) was examined in 47 children and adolescents, ages 5–15 at injury, who had sustained mild-moderate ($N = 18$) or severe ($N = 29$) CHI. Neurological, demographic, and neuropsychological test performance variables were employed as predictors. Greater injury severity and the presence of maladaptive behaviors were significantly associated with special placements after CHI. The predictive utility of socioeconomic status level and gender approached significance. Assessment of children after pediatric CHI should be broad-based. Decisions about academic placement should incorporate neurological and demographic data with the child's performance on tests of behavior and cognition.
Correspondence: *Garland Ann Stallings, Department of Psychology, University of Houston, 4800 Calhoun, Houston, TX 77204-5341, USA.*

L. EWING-COBBS, J.M. FLETCHER, H.S. LEVIN, P. HASTINGS, & D. FRANCIS. Assessment of Injury Severity Following Closed Head Injury in Children: Methodological Issues.
The relative efficacy of different methods of determining the severity of closed head injury was evaluated using several parameters of injury severity in 78 patients of ages 0–15 yr at injury. The relationship between injury severity and late neuropsychological outcome was assessed. Using the lowest post-resuscitation Glasgow Coma Scale score as the sole index of injury severity may lead to a failure to detect the influence of injury severity on IQ and speeded motor test scores. Categorization of the severity of injury was best achieved using either duration of impaired consciousness or a multivariate approach that examines the depth and duration of impaired consciousness and the presence of parenchymal injury as visualized on CT or MRI scans. Future investigations should identify neurological and sociodemographic variables that moderate the relationship between injury severity and long-term outcome.
Correspondence: *Linda Ewing-Cobbs, Department of Pediatrics, University of Texas Health Science Center, 6431 Fannin, Houston, TX 77030, USA.*

L. EWING-COBBS, D.N. CANALES, & J.M. FLETCHER. Pediatric Gunshot Wound to the Brain: A Longitudinal Case Study of Identical Twins Discordant for Gunshot Wound.
Neuropsychological outcome after a craniocerebral gunshot wound (GSW) was evaluated at baseline, 5 months, and 2 yr following injury in a 3-yr-old child with a left frontal GSW and was compared with his identical twin. Adaptive behavior was comparable prior to the injury in both children. At hospital discharge, the patient was severely aphasic and apraxic. At both follow-ups, cognitive and motor scores were deficient; his twin's scores varied from average to borderline. By 2 yr following the injury, the patient's perceptual performance IQ score was lower than the verbal IQ score; general cognitive, adaptive behavior, gross and fine motor, and preacademic scores remained in the deficient range. Early brain injury was associated with global cognitive, motor, and adaptive behavioral deficit.
Correspondence: *Linda Ewing-Cobbs, Department of Pediatrics, University of Texas Health Science Center, 6431 Fannin, Room 3.222, Houston, TX 77030, USA.*

C. BARRY, H.G. TAYLOR, & S. KLEIN. Validity of Postconcussional Symptoms in Children Following Traumatic Brain Injury (TBI).
The predictive and concurrent validity of postconcussional symptoms were investigated in children who sustained traumatic brain injury at 12 months post injury. The sample consisted of 6–12-yr-old children: 24 with severe TBI, 33 with moderate TBI, and 45 with orthopaedic injuries (OI) only. ANOVAs revealed that the two TBI groups exhibited more postconcussional symptoms than the OI group both at baseline and at 12 months even after taking into account premorbid behavioral status. Within the TBI group, baseline postconcussional symptoms predicted 12-month scores on California Verbal Learning Test, Impact on Family Scale, Family Burden of Injury Interview, and Child Behavior Checklist Total Behavior Problems with both severity of injury and preinjury behavior and social status taken into account. Similar relationships were found between postconcussional symptoms at 12 months and 12-month outcomes. These findings provide evidence for both the concurrent and predictive validity of postconcussional symptoms, and also support using

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these symptoms as markers of injury severity and predictors of child and family outcomes.
Correspondence: *Christine T. Barry, Department of Pediatrics, Rainbow Babies and Childrens Hospital, 11100 Euclid Ave., Cleveland, OH 44106, USA.*

D. SLICK, D. BUB, & M. ARGUIN. Relationships Between Stimulus Characteristics and Reading Performance in Alexia Constraints on Models of Letter-by-Letter Reading.
An extensive analyses of reading and lexical decision performance of two pure alexic patients was completed using an exhaustive set of four-letter words. Performance of the patients was compared to that of normals on the same tasks. Effects on patient and control performance of low-level (e.g., letter confusability) and high-level (e.g., neighborhood size) characteristics of the stimuli were simultaneously evaluated. Variables associated with both high- and low-level processes and systems were found to be predictive of patient performance. Patients also showed different patterns of high- and low-level effects than normals. Theories about underlying deficits in pure alexia will therefore have to account for differences in function in both high- and low-level systems.
Correspondence: *Daniel Slick, Department of Psychology, University of Victoria, Victoria, Box 3050, British Columbia V8W 3P5, Canada.*

N. SINGER, J. TOWNSEND, & E. COURCHESNE. Slowed Orienting of Attentional Resources in Individuals with Autism.
The present study used the Posner paradigm and a new motor-free adaptation to examine attentional abnormalities in autism. Subjects were seven high-functioning autistic subjects from a previously described group with bilateral cerebellar abnormalities, and 10 normal controls. Based on previous research that demonstrated slowed shifting of attention in autistic subjects and patients with acquired cerebellar lesions, it was hypothesized that autistic subjects would be slow to orient to the cue, such that performance would be greatly improved at 800 ms versus 100 ms cue-to-target delays. Results were consistent with this prediction, and support the hypothesis that the cerebellum, which has been demonstrated to be abnormal in most autistic individuals, may be involved in the rapid deployment of attentional resources.
Correspondence: *Naomi G. Singer, Neuropsychology Research Laboratory, Children's Hospital, 8110 La Jolla Shores Dr., Suite 200 B, San Diego, CA 92037, USA.*

N.J. MINSHEW, G. GOLDSTEIN, D.J. SIEGEL, J.W. PETTEGREW, E. AYLWARD, & G.D. PEARLSON. MRI and MRS Correlates of Information Processing in Autism.
Recent research in autism has suggested a generalized deficit in complex or late information processing by neocortical systems, and increased brain volume. Correlations between complex and simple neuropsychologic tasks across domains, brain membrane metabolites from ^{31}P MRS of cortex, and MRI volumetric measures of cortical gray and white matter volumes were investigated. Results provide evidence of consistent MRI and MRS correlations with high information processing load variables and equal but opposite correlations with low information processing load variables. These correlations were consistent with recent research findings and demonstrate the potential of neuropsychology, MRI, and MRS for reconciling findings across technologies and for assessing various theories concerning the neurobiology of autism.
Correspondence: *Nancy J. Minshew, Department of Psychiatry, University of Pittsburgh, 3811 O'Hara St., Pittsburgh, PA 15213, USA.*

J.E. CASEY, C.A. ENRIGHT, & M.M. GRAGG. High-Functioning Autism and the Nonverbal Learning Disabilities Syndrome: A Comparison of Neuropsychological and Academic Achievement Functioning.
Although some of the characteristics of high-functioning autism (HFA) and nonverbal learning disabilities (NLD) are thought to be similar, no study has compared these groups directly. This study examines the neuropsychological and academic profiles of six children with HFA and six children with NLD matched on age and FSIQ. Among other things it was found that the HFA group, as compared to the NLD group, obtained higher scores on visuospatial, constructional, and psychomotor tasks and lower scores on most measures reflecting verbal skills and abilities. Both groups demonstrated average achievement in reading and spelling and deficiencies in arithmetic. The results suggest that in addition to certain similarities, important differences were demonstrated that may have implications for the assessment, diagnosis, and treatment of these disorders.
Correspondence: *Joseph E. Casey, Ozad Institute, Windsor Regional Children's Centre, 3901 Connaught St., Windsor, Ontario N9C 4H4, Canada.*

S. HOOPER & T. BROWN. Neuropsychological Profiles of Adolescents with Arithmetic Disabilities Using Regression-Based Ability-Achievement Versus Low-Achievement Definitional Criteria.
This study examined the neuropsychological differences between adolescents defined as having arithmetic disabilities according to low-achievement versus regression-based definitions of learning disabilities. Subjects included 157 adolescents divided into three groups: regression-based definition ($N = 26$); low achievement ($N = 11$); and normal ($N = 120$). Analyses revealed a significant group effect across the intellectual and neuropsychological variables. Significant differences occurred in the Visual-Perceptual Domain and PIQ. These differences reflected lowered performance of the low-achieving group when compared to the other groups.
Correspondence: *Stephen R. Hooper, Department of Psychiatry and Center for Development and Learning, University of North Carolina School of Medicine, Chapel Hill, NC 27599-7255, USA.*

E.R. VRIEZEN & M.L. SMITH. Parent Reports of Everyday Memory Problems in Normal Children and Children with Brain Dysfunction.
Relatives often report everyday memory problems in adults with brain dysfunction. However, parent reports of their children's memory have not been studied. We developed a memory questionnaire (MQ) on which parents rate the frequency of 28 everyday memory problems in their child on a five-point scale. One hundred twenty-nine parents completed the MQ. MQ total scores did not differ for children aged 6–8, 9–11, and 12–14 yr. Similarly, age did not correlate with MQ total score. Parents indicated more everyday memory problems in children with brain dysfunction ($N = 35$) than control children. MQ total scores correlated with delayed recall on the CAVLT and WISC-III FIQ. The correlation with delayed recall of the Rey-Osterreith figure approached significance. The questionnaire samples behaviors that emerge before 6 yr of age and is sensitive to the everyday memory problems experienced by children with brain dysfunction.
Correspondence: *Ellen Vriezen, Psychology Department, Children's Hospital of Western Ontario, 800 Commissioners Rd. E., London, Ontario N6C 2V5, Canada.*

P. COPPENS & S. HUNGERFORD. Landau-Kleffner Syndrome: Linguistic and Behavioral Considerations.
Landau-Kleffner syndrome (LKS) is an acquired aphasia in children associated with abnormal EEG. Although less frequently described, the disorder is also often characterized by abnormal behaviors. We present three cases of children with LKS, and describe the linguistic and behavioral characteristics of each. Each case showed rigid routines, preoccupation with objects, or abnormalities in reciprocal social interaction. Possible relationships between LKS, left temporal lobe abnormalities, and autism are discussed. Additionally, all three cases showed severe language disorders. One case had a progressive switching of handedness as his language regressed. Another case showed a persistent gap between linguistic abilities in vocabulary and syntax. Two of the three cases were able to use some manual sign language, despite almost complete loss of aural-oral language. These characteristics, and others, point to a possible right-hemisphere communicative strategy in the face of left hemisphere dysfunction.
Correspondence: *Patrick Coppens, Department of Speech-Language-Hearing Sciences, Moorhead State University, Moorhead, MN 56565, USA.*

S. RAZ, F. SHAH, & C.J. SANDER. Differential Effects of Risk for Perinatal Hypoxia on Early Developmental Outcome: A Twin Study.
We explored the effects of differential perinatal hypoxic risk on early development in 28 sets of twins without gross sensory and motor deficits. Twins were discordant for early hypoxic risk estimated from the Apgar scores and respiratory support duration. The outcome measures were mental (MDI) and psychomotor (PDI) components of the Bayley Scales of Infant Development. We expected the higher-risk twins to perform worse than lower-risk co-twins on both indices of early development. We found that intrapair dissimilarity in risk for hypoxia was associated with intrapair differences in the MDI, but not the PDI; the higher-risk twins had significantly lower scores. This effect was greater for premature same-sex twins. Early development of mental skills appears more sensitive to perinatal hypoxia than gross motor development.
Correspondence: *Sarah Raz, Department of Psychology, The University of Memphis, Memphis, TN 38152, USA.*

G. BRINSON, E. FENNELL, J. RODRIGUE, & J. GRAHAM-POLE. Memory Deficits in Children with Sickle Cell Anemia.
Children with sickle cell anemia (SCA) tend to experience neuropsychological deficits even in the absence of overt signs of stroke, and these deficits can result in poor academic functioning. This study assessed verbal and nonverbal memory deficits in children with SCA as compared to a matched control group. Subjects were 20 children with SCA without histories of stroke and 20 healthy children. Analyses failed to reveal significant differences between the two groups with regard to age, gender, special education placement, free lunch qualifications, and pretest cognitive measures of intelligence. Children with SCA scored significantly lower on a visual immediate memory measure of pointing span. No significant differences between the two groups were found on verbal immediate memory, verbal and visual short-term memory, or verbal and visual long-term memory. No significant differences were observed between the two groups on parental report of memory problems.
Correspondence: *Gloria A. Brinson, Department of Clinical and Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610, USA.*

E.M.S. SHERMAN, L. JANZEN, & M. JOSCHKO. Sustained Attention and Social Functioning in Children with Tourette Syndrome.
The relationship of social functioning to (1) measures of attention derived from the Continuous Performance Task (CPT) and to (2) behavioral ratings of Attention-Deficit Hyperactivity Disorder (ADHD) was investigated in 26 children with Tourette syndrome (TS) and 17 controls between the ages of 7 and 15 yr. Neuropsychological markers of attentional dysfunction as determined by CPT performance were not related to social functioning in TS children. Tic severity and severity of comorbid obsessive-compulsive behavior (OCB) were also unrelated. Instead, the results suggest that the most important risk factor for social skill problems in TS is the presence of ADHD-related behaviors as determined by a parent-rated behavior scale. A similar pattern was found in normal children in that subclinical ADHD-related behaviors, but not subclinical OCB, were also related to social functioning problems. The results suggest that when social functioning problems are found in children with TS, they are likely related to generalized behavioral dysfunction due to comorbid ADHD, and are not the result of specific problems in maintaining or modulating attention.
Correspondence: *E.M.S. Sherman, Department of Psychology, University of Victoria, Box 3050, Victoria V8W 3P5, Canada.*

A.L. PAUL & W.S. BROWN. Psychosocial Deficits in Agenesis of Corpus Callosum (ACC).
Congenital agenesis of the corpus callosum (ACC) is a birth defect often associated with mental retardation, but which also occurs in neurologically asymptomatic individuals with normal IQ. Our data gathered from two normal IQ adolescent boys with ACC reveals that they perform in normal range on WISC-R and Trail-Making Tests, but significantly below normal on several complex cognitive problem-solving tasks: Categories and Tactile Performance Test. In the psychosocial domain, they perform poorly on the Thematic Apperception Test and Proverbs Test Best Answer Format. Although their MMPI-2 profiles were generally below normal, they both had significant elevations on the L (lie) scale. The findings indicate deficits in complex novel processing, particularly regarding socioemotional experiences.
Correspondence: *A.L. Paul, The Travis Institute, Fuller Graduate School of Psychology, 180 N. Oakland Ave., Pasadena, CA 91101, USA.*

J.B. RICH, M. YASTER, & J. BRANDT. The Effect of Propofol Anesthesia on Implicit and Retrograde Memory in Children.
Adults anesthetized with volatile inhalants may show preserved implicit memory for intraoperative events, whereas opioid agonist anesthetics block both implicit and explicit memory. In this study, sets of pictures were presented prior to induction of propofol anesthesia in 20 children (mean age = 12.2) undergoing fiberoptic gastrointestinal endoscopy. Verbal paired associates were presented via audiophones following induction of anesthesia. Postoperative testing revealed preserved memory for material presented preoperatively (i.e., retrograde memory) but total amnesia (as measured by free association, free recall, cued recall, and recognition) for material presented intraoperatively. These findings indicate that, at least in the dosage range used for surgical anesthesia in children, propofol induces amnesia for material presented during the anesthetized period without interrupting the ability to process and retain information presented immediately prior to the induction of anesthesia.
Correspondence: *Jill B. Rich, Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

J.E. HERRON, L.M. GRATTAN, M. SLOAN, & P.J. ESLINGER. Recovery from Left Tuberothalamic Artery Infarction in an Adolescent: Neuropsychological and Neuroanatomic Findings.
Neurobehavioral studies of adults with thalamic lesions have identified a distinctive pattern of acute and long-term impairments associated with infarction in the territory of the tuberothalamic artery. However, the effects of similar infarction in adolescents is unknown. We report neuropsychological findings of a 15-yr-old girl (R.A.L.) who sustained left tuberothalamic stroke involving anterior, ventroanterior, ventrolateral, and dorsomedial nuclei of the thalamus and post-commissural fornix. Initially, R.A.L. demonstrated impairments in spontaneity, initiation, concentration, verbal memory, and selected language abilities. However, by 18 months poststroke, she resumed most academic and social activities, with only isolated deficits in free verbal recall. Although R.A.L.'s pattern of acute deficits was similar to adults, cognitive and functional recovery was comparatively better for this adolescent.
Correspondence: *Janice E. Herron, Department of Neurology, Box 175, University of Maryland School of Medicine, 22 S. Greene St., Baltimore, MD 21201-1595, USA.*

M. BALTHAZOR, E. SHAPIRO, D. LOES, L. LOCKMAN, C. COX, H. MOSER, & W. KRIVIT. Adrenoleukodystrophy: The Relationship Between MRI Findings and Neuropsychological Functioning.
We studied the relationship between MRI findings and indices of neuropsychological functioning in 51 boys diagnosed with adrenoleukodystrophy (ALD), an X-linked degenerative disease of white matter. Early identification of the cerebral form of the disease is very difficult. We have used a combination of MRI and neuropsychological tests to detect early signs of disease. This study employed a new method of quantifying MRI and compared these scores (Loes scores) to IQ scores. A significant correlation between MRI Loes score and Full Scale and Performance IQ was found. Also, those children with frontal abnormality demonstrated lower IQs than those with posterior abnormality. Results suggest that Loes MRI severity score in conjunction with mea-

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sures of neuropsychological functioning can be used to initially delineate disease severity in ALD.
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R. ZIEGLER & H. DAVIDOWICZ. Neuropsychological Functioning in Duchenne Muscular Dystrophy.
Duchenne muscular dystrophin is a fatal X-linked recessive disorder caused by the absence of the protein, dystrophin, and is characterized by progressive muscle degeneration and death. Dystrophin is present in the brain, although no relationship between intelligence and lack of dystrophin has been demonstrated. Our study integrated pregnancy, birth history data, and early developmental data in association with neuropsychological measures. Of 23 subjects, 4 met criteria for mental retardation, 2 scored within normal limits, and 17 demonstrated various levels of deficit in language, memory, attention, concept formation, and had difficulties and academic achievement. Data from the 17 cognitively disabled subjects were factor-analyzed, yielding a three-factor solution. Language, attentional, and academic measures loaded on factor 1, measures of memory and concept formation loaded on factor 2, and measures of visuospatial and constructional skills loaded on factor 3. Negative correlations between motor and language milestones and neuropsychological measures were found.
Correspondence: *Richard Ziegler, Division of Pediatric Neurology, Box 486, University of Minnesota Medical School, 420 Delaware St. SE, Minneapolis, MN 55455, USA.*

M.J. COHEN. Auditory/Verbal and Visual/Spatial Memory in Children Following Anterior Temporal Lobectomy: A 1-Year Prospective Study.
This study was undertaken to prospectively evaluate memory performance in 11 children who underwent anterior temporal lobectomy (ATL) for intractable epilepsy (6 left; 5 right). Results indicated that both groups exhibited a significant improvement in PIQ 1 yr postsurgery secondary to improved seizure control. Consistent with the adult epilepsy surgery literature, the left ATL group tended to demonstrate evidence for decline in verbal memory following surgery, with evidence for improved verbal memory seen in the right ATL group. Results of visual memory assessment were less consistent, perhaps as a result of shifting of memory functions in some children with early left-sided insult, or the use of verbal mediation on the part of some children in the right ATL group when performing visual memory tasks.
Correspondence: *Morris J. Cohen, Department of Neurology, Medical College of Georgia, Augusta, GA 30912-3255, USA.*

P.M. KAUFMANN, I.M. MOORE, K.A. ESPY, & J.J. HUTTER. The Late Effects of Triple Intrathecal Chemotherapy on Neuropsychological Outcome at 24 Months Postleukemia Diagnosis.
Neurotoxicity is a known consequence of treatment for acute lymphoblastic leukemia (ALL). ALL survivors (6–19 yr) were evaluated longitudinally at 6 and 24 months postdiagnosis on measures of intellectual, academic, attention, and visual-motor skills. Significant increases in impulsive responding and distractibility were found on attention measures from baseline to follow-up evaluations. Visual-motor skills declined significantly from evaluations at 6 and 24 months, whereas verbal intellectual skills were unchanged. Contrary to prediction, at 24 months post-ALL diagnosis, a decrement of 10 points in academic skills was observed between evaluations. The gradual onset of attention disturbance following CNS chemotherapy may result in poorer academic performance. Educational interventions may be necessary to habilitate the cognitive sequelae of CNS chemotherapy.
Correspondence: *Paul M. Kaufmann, Department of Pediatrics, University of Arizona, 1501 N. Campbell Ave., Tucson, AZ 85724, USA.*

K.A. ESPY, C.J. LOCKE, & S. HILL-MANGAN. Neonatal Neurobehavior and Developmental Outcome in Drug-Exposed Infants.
The relationship of the reported neonatal neurobehavioral abnormalities and later developmental outcome has not been investigated in drug-exposed infants. Thirty-five drug-exposed infants were administered a neurobehavioral evaluation shortly after birth and developmental assessments at 4 and 12 months of age. Full-term drug-exposed infants showed neurobehavioral impairment in a wider range of domains than preterm drug-exposed infants. State, motor, and attention skills predicted subsequent developmental outcome. These findings suggest that (1) full-term infants may exhibit greater neurobehavioral impairment related to longer gestational drug exposure, and (2) neonatal neurobehavior in drug-exposed infants can be used to identify infants at-risk for developmental delay and further intervention.
Correspondence: *Kimberly A. Espy, University of Arizona College of Medicine, Department of Pediatrics, 1501 N. Campbell Ave., Tucson, AZ 85724, USA.*

W. WALKER, L. BUCHANAN, & J. ROVET. Selective Reading Impairment in Children with Congenital Hypothyroidism (CH).
Children with early-treated CH are at risk for visuospatial deficits, learning problems, and hearing impairment (HI). We tested the hypotheses that those with hearing loss will be additionally impaired in word reading because they lack access to both critical pathways for deriving pronunciation information from print whereas those without HI will not because they can access the phonological route. We compared 30 third grade CH children (15 HI, 15 non-HI matched for age and gender) with 15 sibling/classmate controls (C) on WJRM Word Identification and Word Attack subtests. A differential stepwise effect was found with HI performing below non-HI who performed below C and with a greater difference between HI and non-HI CH groups for Word Attack than Word Identification ($p < .0001$). These findings support the view of two distinct and alternate reading pathways, one being impaired in children with CH and no HI and both being impaired in CH with HI.
Correspondence: *Wynsome Walker, Department of Psychology, The Hospital for Sick Children, 555 University Ave., Toronto, Ontario M5G 1X8, Canada.*

J. ROVET, R. EHRLICH, & M. HOCKENBERRY. Neurocognitive Complications of Diabetes at Puberty.
To study if puberty is a trigger for the onset of the neurocognitive (NC) complications of diabetes observed among late adolescents and adults, we compared adolescents with diabetes (DM) ($N = 103$) and controls (C) ($N = 100$), who were at various stages of puberty. All subjects received a comprehensive battery of neuropsychological tasks assessing multiple domains of NC function. Diabetes-related parameters were obtained retrospectively and during testing. Results revealed differential pubertal status effects on several executive function and attention measures. DM differed from C in spatial, graphomotor, perceptual domains plus several other attention and executive function variables. Early onset and/or history of severe hypoglycemia were associated with poorer visual and spatial skills. Elevated blood glucose adversely affected sustained attention and increased perseverative responding. Puberty may indeed be a trigger for NC complications in executive functioning and attention, whereas deficits in visual and spatial areas are associated with early DM onset and/or history of severe hypoglycemia.
Correspondence: *Joanne F. Rovet, Department of Psychology, Hospital for Sick Children, 555 University Ave., Toronto, Ontario M5G 1X8, Canada.*

V.R. BREWER, B.D. MOORE, & M. HISCOCK. Subtypes of Learning Disabilities in Children with Neurofibromatosis.
Not only is there a high incidence of learning disabilities (LD) in children with neurofibromatosis, type I (NF-I), but many affected children are thought to have a form of LD characterized by visuospatial and motor deficits. When we cluster-analyzed achievement test scores of 105 patients between the ages of 6 and 18, we obtained 10 groups, 6 of which

met criteria for academic deficiency. A similar analysis of neuropsychological data for the 72 academically deficient children yielded three groups: a neuropsychologically normal group ($N = 28$), a generally deficient group ($N = 34$), and a group with visuospatial-motor deficiency ($N = 10$). Even though selective visuospatial-motor deficits are not a prominent feature of NF-I, the absence of cases with pure linguistic deficits is notable.
Correspondence: *V.R. Brewer, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

J.M. BYRNE & H.N. BAWDEN. Neuropsychological, Intellectual, and Academic Sequelae of Infantile Hemidecortication: A 13-Year Follow-up.
Hemidecortication provides a unique opportunity for studying cerebral plasticity. A 13.5-yr-old adolescent was given a full neuropsychological, intellectual, and academic assessment. He had undergone a functional left hemidecortication at 6 months of age. Of particular note is the fact that preoperative data revealed an intact right hemisphere, and that school personnel were completely unaware of his hemidecortication. He exhibited global intellectual, academic, and neuropsychological deficits. These results do not support the contention that early cerebral insult diminishes vulnerability sparing psychological functions.
Correspondence: *Joseph M. Byrne, Department of Psychology, IWK Children's Hospital, P.O. Box 3070, Halifax, Nova Scotia B3J 3G9, Canada.*

S.R. McCAULEY, J.M. FLETCHER, M. BRANDT, T. BOHAN, & K. THORSTAD. Regional Gray and White Matter Differences in the Hydrocephalic Brain.
Neuropsychological measures of verbal and performance abilities and relative percentages of gray, white, and cerebrospinal fluid (CSF) were obtained in children with hydrocephalus and a normal control group. The hydrocephalic group had a higher percentage of CSF in the posterior regions bilaterally, less gray matter in the right posterior quadrant, and less white matter in the left posterior quadrant. Analyses indicated that differences in gray matter were the result of the absence of callosal gray (agenesis of the splenium). Positive correlations were demonstrated between verbal, performance, and motor measures and right posterior gray matter in the shunted group. Negative correlations were found between these measures and CSF in both posterior quadrants.
Correspondence: *S.R. McCauley, Department of Pediatrics, University of Texas Medical School-Houston, 6431 Fannin, Houston, TX 77030, USA.*

V. VOLTERRA, G. PEZZINI, S. VICARI, L. MILANI, M.T. OSSELLA, & O. CAPIRCI. Neuropsychological Abilities in Williams Syndrome Subjects.
A specific neuropsychological profile with a proficient language and face recognition but, at the same time, severe difficulties in other visuospatial tasks has been hypothesised in Williams syndrome (WS) subjects. However, very few data on cognitive and linguistic development in young WS children are available. The present study aimed at investigating neuropsychological abilities in persons with WS. Performances of 18 WS subjects were compared with those of normally developing children. Results show that the subjects included in our study obtained very different profiles in their neuropsychological performances. In particular, we found only few cases of dissociations between the linguistic and visuospatial domains as described by other authors. Overall, our results seem to support the hypothesis that children with WS have a complex neuropsychological profile characterized by atypical developments in both the domains of cognition and language.
Correspondence: *Virginia Volterra, Institute of Psychology-C.N.R., Department of Neuropsychology of Language and Deafness, via Nomentana, 56, 1-00161 Rome, Italy.*

J.M. KIEFEL, K.O. YEATES, & B. ENRILE. Verbal/Nonverbal Skill Discrepancies in Children with Myelomeningocele.
This study examined verbal/nonverbal skill discrepancies in children with myelomeningocele (MM). Participants included 47 children with MM and 27 siblings, all from 8 to 15 yr of age. They completed a neuropsychological test battery from which three scores representing verbal/nonverbal skill discrepancies were derived. Consistent with prior research, children with MM displayed larger discrepancies, with poorer nonverbal than verbal skills, compared to siblings. However, the magnitude of the discrepancies was not related to selected medical background variables among children with MM, perhaps because of brain abnormalities that are present in almost all children with this severe form of spina bifida. Unexpectedly, the magnitude of verbal/nonverbal skill discrepancies was predicted by handedness. This result raises interesting questions concerning cerebral lateralization and brain reorganization in MM.
Correspondence: *Jacqueline Kiefel, Department of Psychology, Children's Hospital, 700 Children's Dr., Columbus, OH 43205, USA.*

S.D. GREWE, K.O. YEATES, & B. ENRILE. Profiles of Academic Achievement in Children with Myelomeningocele.
The current study used cluster analysis to study patterns of academic achievement in 48 children with myelomeningocele (MM) and 27 siblings, all between the ages of 8 and 15. A seven-cluster solution was chosen based on multiple criteria. The clusters differed in both level and pattern of performance on the three subtests from the WIAT Screener. The clusters also differed in composite scores derived from a neuropsychological test battery. Children with MM and siblings did not overlap much in cluster membership, even when the clusters were equated for overall level of performance, suggesting that the academic achievement of children with MM varies both quantitatively and qualitatively from their siblings. The differences may reflect age-related declines in mathematical reasoning skills specific to children with MM.
Correspondence: *Scott D. Grewe, Department of Psychology, Children's Hospital, 700 Children's Dr., Columbus, OH 43205, USA.*

M.A. SMITH & M.A. ROMAN. Neuropsychological Findings in a Case of Rasmussen's Syndrome Pre- and Post-Total Right Hemispherectomy.
Rasmussen's syndrome is an extremely rare disorder of progressive, unremitting epilepsy with intellectual deterioration. Fewer than 100 cases have been documented in the literature and most involve children. Only total hemispherectomy has been found to be effective in arresting the disease and achieving seizure control. Despite the dramatic consequences of the disease for the individual, comprehensive neuropsychological data are lacking. This paper presents the case of J.R., a 13-yr-old right-handed girl who underwent a right hemispherectomy following a diagnosis of Rasmussen's syndrome. She has been comprehensively evaluated both pre- and post-hemispherectomy. Our findings provide interesting evidence to support many widely held beliefs about right hemisphere brain functions, but call others into question. They also provide practical evidence for the benefits and consequences of right hemispherectomy.
Correspondence: *M.A. Smith, Department of Pediatrics, The University of Texas Health Science Center at San Antonio, San Antonio, TX 78284-7808, USA.*

S. VICARI, G. CARLESIMO, D. BRIZZOLARA, G. PEZZINI, & V. VOLTERRA. Dissociations in Memory Abilities in Williams Syndrome Subjects.
In the last few years a specific neuropsychological profile with a dissociation between language and visuospatial abilities has been hypothesised in Williams syndrome (WS) children. So far, very little information is available about memory abilities, although data about verbal and visuospatial memory may substantially contribute to a better understanding of their cognitive profile. The present study aimed at investigating verbal and spatial memory in persons with WS. Performances of 16 WS

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subjects were compared with those of 16 normally developing children on tasks of verbal and spatial span and immediate and delayed recall of verbal and visuoperceptual materials. Overall, memory abilities of WS children appear to be characterized by defective visuospatial memory (both short-term and long-term) and, in the context of verbal memory, by a dissociation between normal short- but deficient long-term learning. Results of the present study, which point out neuropsychological dissociations between more and less preserved cognitive functions in WS children, further support the hypothesis that describes mental retardation as defective functioning of a complex system in which some cognitive abilities may be disrupted more than others.
Correspondence: *Stefano Vicari, Ospedale Bambino Gesù, 00058 S. Marinella, Rome, Italy.*

D.L. MOLFESE & D.L. MOLFESE. Brain Responses Discriminate Learning from Familiarity in Adolescents.
Event-related potentials (ERPs) were recorded from over left and right frontal, temporal, and parietal hemisphere regions of 12 high school students before and after they learned to pair nonsensical labels to randomly generated shapes. Marked increases in the P300 region of the waveform over parietal and frontal areas occurred following successful training trials, whereas only a slow positive component that occurred later in the waveform discriminated learning trials from familiarization trials. A second study with a different group of adolescents replicated the earlier findings. These experiments represent the first successful use of ERPs to identify systematic changes in learning. Discussion focuses on the use of this technique to monitor training and intervention.
Correspondence: *Dennis L. Molfese, Department of Psychology, Southern Illinois University at Carbondale, Carbondale, IL 62901-6502, USA.*

A. TAN, L.A. GILL, & D.L. MOLFESE. Differential Hemispheric Involvement During Syntactic Processing in Preschoolers: Electrophysiological Correlates.
Auditory evoked response potentials (ERPs) were recorded from the left and right hemisphere frontal, temporal, and parietal regions of 22 preschool-age children. Each child watched a videotaped series of scenes that were accompanied by auditorily presented nouns and verbs, which either matched or did not match the objects or actions depicted in each of the scenes. Subsequent analysis of the ERPs revealed varying patterns of responses occurring at different latencies in the waveform that were evoked by the different word types and matching conditions. The present results, which are discussed in the light of a previous study conducted with adults, indicate multidimensional hemispheric differences in the mechanisms involved in the processing of nouns and verbs.
Correspondence: *Arlene Tan, Department of Psychology, Southern Illinois University at Carbondale, Carbondale, IL 62901-6502, USA.*

U. KIRK, C. McCARTHY, & E. KAPLAN. The Development of Clock-Drawing Skills: Implications for Neuropsychological Assessment.
This study examined the performance of 228 children from ages 6 to 15 on two clock tasks: (1) positioning numbers on a predrawn circle, and (2) setting specified times on predrawn clock faces. Quantitative and qualitative analyses revealed different age-related patterns of accuracy and error. Incorrect use space on the left side of the clockface (hemineglect in adults) was observed at ages 6–9, but not thereafter, suggesting that such errors reflect a developmental aspect of spatial planning. Contributions of other neuropsychological functions to performance on the clock tasks were evaluated. Performance on clock tasks was related to selected NEPSY language, visuospatial, and strategic planning subtests, but was unrelated to tests of visuomotor integration and visuomotor precision. Implications for neuropsychological assessment of children are discussed.
Correspondence: *Ursula Kirk, Department of Developmental and Educational Psychology, Teachers College, Columbia University, Box 142, New York, NY 10027, USA.*

Symposium 3/11:00 a.m.–12:30 p.m.

PRACTICAL AND METHODOLOGICAL ISSUES IN CLINICAL TRIALS

Organizer & Chair: Elizabeth Koss

E. KOSS (Organizer). Symposium—Practical and Methodological Issues in Clinical Trials.
Ascertainment of therapeutic efficacy on cognition within the framework of clinical trials presents unique challenges to the clinician and researcher. The neuropsychologist, combining a thorough understanding of brain disease process with knowledge of experimental design and testing, is well prepared to play a growing role in the development and organization of clinical trials. This symposium will discuss four important issues faced by the neuropsychologist interested in clinical trials: overcoming traditional biases against the use of neuropsychological measures; developing neuropsychological efficacy measures; dealing with administrative and methodological issues in multicenter trials; and estimating pharmacoeconomic considerations. Presenters will discuss these issues with particular emphasis on dementing illnesses (Alzheimer's disease; Huntington's disease, and HIV infection) and will present findings from multicenter trials in which they assumed key functions.
Correspondence: *Elisabeth Koss, 12200 Fairhill Rd., Cleveland, OH 44120, USA.*

F.A. SCHMITT. Issues Surrounding Neuropsychological Evaluations of Antiretroviral Therapy in HIV Infection.
Many medical conditions affect central nervous system (CNS) functioning and these changes can be reliably measured through the use of neuropsychological techniques. Neuropsychological studies of treatment response, however, can be problematic for a number of reasons. First, most therapeutic studies focus on biological or medical outcomes of treatment, and CNS functioning as indexed by neuropsychological methods is often deemed a secondary outcome of treatment efficacy. Second, issues surrounding test administration, reliability, validity, and interpretation often result in biases against neuropsychological outcome measures in clinical trials. This presentation will provide examples of these problems from several multicenter trials. It will highlight the development and subsequent evolution of the use of neuropsychological tests in the study of several antiretroviral therapies for HIV infection with reference to CNS function.
Correspondence: *F.A. Schmitt, Sanders-Brown Center on Aging, University of Kentucky, Lexington, KY 40536, USA.*

J.A. MACKELL. Development of Efficacy Measures in Clinical Trials for Alzheimer's Disease.
With development of pharmacologic agents for the treatment of Alzheimer's disease (AD), improved evaluation is necessary to determine whether a drug has a therapeutic effect, and whether that effect is clinically meaningful and of sufficient magnitude to outweigh possible risks. Accuracy of this information relies on sensitive, reliable, and clinically relevant outcome measures. To address these issues, improved efficacy measures were conceptualized, developed, refined, and evaluated in a 1-yr multisite study of normal controls and patients across the spectrum of dementia severity ($N = 314$) for six domains: clinical change, cognitive function, behavioral symptoms, activities of daily living, severe impairment, and Spanish language versions of these measures. Findings on the efficacy of these tests, reliability, and practice effects, as well as sensitivity to longitudinal change, will be presented.
Correspondence: *J.A. Mackell, Aging and Dementia Research Center, New York University Medical Center, New York, NY 10016, USA.*

P.G. COMO. Neuropsychological Assessment in Multicenter Clinical Trials.
Neuropsychological assessment in multicenter clinical trials poses substantially greater methodological issues compared to a single site. We

have gained considerable experience from several multicenter trials investigating drugs in patients with Parkinson's disease and Huntington's disease. Each of these trials required repeated cognitive assessment and did not require that a trained neuropsychologist administer the battery. This section of the symposium will address specific administrative issues for neuropsychologists who participate in large-scale, multicenter clinical trials, including (1) development of a neuropsychology working group, (2) test battery selection for use by non-neuropsychologists, (3) data management (e.g., inter-center reliability, primary versus secondary endpoints), and (4) potential role of the neuropsychologist as a site investigator. Based on our experience in multicenter clinical trials, we conclude that it is crucial that the principal investigator assemble a neuropsychology working group to develop and oversee the test protocol and take responsibility for its proper administration, reliability, and data analysis.
Correspondence: *P.G. Como, Department of Neurology, University of Rochester Medical Center, Rochester, NY 14624, USA.*

M. SANO. Pharmacoeconomic Evaluations in Clinical Trials.
The current social climate requires development of methods to assess the economic impact of treatment in parallel with safety and efficacy issues. Different types of pharmacoeconomic studies will be described and the applicability of each to potential treatments for cognitive deficits and dementia will be discussed. The assumptions of each approach will be identified to determine if they are accurate in dementia. Specific topics are cost-specificity for disease stage, cost of informal services, and the ability of the patient to evaluate treatment alternatives in the presence of cognitive compromise. Methods for estimating costs based on psychometric changes will be discussed. Economic analyses for symptomatic benefit and slowing of deterioration will be modeled based on data from published clinical trials in Alzheimer's disease.
Correspondence: *M. Sano, Columbia University, Sergievsky Center, New York, NY 10032, USA.*

Symposium 4/11:00 a.m.–12:30 p.m.

NEUROIMAGING STUDIES OF LEARNING AND MEMORY

Organizer and Chair: Cheryl L. Grady

C.L. GRADY. Neuroimaging Studies of Learning and Memory.
The purpose of this symposium is to review how different neuroimaging techniques are being used to study memory. Dr. Grady will review PET studies that examine the roles of medial temporal and prefrontal cortex in encoding and retrieval and present data from an experiment of face recognition memory. Dr. Blaxton will present data from experiments using both PET and electrical stimulation mapping to examine implicit and explicit recall of words. Dr. Gabrieli will discuss functional MRI experiments examining frontal lobe activity during semantic and nonsemantic encoding. Finally, Dr. McIntosh will present the application of path analysis to neuroimaging data to determine brain networks involved in working memory for faces. These talks will provide an overview of current knowledge of the brain areas responsible for memory.
Correspondence: *Cheryl L. Grady, Laboratory of Neuroscience, NIA, Bldg. 10, Rm 6C414, 9000 Rockville Pike, Bethesda, MD 20892, USA.*

C.L. GRADY. The Roles of Medial Temporal and Prefrontal Cortex in Encoding and Recognition of Visual Stimuli.
There is much evidence that both medial temporal and prefrontal cortex participate in memory. A positron emission tomography (PET) study was carried out in young subjects during learning of and recognition memory for faces. During encoding of faces, compared to control tasks, subjects showed increased blood flow in the right hippocampal region, left inferior prefrontal cortex, and left inferior temporal cortex. During recognition, the subjects had activation of right prefrontal and parietal cortex, and bilateral ventral occipital cortex. These results agree with other PET studies that found left versus right prefrontal activation during encoding and recognition, and indicate that there are separate brain networks responsible for these memory processes. This finding also provides support for theories that stress the role of the hippocampus in stimulus encoding.
Correspondence: *Cheryl L. Grady, Laboratory of Neuroscience, NIA, Bldg. 10, Rm. 6C414, 9000 Rockville Pike, Bethesda, MD 20892, USA.*

T. BLAXTON. Functional Mapping of Perceptual and Conceptual Components of Human Memory.
Neurological substrates of conceptual and perceptual memory processes were investigated in two experiments. A PET study showed that conceptual word association and semantic cued recall tests were mediated by left temporal and frontal regions. Conversely, memory-specific changes in blood flow during perceptual tests of implicit and explicit word fragment completion were localized in bilateral occipital cortex. A second study using electrical stimulation mapping in epilepsy patients showed that stimulation of left frontal and temporal cortex disrupted conceptual priming of category member production. These results demonstrate that conceptual and perceptual memory processes are mediated by dissociable neuroanatomical regions.
Correspondence: *Teresa A. Blaxton, National Institute of Neurological Disorders and Stroke, NIH, Bldg. 10, Rm. 5C205, 9000 Rockville Pike, Bethesda, MD 20892, USA.*

J.D. GABRIELI. Functional Magnetic Resonance Imaging (fMRI) of Memory Processing in the Frontal Lobes: Evidence for a Brain Locus for Semantic Working Memory.
In studies examining frontal lobe activity via fMRI, we found a left inferior prefrontal cortex (LIPC) region, corresponding to Brodmann's areas 45, 46, and 47, where activation increased during semantic versus nonsemantic processing of words, and decreased during repeated versus initial semantic processing of words. Increased activation was linked to semantic processing rather than task difficulty, and decreased activation to repeated semantic processing rather than more general consequences of word repetition. Wada-assessed patients with left-lateralized language showed LIPC activation during semantic processing: patients with right-lateralized language showed right-sided activation. An Alzheimer's patient failed to show LIPC activation, but a patient with global amnesia did show LIPC activation. This LIPC region may mediate an executive component of semantic working memory.
Correspondence: *John D. Gabrieli, Department of Psychology, Stanford University, Jordan Hall, Stanford, CA 94305, USA.*

A.R. McINTOSH. Measuring Functional Neural Interactions with Structural Equation Modeling.
Much neuroscientific research has been focused on the role a particular brain area plays in behavior. However, given the extensive connectivity of the nervous system, it is possible that the role a region plays is determined in the larger context of its interactions with other connected areas. One method that seeks to understand brain function within the context of neural interactions is network analysis using structural equation modeling. All applications thus far have combined functional neuroimaging data with neuroanatomy to construct functional models of the systems engaged in a particular operation. This presentation will explain the theoretical basis of neural structural equation modeling and present an empirical example using brain imaging data from a working memory task for faces.
Correspondence: *Anthony R. McIntosh, Rotman Research Institute, 3560 Bathurst St., North York, Toronto, Ontario M6A 2E1, Canada.*

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Special Topic/11:00 a.m.–12:30 p.m.

THE RECOVERED MEMORY CONTROVERSY: A NEUROBIOLOGIC PERSPECTIVE

STUART ZOLA. The Recovered Memory Controversy: A Neurobiological Perspective.
The controversy of the "recovered memory syndrome," wherein individuals "recover" memories of childhood sexual abuse and trauma that were allegedly repressed for many years, has become one of the leading mental health problems in the United States today. During the last decade, work on the neurobiology of memory has revealed considerable information about the way memory works and how memory is organized in the brain. Findings from this work are particularly germane to the issue of recovered memories. I describe how our recent understanding of memory can help address the controversy of recovered memory syndrome, particularly with respect to the question of whether recovered memories are accurate representations of real prior events or instead could be false or illusory memories.
Correspondence: *Stuart Zola, Veterans Affairs Medical Center, San Diego and Departments of Psychiatry and Neuroscience, University of California, San Diego, CA 92161, USA.*

FRIDAY AFTERNOON, FEBRUARY 16, 1996

Paper Session 13/1:30–3:20 p.m.

ALZHEIMER'S DISEASE—3

C. FENNEMA-NOTESTINE, K. JAIN, D.P. SALMON, & N. BUTTERS. A Continuous Pronunciation Measure of Semantic and Repetition Priming in Patients with Dementia of the Alzheimer's Type.
The pattern of spared and impaired priming performance in patients with dementia of the Alzheimer's type (DAT) has been explained by either a deficit in semantic memory or by deficient controlled processes that prevent access to existing information. To explore these views, a continuous pronunciation priming paradigm incorporated repetition and semantic priming conditions at varied interstimulus intervals (ISIs). For DAT patients, semantic priming effects were absent, and repetition priming was abnormal. For repetition priming at the longest ISI, control subjects presented positive whereas DAT patients presented negative priming effects that were positively correlated with digit span performance (an attentional measure). These findings supported both deficient controlled processing and a degraded semantic memory or, perhaps, a singular processing deficit, reflecting inefficient inhibitory mechanism.
Correspondence: *C. Fennema Notestine, Departments of Psychology and Cognitive Science, University of California, San Diego, La Jolla, CA 92093, USA.*

C. BUSHELL, A. MARTIN, & T. SUNDERLAND. Semantic Priming of Nouns and Verbs in Patients with Alzheimer's Disease.
Object naming deficits are commonly found in patients with temporoparietal lesions, whereas difficulty with verbs is often associated with anterior lesions. Because the neuropathology causing Alzheimer's disease (AD) affects primarily the temporoparietal region, we investigated whether automatic semantic priming effects for nouns were aberrant relative to verbs. We tested concrete and abstract nouns and motion and nonmotion verbs to identify differences in priming for words defined by knowledge about sensorimotor-based attributes versus abstract features. Normal elderly demonstrated priming for concrete nouns and motion verbs, whereas the patients showed priming only for concrete nouns. These results will be discussed in terms of the effects that the pathology of AD might have on concepts defined by many attributes (concrete nouns) versus fewer attributes (motion verbs).
Correspondence: *Camille Bushell, NIMH, Laboratory of Clinical Science, Bldg. 10, Rm. 3D-41, 9000 Rockville Pike, Bethesda, MD 20892, USA.*

C. BUSHELL & A. MARTIN. Semantic Priming in Fluent Aphasics and Patients with Alzheimer's Disease: Evaluation of Attention-Driven Retrieval.
The mechanisms underlying word finding deficits in fluent aphasics and patients with Alzheimer's disease remain controversial, attributed to either degraded semantic representations or defective attention-driven retrieval. A semantic priming paradigm was used to investigate attention-driven retrieval by manipulating the proportion of related words (RP) from low to high. Both patient groups and normal elderly demonstrated facilitatory priming at the high RP, suggesting expectancies were generated for related words. However, in the low condition the patients demonstrated inhibition of related words, differing from the normals' null effect. Application of opposing strategies in low versus high RP conditions suggests that these patients overused the list RP (compared to controls) to facilitate word recognition. We conclude that AD and aphasic patients can effectively invoke expectancy-based, attention-driven retrieval.
Correspondence: *Camille Bushell, NIMH, Laboratory of Clinical Science, Bldg. 10, Rm. 3D-41, 9000 Rockville Pike, Bethesda, MD 20892, USA.*

D.J. LaVOIE, E. ANDERSEN, D. KEMPLER, & M. SEIDENBERG. Maintenance of Semantic Featural Knowledge in Alzheimer's Disease.
This study investigates the claim that the cognitive decline seen in Alzheimer's disease (AD) patients reflects disrupted semantic knowledge. We compared the semantic priming performance of 15 AD patients to that of 20 older normal controls (NC). Employing a cross-modal word naming task, two different types of auditory prime-visual target pairs were presented: (1) high versus low saliency (e.g., "red" versus "raw" for apple), and (2) high versus low intercorrelated features (e.g., "faucet" versus "mat" for bathroom). Both NCs and ADs showed greater priming for "high" as compared to "low" items. Additionally, ADs exhibited larger priming scores than NCs. Together these results indicate that while the semantic system of AD patients is degraded, it is nonetheless sensitive to the relative weightings of featural knowledge.
Correspondence: *Donna LaVoie, Department of Psychology, Saint Louis University, Shannon Hall, Rm. 201, St. Louis, MO 63103, USA.*

P. BEESON, A. HOLLAND, & L. MURRAY. Superordinate Naming in Aphasia and Alzheimer's Disease: It's Hard!
Twenty-eight individuals with aphasia and 28 individuals with Alzheimer's disease who performed similarly on a 16-item confrontation naming task were studied. Each naming trial was followed by requests for the superordinate, other semantic information, and an in-class coordinate. The two groups performed relatively similarly in that provision of the superordinate was the most difficult task. These findings suggest that access to basic level name and attribute information are not dependent on initial specification of superordinate category.
Correspondence: *Pelagie M. Beeson, National Center for Neurogenic Communication Disorders, Department of Speech and Hearing Sciences, University of Arizona, Tucson, AZ 85721, USA.*

T.J. SCHWARTZ, M. KUTAS, D. SALMON, J. PAULSEN, & N. BUTTERS. "Bottom-up" Breakdown of Semantic Networks in Alzheimer's Dementia?: Evidence from ERPs.
Event-related brain potential (ERP) and reaction-time measures were used to test the notion of a "bottom-up" breakdown of the semantic net-

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works in patients with dementia of the Alzheimer's type (DAT). DAT, normal elderly, and young subjects heard a category label prime and decided whether the immediately following visually presented name of an imageable object was a category member. Category primes were either superordinate to, at, or subordinate to the basic level. All groups showed similar priming effects in response to the category manipulation, but DAT subjects showed the smallest ERP priming effects and young controls the largest. This study did not provide evidence for a strictly "bottom-up" breakdown of semantic networks in DAT.
Correspondence: *Tanya J. Schwartz, Psychology Department (V116B), VA Medical Center, 3350 La Jolla Village Dr., San Diego, CA 92161-0002, USA.*

Paper Session 14/1:30–3:20 p.m.

REHABILITATION

K. FRANZEN, M. ROBERTS, D. SCHMIDT, W. VERDUYN, & F. MANSHADI. Cognitive Rehabilitation of Memory Deficits in Children Following Mild Traumatic Brain Injury.
Robinson's (1970) elaborative encoding technique (PQRST) was implemented as the active cognitive intervention strategy to address semantic memory deficits in two children, matched for degree of deficit following mild traumatic brain injury (TBI). A Think-Aloud metacognitive strategy was also implemented for comparison purposes. Single-case methodology was employed using a counter-balanced crossover of the two intervention strategies and controlling for nonspecific effects of attention. Both TBI subjects' performance improved markedly during implementation of the PQRST technique and approached the performance of the normal comparison subject. In contrast, both TBI subjects' performance remained at, or returned to, baseline levels during implementation of the Think-Aloud procedure. Furthermore, during PQRST intervention only, improvement generalized to the children's classroom reading materials. Clinical improvement reflected both remediation and compensatory mechanisms.
Correspondence: *K. Franzen, Department of Pediatrics, University of Iowa, Iowa City, IA 52242, USA.*

R. HANKS & P. LICHTENBERG. Functional Outcome Across Four Decades of the Older Adult Lifespan.
The present cross-sectional study utilized 812 urban geriatric rehabilitation patients who were divided into four groups based on their decade of life (60s, 70s, 80s, and 90+) to assess functional outcome. Results suggest that the younger old (60s and 70s) and the older old (80s and 90+) patients may represent two different rehabilitation groups. Specifically, the older old patients demonstrated poorer cognitive skills, as measured by the Mattis Dementia Rating Scale. The younger group evidenced significantly higher levels of alcohol abuse and comorbid physical disease, as well as more cognitive impairment than community base rate data. The groups were not significantly different on scores from the Geriatric Depression Scale, but there was a significant correlation between depression and co-morbid physical disease.
Correspondence: *Robin Hanks, Departments of Psychology and Physical Medicine and Rehabilitation, Wayne State University, 261 Mack Ave., Detroit, MI 48201, USA.*

A.M. SANDER, W.M. HIGH, JR., H.J. HANNAY, M. SCHERER, & M. STRUCHEN. Relative Efficiency of Coping Style Versus Patient Outcome in Predicting Psychological Health in Caregivers of Patients with Closed Head Injury.
The current study investigated the contribution of individual coping style, as assessed by the Ways of Coping Questionnaire, to psychological health, as assessed by number of symptoms endorsed on the General Health Questionnaire, in 69 caregivers of patients who had sustained closed head injury. The relative effects of time since injury and the level of patient recovery at the time of caregivers' participation were also investigated. Results revealed that the use of emotion-focused coping was related to greater psychiatric symptomatology, regardless of time since injury. Level of patient recovery did not have a significant effect on caregivers' psychological health. The implications for rehabilitation and for existing theory on caregiver adjustment to CHI are discussed.
Correspondence: *A.M. Sander, The Institute for Rehabilitation and Research, 4007 Bellaire Blvd., Ste. EE, Houston, TX 77025-1167, USA.*

S. MACNEIL & C. BOAKE. The Relationship between Functional Outcome and Depression Following Traumatic Brain Injury.
This study evaluated relationship between depression and functional abilities in 83 outpatients seen an average of 3.6 yr postinjury. Depression was measured using the Zung Self-Rating Depression Scale, and functional outcome was assessed through interview with a primary caretaker with the Barthel ADL Index and Craig Handicap Assessment and Report Technique. Depressive symptoms were related to number of years postinjury and severity of injury. These findings suggest that depressive symptoms may arise after discharge from the acute hospital. No relationship was found between depression and physical disability. As more patients are surviving head injuries, the need for consistent accurate follow-up of both physical recovery and emotional adjustment becomes imperative.
Correspondence: *Susan MacNeill, Department of Neuropsychology, The Institute for Rehabilitation and Research, Houston, TX 77030, USA.*

S. GAUGGEL, A. WIETASCH, & C. BAIER. Does Negative Feedback Have a Positive Influence on Reaction Time in Brain-Damaged Patients?
The effect of negative feedback was assessed in a four-choice reaction time task for brain-damaged and orthopaedic patients. Subjects were 73 brain-damaged patients with different etiologies (e.g., closed-head injury, stroke) and 33 orthopaedic control patients. Patients in each group were equally and randomly assigned to two conditions; one in which a negative feedback was provided, and one in which no feedback was provided. Feedback was independent of the actual performance. Statistical analyses indicated that negative feedback had a significant positive influence on RT of brain-damaged patients. Additionally, even brain-damaged patients with high depression scores were susceptible to negative feedback. Surprisingly, although a failure experience was given to these patients no "catastrophic reaction" with consequent severe disruption of performance could be observed.
Correspondence: *Siegfried Gauggel, Department of Psychology, Philipps University of Marburg, Gutenbergstr. 18, D-35032 Marburg, Germany.*

M. STONE & S. RASKIN. Prospective Memory Training in TBI and ABD.
Three single-subject studies (using a B-A design, A only, and no treatment) were conducted using prospective memory training to cognitively remediate severe memory impairment resulting from anoxic brain damage (ABD) and traumatic brain injury (TBI). The two experimental subjects received neuropsychological testing before and after training. After systematic treatment, the span of prospective memory increased for both treated subjects. Additionally, performance improved, as compared to baseline testing, on the Prospective Memory Screening test (PROMS). No improvement was observed after condition B. The subject who received no training demonstrated no improvement on the PROMS. These findings also generalized as both treatment subjects demonstrated improved performance on a measure of prospective memory functioning in daily life.
Correspondence: *M. Stone, Department of Psychology, Trinity College, Hartford, CT 06106, USA.*

T.A. NOVACK, W.T. JACKSON, & M.J. ROSNER. Physiological Factors in Cognitive Recovery Following Traumatic Brain Injury.
This study examined the effects of cerebral perfusion pressure (CPP), systemic arterial blood pressure (SABP), and intracranial pressure (ICP)

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during acute care on cognitive recovery after traumatic brain injury. Subjects were 79 patients with severe TBI (Glasgow Coma Scale 3-7) referred for inpatient rehabilitation immediately after acute care. Neuropsychological data were collected on testable patients at an average of 4 months postinjury (range, 3 wk to 14 months). Results support previous findings that ICP is not related to cognitive outcome; however, SABP, independent of subject age, education, and admission GCS, proved to be a significant discriminator between those individuals who were testable and nontestable in the first year postinjury (79% correct classification rate). Additionally, CPP was predictive of performance on part B of the Trail Making Test.

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Paper Session 15/1:30-3:20 p.m.

IMAGING-2

R. DE RAEDT, R. CLUYDTS, H. D'HAENEN, H. EVERAERT, & A. BOSSUYT. Cerebral Blood Flow (rCBF) after Induction of a Depressed Mood in Normal Volunteers.

rCBF (Tc-99m HMPAO) was measured after a mood-induction procedure (MIP) using a modified Velten procedure (tape-recorded self-referred statements) MIPs were administered to 14 healthy female volunteers "within" and "outside" the realm of attention. For the induction outside the realm of attention, a combination of dichotic listening and subliminal stimulation was used. A neutral induction served as control. Mood rating scales showed a negative change after both MIPs. Statistical analyses revealed lateralized changes in rCBF for the thalamus region. In comparison to the neutral condition, MIPs decreased thalamic activity in the right hemisphere. The left hippocampal rCBF increased significantly after the induction outside of the realm of attention only. The results suggest thalamic and hippocampal involvement in a circuit that regulates the experience of emotion.

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M. CHERRIER & G.W. SMALL. Mood State and Cerebral Metabolism in Persons with Age-Associated Memory Impairment.

Functional imaging such as positron emission tomography (PET) is important in a comprehensive diagnostic evaluation for individuals with memory concerns. In this study, we explore the relationship between self-ratings of mood state and cerebral glucose metabolism as measured by PET in middle-aged and older adults with memory complaints. We examined 27 older individuals who were concerned about their own memory functioning and met criteria for age-associated memory impairment (AAMI). Subjects were administered several mood measures along with a visual analogue mood scale before the PET procedure. Mood ratings of fatigue correlated significantly with increased cerebral glucose metabolism in the basal ganglia and mesial temporal lobe. Overall, our results indicated the subjective changes in mood state during a brain scan can affect brain metabolism.

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J. RAGLAND, D. GLAHN, R.C. GUR, D.M. CENSITS, R. SMITH, A. ALAVI, & R.E. GUR. Similarities in Regional Cerebral Blood Flow During Executive and Declarative Memory Tasks: Positron Emission Tomography in Healthy Volunteers.

The relationship between executive function, declarative memory, and prefrontal and temporal-limbic regions was examined by developing a declarative memory task—the Paired Associate Recognition Test (PART)—that utilizes stimuli from an executive task, the Wisconsin Card Sorting Test (WCST). The PART, WCST, and a resting baseline were administered to 30 healthy volunteers (16 men, 14 women) during 10-min PET ^{15}O measures of cerebral blood flow (CBF). Bilateral effects were similar in showing CBF increase in lateral prefrontal, inferior frontal, and occipital temporal regions for both tasks. Laterality results diverged, showing greater right than left hemisphere change in orbital-frontal for WCST, and greater left than right change in the parahippocampal gyrus for PART. Low correlations between PART and WCST performance supported the conclusion that they are measuring anatomically related, but functionally distinct, processes.

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S.K. KLEIN, L.A. THOMPSON, D. WU, D.A. MILLER, & J.S. LEWIN. Differing Activation of Frontal Regions During the Wisconsin Card Sorting Test: Evidence from Functional MRI.

Lesion and PET studies suggest that frontal activation occurs during the Wisconsin Card Sorting Test (WCST), but have not examined differential activation in frontal regions. We studied activation in two frontal regions (dorsolateral [DLPFC] and orbitofrontal [OFC]) in 11 adults using functional MRI, and examined replicability. Two task variants were used: matching (1) only by color, and (2) by color, form, and number (CFN). A region of interest (ROI) in each area was selected *a priori*, and differences in the ratio of activated clusters in the ROI were compared to those outside using MANOVA ($N = 6$) (location, hemisphere, and condition). Replicability was tested ($N = 11$) for two trials in the DLPFC alone. All six subjects showed greater activation of the DLPFC versus OFC (location × condition, $F(3,15)$ 3.75, $p = .04$). No differences occurred in the DLPFC alone, although there was a trend for differences in task versus rest conditions. These findings suggest that activation in the DLPFC may be more critical than OFC activation. Reliable activation can be detected with fMRI.

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S.J. WOODLEY, S.M. RAO, A.C. ROSEN, T.A. HAMMEKE, & J.A. BOBHOLZ. Functional Neuroanatomy of Human Verbal and Visuospatial Working Memory.

Whole-brain functional magnetic resonance imaging was used to determine areas of brain activation in response to matrix recognition tasks of verbal and visuospatial working memory. For both tasks, the identical stimuli and response methods were used, with the only difference being the instructions provided to subjects ($N = 13$) prior to the scanning series. The verbal task resulted in greater activation of the left prefrontal (Broca's area; Brodmann area [BA] 44), supplementary motor area (BA 6), anterior cingulate (BA 24/32), and anterior calcarine (BA 17) regions. In contrast, the spatial task resulted in activation of the bilateral superior parietal (BA 7), right occipital (BA 19), and bilateral premotor (BA 6) regions. These results suggest distinct slave systems associated with verbal and visuospatial working memory.

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A. PALMER, T. NICHOLS, M.B. WISEMAN, M.A. MINTUN, S.T. DEKOSKY, & J.T. BECKER. Functional Connectivity in Auditory Verbal Short-Term Memory in Alzheimer's Disease.

Using PET, Alzheimer's disease (AD) patients show normal patterns of rCBF during performance of verbal memory tasks, despite poor performance on these tasks. To understand the relationships among active brain regions, the functional connectivity was considered. Patients and controls were scanned in four conditions: rest, one word recall, three

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word recall, and eight word recall. Data were analyzed using SPM94. The PCAs revealed a significant first component accounting for 75.8% of the variance in the control data and 66.8% of the variance in the patient data, both corresponding to task complexity. The two sets of eigenimages suggest that AD patients use more "normal" information processing than previously thought. Task difficulty may account for a major component of the apparent differences between patients and controls.
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A.C. ROSEN, S.M. RAO, D.L. HARRINGTON, K.Y. HAALAND, J.A. BOBHOLZ, T.A. HAMMEKE, S.J. WOODLEY, & J.R. BINDER. Functional MRI Correlates of Cognitive-Motor Learning.
Our knowledge of the neural systems involved in cognitive-motor learning is incomplete. Whole-brain functional magnetic resonance imaging was used to determine changes in brain activation patterns in response to the Nissen-Bullemer (1987) four-choice serial reaction time (RT) task. Twenty healthy subjects received 10 blocks of either repeated ($N = 10$) or pseudorandom ($N = 10$) stimulus presentations. Examination of t-test maps indicated that during the period of greatest learning (blocks 1–5), as defined by reductions in RT, the left dentate nucleus, left lateral cerebellum, right posterior insular cortex, and the anterior cingulate were active. As the task became overlearned, activation was primarily confined to the left prefrontal (BA 9) and left parieto-occipital (BA 19/37) regions. These results suggest distinct cortico-cerebellar networks involved in the process of cognitive-motor learning.
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Poster Session 5/1:30–3:20 p.m.

AGING—2

D. BOHAC, G. SMITH, & T. RUMMANS. The Efficacy of the GDS-SF in Detecting Depression Among Cognitively Impaired Elderly.
We investigated the validity of the Geriatric Depression Scale-Short Form (GDS-SF) among 30 cognitively normal nondepressed (CON), 30 cognitively impaired nondepressed (CIND), and 30 cognitively impaired depressed (CID) patients. The CID and CIND patients were matched on age, gender, and Mini-Mental State Exam scores. CON and CID patients were matched on age and gender. The GDS-SF effectively discriminated between CID and both other groups ($F(2,87) = 31.56$, $p < .0001$). Subsequent matched pairs t-tests were significant for all contrasts. Although cognitive impairment led to slight increases in GDS-SF scores, mean scores for both nondepressed groups were below recommended cutoffs. The results support the use of the GDS-SF as a screening device among patients with mild-to-moderate global cognitive impairment.
Correspondence: *Daryl L. Bohac, Department of Psychiatry and Psychology, Mayo Clinic, 200 First St., SW, Rochester, MN 55905, USA.*

W.B. THOMAS, M. DIJKERS, P. LICHTENBERG, & M. NANNA. The Relationship Between Depression and Cognition in Geriatric Populations: A Meta-Analysis.
The relationship between cognition and depression in older adults was investigated by means of a meta-analysis of 30 published reports on the topic since 1980. Results revealed that measures of language and memory held the strongest relationship to depression, and that attention and general measures of cognition were less related to cognitive scores. Correlations between language, memory, and cognition were modest, however. It was concluded that these findings support the view of a modest relationship between cognition and depression that is not simply a result of poor motivation or attention. Methods to improve data collection are also highlighted since a lack of studies using the older old, and a lack of demographic information limit the generalizability of these findings.
Correspondence: *Bryan Thomas, Department of Psychology, Rehabilitation Institute of Michigan, Detroit, MI 48201, USA.*

B. PALMER, K. BOONE, I. LESSER, M. WOHL, N. BERMAN, & B. MILLER. Neuropsychological Deficits Among Depressed Older Adults Vary by Symptom Subtype.
The present study explored the relationship between depression symptom subtypes and neurocognitive functioning among older depressed patients. Two groups were identified using Hamilton Scale factor scores: (1) patients with a predominance of cognitive/affective symptoms, and (2) patients with predominantly vegetative symptoms. Fourteen cognitive depression patients, 22 vegetative depression patients, and 40 age-matched control subjects completed a comprehensive neuropsychological evaluation. The vegetative group had significantly worse performance than controls on several measures associated with right hemisphere functioning, and on a measure of executive functioning. In contrast, the cognitive group did not significantly differ from the normal control group on any measure, and had significantly better performance than the vegetative group on several tasks. Findings suggest that neuropsychological deficits in depression may be most closely associated with vegetative symptoms.
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S.S. OSATO, S.S. WILKINS, K.D. TINGUS, J.T. PICKETT, M. METTLER, & R.S. KERN. Identifying Critical Neuropsychological Functions Associated with Successful Treatment Outcomes in Depressed Elderly Inpatients.
Neuropsychological assessment can assist in determining the best candidates for successful treatment intervention. The present study evaluated neuropsychological predictors of skills acquisition (in a social skills training program with a focus on medication adherence) in a sample of older depressed adults. Pearson correlation coefficients were calculated between the neuropsychological measures and scores on a 34-item test of medication skills competence that was administered both pre- and posttreatment. Significant correlations were noted between measures of verbal learning and memory and pre- and posttest scores. Other significant findings were observed between intellectual functioning and pretest scores, and between attention and concentration and posttest scores. The implications of these findings for the selection of candidates for social skills training programs are discussed.
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E. FISHMAN, C. GRECO, R. FARR, & J. McGONIGLE. Conceptual Ability in Adults with Mental Retardation.
Meaningful assessment of cognitive functioning in adults with mental retardation is challenging, and standardized cognitive tests designed for normal adults are often inadequate for this purpose. The Cognitive Diagnostic Battery (from PAR) is a developmental battery of tests useful for MR adults. Seventy-one mentally retarded adults were administered a battery of tests covering demographic, psychiatric, cognitive, neurodiagnostic, adaptive functioning, and genetic characteristics at admission and discharge from an inpatient psychiatric hospitalization. Regression statistics showed general intelligence and psychomotor speed to be important for simple conceptual skills, while visual attention, visuospatial construction skills, and sustained attention are important for more complex conceptual ability.
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G.E. ALEXANDER, J. SZCZEPANIK, & M.B. SCHAPIRO. Effects of Age on Neuropsychological Function in Nondemented Adults with Down's Syndrome.

By age 40, adults with Down's syndrome (DS) show the neuropathological features of Alzheimer's disease (AD), yet the prevalence of dementia in this cohort ranges between 20 and 30%. We evaluated neuropsychological performance in 40 nondemented, DS adults over a wide age range (22–61 yr). Old DS subjects (ages 41–61) showed poorer performance in memory, orientation, and visuospatial skills than young DS subjects (ages 22–38), but the groups did not differ in other measures. In multiple-regression analysis, declines in long-term memory and orientation were the best predictors of increasing age followed by language ability, which was positively correlated. Our findings indicate a specific pattern of age-related differences in cognitive function among nondemented DS adults, supporting the study of DS as a clinical model of the cognitive effects of AD prior to the onset of dementia.

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R. NIJJAR & C. MURPHY. Olfactory Decline as a Function of Aging and Progression of Dementia in Down's Syndrome.

Neuropathological changes of Alzheimer's disease consistently develop in individuals with Down's syndrome who have reached their third and fourth decade of life. Olfactory impairment has been reported in both Alzheimer's patients and in older Down's syndrome individuals. In Alzheimer's disease, the severity of the dementia, as well as the decline in olfactory ability, serve to mark the progression of the disease (Murphy et al., 1990). Baseline functional assessment on 23 Down's syndrome subjects (mean age = 30.1 yr old) included tests of olfactory threshold, odor identification, and odor memory. Level of cognitive functioning was assessed using the Dementia Rating Scale. Persons with Down's syndrome performed poorer than controls on all olfactory tasks. On a 4-year follow-up, the original Down's syndrome subjects were retested on DRS and all olfactory measures. The results reveal significant decline of both DRS and olfactory function from baseline, suggesting a decline similar to that found in patients with AD.

Correspondence: *Rani Nijjar, Department of Psychology, San Diego State University and University of California, San Diego, School of Medicine, 6363 Alvarado Ct., San Diego, CA 92120-4913, USA.*

J. ROTHLIND. Cognitive Impairment Associated with Syphilis Seropositivity in Geriatric Patients.

Neuropsychological techniques hold the potential of assisting in the clinical investigation and treatment of neurosyphilis in geriatric patients. However, to date there have been no reported studies involving group comparisons of affected individuals and appropriate controls on standardized cognitive measures. In this retrospective study, 10 (22%) of 45 geriatric patients referred for neuropsychological evaluation in two urban medical clinics in Baltimore, MD, were documented to be seropositive for syphilis using FTA-ABS and RPR testing. Data from one additional seropositive patient were included. The remaining patients were seronegative. All patients were screened with the Mattis Dementia Rating Scale, language assessment, as well as individually chosen tests. When contrasted with 18 controls matched for overall severity of cognitive impairment, the patients with evidence of active late syphilis demonstrated greater memory impairment and disorientation, and the majority also displayed an unusually early age of onset and/or lengthy course of illness. Case descriptions are provided, and the implications for differential diagnosis are discussed.

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F.R. FERRARO & J. MOODY. Consistent and Inconsistent Responding in Young and Elderly Adults.

Nineteen young adults and 20 nondemented elderly adults participated in both simple-reaction time (SRT) and choice-reaction time (CRT; lexical decision task) tasks to examine consistent and inconsistent cognitive performance in tasks that vary in processing demands. A median split, based on SRT standard deviations (*SD*s), classified young and elderly subjects into two groups: (1) high-consistency responders (Hi-C, small SRT *SD*s) and (2) low-consistency responders (Lo-C, large SRT *SD*s). SRT and LDT performance was then examined as a function of performance consistency/inconsistency. Hi-C elderly adults performed as well as young adults, and this was independent of processing demands associated with the tasks. Response latency slowing ratios (elderly/young) were much lower than the typically observed 1.5 slowing ratio often reported in the aging literature. This suggests that the strong version of general slowing (all cognitive operations slow to the same extent across age) requires further examination. These results also highlight the importance of individual differences in cognitive aging research.

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R. PONDS & J. JOLLES. Age-Related Changes in Subjective Cognitive Functioning.

Three studies are presented on age-related changes in self-evaluation of cognitive functioning (in particular memory). Data were obtained from a large survey (2,043 subjects; age range 24–86 yr). In study 1, self-evaluation of memory was measured with the Metamemory in Adulthood (MIA) questionnaire. In study 2, self-evaluations within several cognitive domains were examined (e.g., memory, attention, planning); subjects rated their present level of cognitive functioning to three reference points (in comparison to peers, to their own level 5–10 yr ago, and at the age of 25 yr). In study 3, we examined the prevalence of forgetfulness and its impact in terms of perceived degree of hindrance and worry. Subjects also indicated what they thought were the main causes of their forgetfulness.

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D. CARMELLI, G. SWAN, & A. LaRUE. Predictors of Change in Cognitive Function in Late Adulthood.

Subjects in the present study are a subgroup of surviving men from the Western Collaborative Group Study, a longitudinal study of cardiovascular disease that started in 1960–61. The sample for this analysis consisted of 592 men who were examined in 1986–88, and then reassessed for cognitive functioning in a follow-up examination conducted in 1992–94. Age of subjects in 1986–88 ranged from 64 to 86 yr. Three tests of cognitive function were administered twice over the 5-yr interval between examinations including the Digit Symbol Substitution Test, Benton Visual Retention Test (BVRT; total errors), and Verbal Fluency. Significant change in performance on any single test was defined as a drop or increase of one quartile rank. Aggregate decline or increase was calculated by summing quartile change scores across the three tests. Significant aggregate decline or improvement was defined as a change in two or more quartiles across all three tests. Mean change in quartile rank was significant for all three tests. On the aggregate measure of change we found that 20.1% ($N = 114$) of subjects declined while another 16.8% ($N = 95$) improved in aggregate cognitive performance. Risk factors for aggregate decline in cognitive performance were lower education, stroke in 1988, and heavier alcohol consumption. Findings from the present study challenge the view of aging as an inevitable trajectory of decline in cognitive functioning over time.

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G. SWAN, A. LaRUE, & D. CARMELLI. CHD Risk Factors and Neuropsychological Performance in the Elderly.

The synergistic effect of cardiovascular risk factors on cognition in the elderly is understudied. The Western Collaborative Group Study

(WCGS) is a prospective cardiovascular epidemiologic study that began in 1960–61 with 3,152 healthy males (39–59 yr of age). At the 1986–88 follow-up, a total of 1,128 subjects (mean age = 70.6 yr) participated in the examination. Cross-sectional analysis showed that individuals who were hypertensive and diabetic had a significantly lower mean performance score on the Digit Symbol Substitution Test (mean = 38.7) than those with only hypertension (mean = 41.1, $p < .05$) or that of subjects with neither of the two conditions (mean = 42.2, $p < .01$). Another follow-up examination of surviving subjects ($N = 708$; mean age = 76.1 yr) was conducted during 1992–94. Cross-sectional analyses of these data indicate that obese-hypertensives had significantly lower performance on tests of psychomotor speed and verbal learning and memory than did those who had neither of these two conditions. Prospective analyses ($N = 629$) suggest a significant interaction between high resting SBP and central obesity (1960–61) in relation to lower performance on speeded tests and tests of verbal memory (1992–94). These associations were obtained after adjustment for cerebrovascular disease, age, education, depression, and alcohol consumption.

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C.A. EBERLE, G.G. KAY, R. BILLINGSLEY, & A.A. HARTLEY. Effects of Aging on Computerized and Conventional Cognitive Test Performance in Healthy Aviators.

One-hundred twenty U.S. commercial aviators ranging in age from 24 to 65 yr were administered a battery of computerized and conventional cognitive tests. Scores derived from the tests were subjected to regression analyses to determine the percentage of variance in test performance accounted for by age. A curve-fitting technique was employed to ensure that the best model for each measure was implemented in the regression equation. Scores were divided into groups according to their cognitive domains. Aging effects were most pronounced for tests of working memory. For certain measures, nonlinear models (e.g., quadratic and Gompertz curves) strengthened the relationship between performance and age. This may indicate the presence of critical periods during which cognitive ability is especially susceptible to decline.

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C. MURPHY, S. NORDIN, & L. ACOSTA. Age-Related Impairment in Odor Recall and Recognition Memory.

Significant neuropathology is seen in anterior olfactory nucleus and entorhinal cortex in normal aging. Aging significantly impairs sensitivity to and identification of odors. In this study we sought to determine whether odors that are detectable and identifiable by the elderly can be rerecalled by the elderly. Twenty young and 20 nondemented elderly performed both verbal (CVLT) (Delis et al., 1983) and odor-learning tests. Odorants were chosen on the basis of identifiability, familiarity, intensity, and membership in well-defined categories. The procedure was the same for odors and words. The 16 items of set A were presented at fixed intervals with the instruction to recall as many items as possible after presentation of the last item in the trial. This procedure was repeated over five trials. Set B was presented, followed by short-delay free recall of set A, then short-delay cued recall. After a 20-min delay, free and cued long-delay recall, then recognition of set A, and, finally, odor identification were assessed. Significant effects of age for both odors and words were seen for all immediate recall trials, short- and long-delay free and cued recall, recognition, learning across trials, and semantic clustering. Age did not affect serial clustering. Thus, the ability to encode, store, and recall memory for odors was significantly affected by normal aging.

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N. NABORS, S. VANGEL, JR., P. LICHTENBERG, & P. WALSH. Normative and Clinical Utility of the HVOT.

Normative data for the Hooper Visual Organization Test (HVOT) and its relationship to demographic factors was investigated in an urban geriatric medical patient sample. Scores for 41 cognitively intact medical patients were lower than other published geriatric norms. The HVOT scores were related to education, but were not related to age, race, or gender. These results suggest the need for lower cutoff scores. The clinical utility of the HVOT was investigated by comparing the scores for 41 cognitively intact medical patients to the scores for 51 cognitively impaired medical patients. The cognitively intact group scored higher than the cognitively impaired group, suggesting that the HVOT could be utilized in the detection of cognitive impairment in the elderly.

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K.Y. HAALAND & D.L. HARRINGTON. Do the Elderly Use Sensory Information as Effectively as the Young to Control Movement?

Skilled actions depend more upon fast than upon slow movements. This may reflect their greater reliance on motor programs and decreased reliance on feedback. Previous data have shown that the elderly have difficulty developing motor programs and rely more upon sensory feedback when the presence or absence of visual feedback is predictable and more likely to engage different planning strategies. The current study further examined the effect of visual feedback removal on the initial and secondary components of an aiming movement when feedback (arm/target, no arm, no target, no feedback) was removed unpredictably. In contrast to predictable removal, unpredictable removal did not suggest the elderly were more dependent on sensory feedback. However, the young adults utilized sensory feedback in the earliest part of the initial movement, whereas the elderly used sensory feedback later in the secondary movement component reflecting their decreased efficiency of processing sensory input. Comparison of these two paradigms suggests that motor program difference are seen most clearly when feedback removal is predictable and efficiency of utilizing sensory input is reflected by unpredictable removal.

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L. ROSENSTEIN. The Impact of Depression on Visuoconstructional Ability in the Differential Diagnosis of Dementia Versus Depression.

Neuropsychologists are often called upon to assist in making differential diagnoses between dementia and depression. With the exception of memory, however, few neurocognitive functions have been studied in terms of the impact of depression. In a retrospective study of 198 patients, the relationship between depression (Beck or GDS) and visuoconstructional ability (Rey-Osterrieth [RO] Copy) was evaluated. There was no systematic relationship found, even when controlling for the significant effects of age and education. A prospective study of psychiatric inpatients with major depression tested on admission and discharge matched with normal controls yielded similar results. Thus, poor performance on the RO Copy should not be interpreted as a consequence of depression. Age and education, however, should be considered when interpreting RO Copy performance.

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G. SWAN, A. LARUE, & D. CARMELLI. Visual Memory Performance and 5-Year Mortality in the Elderly.

We examined the relationship between lower visual memory performance and excess risk for all-cause mortality over a subsequent 5-yr follow-up in 1,128 subjects from the Western Collaborative Group Study (WCGS; mean age = 70.6 years). In 1986–88, subjects received a medical examination, the Benton Visual Retention Test (BVRT), and indi-

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ces of psychosocial functioning. The Cox proportional hazard regression model was used to examine the relationship of BVRT total correct scores to all-cause mortality during 5 yr of subsequent follow-up. The unadjusted relative risk (RR) was .84 (95% CI .74–.94) for subjects who scored 1 point higher than average on the BVRT total correct score. The mean difference between survivors and deceased was 6.7 versus 6.2, respectively ($t(123) = -2.31$, $p < .03$). The association between visual memory performance and mortality persisted after adjustment for age, education, and health risk factors (RR = .86, 95% CI .75–.99). This finding supports the role of neuropsychological performance as an independent contributor to mortality in elderly, community-dwelling adults.
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H. KATZEN, S. BROWN, T. BALDEWICZ, N. NIEBLER, J. CORDLE, M. LLABRE, & B. LEVIN. Age of Onset as an Important Determinant in the Development of Dementia in Parkinson's Disease.
The present study investigated the role of age of disease onset in the expression of cognitive impairment in Parkinson's disease (PD). A battery of 12 measures were administered to 174 patients with idiopathic PD to assess memory, language, visuospatial, judgment and reasoning, executive functioning, and attention and mental tracking. Simple regressions showed that age of PD onset predicted performance on most measures administered. The older the patient at disease onset, the greater the degree of impairment in cognitive functioning. It appears that aging is a dynamic process that exerts an increasing effect over time. These data suggest a synergy between normative aging and the PD process.
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EPILEPSY

H. KIM & S. LEE. Patterns of Memory Dominance in Temporal Lobe Epileptic Patients: An Intracarotid Amobarbital Study.
A Wada memory test was conducted on 33 temporal lobe epileptic (TLE) patients, 18 LTLE, and 15 RTLE patients. LTLE versus RTLE patients were different in mean patterns of memory dominance. There also were wide individual variations in patterns of memory dominance within each group of patients. To closely examine this within-group variability, patients were classified into four types of memory dominance: left-dominant, right-dominant, bilateral-high, and bilateral-low. The left-dominant type was more common in RTLE patients, whereas the right-dominant type and the bilateral-high type were more common in LTLE patients. This within-group variability in patterns of memory dominance was partly attributable to variations in seizure onset time or duration.
Correspondence: *Hongkeun Kim, Department of Psychotherapy, College of Rehabilitation Science, Taegu University, Nam-Taegu, Taegu, P.O. Box 21, South Korea.*

C. KUBU, M. PAVOL, R. McLACHLAN, J. GIRVIN, & M. HARNADEK. Postoperative Memory Outcome in Temporal Lobectomy Patients Who Fail the Intracarotid Amobarbital Procedure (IAP) Bilaterally.
The IAP is widely used to help predict who might be at risk for postoperative amnesia following unilateral temporal lobectomy for intractable seizures. We describe the memory outcome in seven patients who failed the memory portion of the IAP following the right and left injections and went on to have a standard temporal lobectomy. At follow-up, none of the patients presented with a neuropsychological pattern indicative of a global amnesia and 71% (5/7) demonstrated a >90% improvement in their seizure disorder. These findings indicate that bilateral memory failure on the IAP does not necessarily preclude a successful surgical outcome. These findings raise questions regarding the validity of the IAP and the functional neuroanatomy of memory in patients with a long history of temporal lobe epilepsy.
Correspondence: *C. Kubu, Department of Psychological Services, University Hospital, 339 Windermere, London, Ontario N6A 5A5, Canada.*

G.K. DEUTSCH & G. GLOSSER. Anosognosia for Hemiplegia and Speech Disorders During the Intracarotid Amobarbital Test (IAT).
Anosognosia for hemiplegia (AHP) and anosognosia for speech disorders (ASP) were assessed in temporal lobe epilepsy patients during the IAT to investigate the processes that contribute to awareness of deficits. Significantly more patients exhibited AHP compared to ASP despite the fact that all became hemiplegic and dysarthric following injections to both hemispheres. This pattern of awareness was found regardless of epileptic focus, memory accuracy, or site of injection. There was no support for the view that awareness is generally less accurate following right hemisphere inactivation. Findings are more consistent with a "modular" theory of anosognosia, suggesting that awareness is selective for different types of deficits.
Correspondence: *Gayle Deutsch, Department of Neurology, Graduate Hospital, 1 Graduate Plaza, Philadelphia, PA 19146, USA.*

C. SANTSCHI-HAYWOOD, K. PERRINE, J.C. BOROD, P.K. NELSON, & O. DEVINSKY. Lateralization for Prosodic Emotional Perception: Temporal Lobe Epilepsy and the Intracarotid Amobarbital Procedure.
This paper describes the performance of preoperative epilepsy patients with unilateral temporal lobe seizures, on a task of emotional prosodic perception, during the intracarotid amobarbital procedure (IAP). Testing was conducted during both right and left hemisphere injections. Laterality of seizure focus was assessed via scalp/sphenoidal video EEG. There were no significant subject group differences for demographic or IAP procedural variables. Percent accuracy scores were analyzed with respect to laterality of epileptogenic focus for the experimental task. Overall, subject performance was significantly worse during right than left hemisphere injections, regardless of laterality of seizure focus. Results lend corroboration to, and extend previous findings in, the literature suggesting right hemisphere mediation of prosodic emotional perception.
Correspondence: *Cornelia Santschi-Haywood, Psychology Department, Queens College, 65-30 Kissena Blvd., Flushing, NY 11367, USA.*

J. WADE, L. DOUGHERTY, R. HART, B. SMITH, K. HOLLOWAY, & S. HARRIS. Relationship of Age of Onset, Presence of Hippocampal Sclerosis, and Adequacy of Preoperative Performance to Memory Change after Anterior Temporal Lobectomy.
The primary neuropsychological morbidity associated with anterior temporal lobectomy for intractable seizures has been a decline in memory. We examined the relationship between the neuropathologic status of the resected hippocampus, adequacy of preoperative memory, and age at seizure onset to postoperative memory decline. Patients who underwent left ($n = 16$) anterior temporal lobectomy (ATL) were administered tests of verbal and nonverbal episodic memory, both preoperatively and 1 yr postoperatively. Stepwise regression analyses indicated that absence of hippocampal sclerosis, better preoperative memory performance, and a later age at seizure onset were associated with a decline in episodic memory following ATL. Applying this information clinically may provide a basis for counseling patients and limit the likelihood of postoperative cognitive decline.
Correspondence: *James B. Wade, Department of Psychiatry, Medical College of Virginia, P.O. Box 980268, Richmond, VA 23298-0268, USA.*

P. FEDIO, C. LANEY, K. McCANN, L. RYAN, M. SCHULTHEIS, G. EVERLY, & A. AUGUST. Personality Traits of Epilepsy Patients with Lateral or Mesial Temporal Lobe Lesions.
The personality profiles of 31 patients with left or right, mesial or lateral lesions were studied preoperatively with the Millon Clinical Multiaxial Inventory (MCMI). The pattern of traits was not pathognomic,

but patients with left and right mesial lesions differed and appeared to be more maladaptive than those with lateral lesions. Patients with left mesial lesions had a schizoid, avoidant, anxious, and dysthymic profile. Intensity of these traits was influenced by the severity of their language impairment and early onset of seizures. Right mesial patients were more likely immature and histrionic, and were intent on preserving a positive image. Long-standing injury to mesial temporal structures, notably the amygdala, alters how the brain codifies and perceives emotional experiences and shapes personal and social self-concept.
Correspondence: *Paul Fedio, Bldg. 10, Rm. 5D-49, National Institutes of Health, NINDS, Bethesda, MD 20892, USA.*

J.I. BREIER, P.M. PLENGER, B.L. BROOKSHIRE, J.W. WHELESS, A.B. THOMAS, V.L. CURTIS, A. PAPANICOLAOU, & L.J. WILLMORE. Effects of Temporal Lobe Epilepsy on Spatial and Figural Memory for a Complex Geometric Figure.
The preoperative performance on the Rey-Osterrieth Complex Figure of 54 patients with intractable temporal lobe epilepsy was analyzed using three different indices. One index (Rey total) was derived using a common scoring method that included both spatial and figural aspects of memory. The other two indices were derived emphasizing either spatial or figural aspects of memory. Patients with right temporal lobe epilepsy (RTLE) performed worse than those with left temporal lobe epilepsy (LTLE) on all three indices. However, the RTLE group performed significantly worse on the spatial as compared to the other two memory indices, while the LTLE group performed comparably on all three. When the efficacy of the three indices in predicting group membership was compared, the spatial memory index was superior to the other two. Results are discussed in terms of clinical efficacy of nonverbal memory tests in distinguishing RTLE from LTLE and implications for models of the anatomical substrate of nonverbal memory.
Correspondence: *Joshua Breier, Texas Comprehensive Epilepsy Program, University of Texas Health Science Center, 6431 Fannin, Suite 7.148, Houston, TX 77030, USA.*

M. HAMBERGER & T. TAMNY. Visual and Auditory Naming in Temporal Lobe Epilepsy.
Word finding ability is routinely assessed with visual object naming tasks. However, many temporal lobe epilepsy (TLE) patients with seizures arising from the left (i.e., language dominant) hemisphere complain of word finding difficulties and exhibit deficits in conversation but show no deficits on these tasks. It was reasoned that an auditory naming task would better simulate the conditions under which word finding difficulties typically occur. Performance on auditory and visual naming tasks were compared in left TLE (LTLE) and right TLE (RTLE) patients and normal controls. LTLE patients obtained significantly lower scores on auditory naming, whereas their performance on visual naming was indistinguishable from RTLE patients and normals. Additionally, performance on auditory naming successfully predicted laterality of seizure focus in 81% of patients.
Correspondence: *Marla J. Hamberger, 710 West 168th St., New York, NY 10032, USA.*

W.B. BARR, A. TRÖSTER, V. WARMFLASH, G. NEY, & N. SCHAUL. Interactions Between Verbal and Figural Fluency in Patients with Temporal Lobe Epilepsy.
Tests of verbal and figural fluency are commonly used measures of initiation and productivity associated with "frontal lobe" functioning. We examined performance on the Controlled Word Association Test (letters CFL) and the Ruff Figural Fluency Test in 64 patients with intractable temporal lobe seizures (35 left temporal [LTL], 29 right temporal [RTL]). Results of a MANOVA showed no differences between LTL and RTL groups in the mean number of words or figures generated in 1 min. There was, however, a significant interaction effect with LTL patients generating relatively fewer words and RTL patients generating relatively fewer designs ($F = 4.63$, $p < .04$). The findings indicate that measures of verbal and figural fluency provide sensitive indices of "material-specific" cognitive functioning in patients with temporal lobe seizures.
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C.P. BUCHANAN, K.J. SASS, K.A. TUCKER, & M. WESTERVELD. Investigation of the Visuo-Motor Selective Reminding Test for Lateralizing Temporal Lobe Seizure Foci.
The utility of the visuo-motor Selective Reminding Test (vmSRT) for lateralizing temporal lobe seizure foci was investigated. One hundred twenty-eight patients (60 left foci, 68 right foci) completed the vmSRT, in addition to the verbal Selective Reminding Test (vSRT). The group mean vmSRT scores did not differ, but patients with left foci were significantly less effective on the vSRT ($t = -3.57$, $p < .01$). Their scores were most often in the lowest quartile and least often in the upper quartile ($\chi^2 = 13.0$, $p < .01$). Group distributions of quartile scores were equivalent for the vmSRT. We conclude that the vmSRT is not sensitive to the side of seizure foci, at least when most of the sample acquired their disease in childhood.
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B.J. WINEGARDEN, P.K. SHEAR, E.M. ZIPF, E.V. SULLIVAN, M.J. MORRELL, & F. ORLICH. Neuropsychological Correlates of Epilepsy Arising from Cingulate and Supplementary Motor Cortex.
A subgroup of patients with localization-related epilepsy has seizures emanating from the cingulate gyrus (CC) and supplementary motor cortex (SMC). Although many studies have examined neuropsychological concomitants of CC resection in psychiatric patients, little is known about the cognitive effects of CC and SMC seizure foci. This study found that, although a group of presurgical CC-SMC epilepsy patients did not differ significantly from a comparison group of presurgical temporal lobe epilepsy patients, they were significantly impaired relative to healthy controls on tests of attention, executive functioning, and memory. Thus, many of the deficits that have previously been described in psychiatric patients with cingulate lesions are also evident in this sample of presurgical epilepsy patients.
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A.M. SANDER, W.B. BARR, V. WARMFLASH, G. NEY, & N. SCHAUL. Interaction of Sex and Side of Seizure Focus on Discrepancies Between Verbal Versus Visual Intellectual and Memory Performance in Epilepsy Patients.
This study investigated the interaction of sex with side of seizure focus on the difference scores between the WAIS-R Verbal and Performance IQ and between the WMS-R Verbal and Visual Memory indices. The WAIS-R and WMS-R were administered to 94 surgery candidates with unilateral temporal lobe seizures (52 left [LTL], 42 right [RTL]). There was a significant interaction between sex and side of seizure focus for the WAIS-R difference score. Males with RTL had a larger difference in favor of Verbal IQ. There was no interaction noted for the WMS-R difference score. The results suggest that sex has an effect on the cerebral organization of global cognitive skills, but not on more material-specific skills thought to be more focally represented.
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M. KORKMAN, M.-L. GRANSTRÖM, & S. LEHTO. Neuropsychological Performance in Children with Lateralized Epileptic Foci.
The study aimed at exploring lateralization effects in children and adolescents with epilepsy of focal origin. Subjects were 38 children and adolescents (5–21 yr old); 22 had left-sided foci (LSF), 16 had right-sided foci (RSF). Assessments included intelligence tests, a 37-subtest neuro-

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psychological assessment (NEPSY), and three tests of lateral advantage. There was no tendency toward a lateralization effect on the IQ measures, nor on tests of attention, language, sensorimotor or visuospatial functions, or memory. Significant group differences emerged on two of three lateral advantage tests (a dichotic test and a hole-pricking test), whereas visual half-field advantage did not differ. In children with abnormal results on two of the three tests, predictions concerning side of focus were correct in 100% of the cases. However, only nine children (23.7%) had such abnormal findings.
Correspondence: *Marit Korkman, Helsinki University, Department of Child Neurology, Children's Castle Hospital, Lastenlinnantie 2, FIN-00250 Helsinki, Finland.*

C. McCLEARY & J.G. BUCKWALTER. Predicting Seizure Laterality Using Clinical Measures of Verbal and Visual Memory.
The purpose of this study was to determine which memory tests discriminate between patients with right and left temporal lobe seizure foci. Two verbal measures (Logical Memory [LMI and LMII-WMS-R] and California Verbal Learning Test [CVLT]) and two nonverbal measures (Visual Reproduction [VRI and VRII-WMS-R] and Continuous Visual Memory Test [CVMT]) were administered. In stepwise discriminant analyses, VRI and VRII emerged as the best predictors of group membership. The nature of the visuospatial demands of VR (as opposed to memory skills) may be the factor that allows for group prediction.
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P. CIRINO, D. CAUDLE, A. ALEXANDER, & L. CHAPIESKI. Behavior Problems in Children with Idiopathic Epilepsy.
This study investigated the behavioral functioning of children with idiopathic seizures as compared to siblings. Mothers reported more problems with lack of control and hyperactivity in the children with epilepsy. Teachers reported more problems with social competence. These reported differences were stable over the course of a year. In a larger group of children with primary epilepsy, the relationship of seizure type, IQ, and social variables to these behavioral problems was examined. There was not a significant effect of seizure type or IQ on any of these behaviors. Poor self-control, hyperactivity, and poor social competence were better explained by social variables.
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G. GLOSSER, L.C. COLE, J.A. FRENCH, A.J. SAYKIN, & M.R. SPERLING. Developmental Predictors of Cognitive Performance in Adults with Intractable Epilepsy.
Relationships of social (education), medical (history of status epilepticus), and developmental variables (age at which the neurological damage presumed to underlie the epilepsy occurred and age at onset of regular seizures) to cognitive performance (IQ) were assessed in a sample of 253 adult patients with intractable temporal lobe epilepsy. Less education and early age of onset of regular seizures were independently related to lower IQ. The obtained results are most consistent with the hypothesis that ongoing seizures in childhood, rather than the occurrence of a discrete neurological problem in early childhood, or total number of years of regular seizures, pose significant risk to cognitive development in the epilepsy population. Occurrence of seizures at a specific age period early in neural development is most related to later intellectual performance.
Correspondence: *Guila Glosser, Department of Neurology, Graduate Hospital, 1 Graduate Plaza, Philadelphia, PA 19146, USA.*

M.B. PULSIFER, J.M. GORDON, J. BRANDT, E.P.G. VINING, & J. FREEMAN. Developmental and Behavioral Change with the Ketogenic Diet for Epilepsy.
The ketogenic diet is a treatment for childhood epilepsy that aims to reduce seizures without medication by promoting metabolism of fat. Past reports indicate reduced seizures with the diet, but longitudinal research on development is sparse. This study follows 17 children with intractable seizures treated with the ketogenic diet at the Johns Hopkins Pediatric Epilepsy Center. Developmental and behavioral functioning and parental stress were assessed before and after at least 3 months of treatment. Subjects showed significant reductions in seizure frequency and significant improvements in functioning.
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P.A. DERRY, J. SONTROP, M.C.S. HARNADEK, R.S. McLACHLAN, & W.T. BLUME. Influence of Reporting Seizure Symptoms on the Interpretation of Psychopathology on the MMPI-2 in Patients with Epilepsy.
This study investigated whether the interpretation of psychopathology on the MMPI-2 is influenced by reporting seizure symptoms in patients with epilepsy, thereby spuriously inflating certain scales. When patients were surgically rendered seizure-free, declines in selected scale scores were expected. In a repeated-measures design, MMPI-2 scale scores and the percentage of seizure items were analyzed prior to surgery and again 2 yr later when patients were either seizure-free or not seizure-free. Only in the seizure-free group on the Hypochondriasis scale was there a decrease in the percentage of seizure items. However, this was not a clinically relevant change. Seizure content did not elevate any other scale. The MMPI-2 is a valid measure of psychopathology in epilepsy, primarily reflecting psychological rather than neurological status.
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SCHIZOPHRENIA—2

G. GOLDSTEIN, W.J. SHEMANSKY, & S. BEERS. Frontal Lobe Dysfunction in Schizophrenia.
Frontally based dysfunction said to be characteristic of schizophrenics may actually exist for only those patients exhibiting a deteriorating condition and poor outcome, called Kraepelinian schizophrenia. However, research reports varied performance on tests generally considered sensitive to frontal lobe function, with no indication regarding the source of the diversity. A sample of 229 carefully diagnosed male schizophrenic inpatients were divided into impaired and normal groups based on WCST score. Group comparisons of WAIS-R and the Halstead-Reitan Battery indicated the impaired group did significantly less well than the normal group on most measures. Covariance analyses indicated that age and education accounted for little group difference, nor did clinical variables (e.g., length of illness) discriminate between groups. We identified one subgroup of schizophrenic patients that failed to demonstrate the frontal lobe deficits often associated with schizophrenia and another that demonstrated a performance comparable to that reported in progressive dementia. Schizophrenia appears to be a diverse disorder, but the basis of this diversity is not well understood.
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G. REHKEMPER, J. GOLD, S. BINKS, C. CARPENTER, T. GOLDBERG, & D. WEINBERGER. Learning and Forgetting in Schizophrenia.
Recent neuroimaging studies have documented medial temporal lobe abnormalities in schizophrenia. We examined if schizophrenia involves accelerated forgetting, as reported in several studies of patients with medial temporal lobe damage. Immediate and delayed recall of stories and figures was tested in 76 patients and 51 normal controls. Controls had a significantly higher percentage of retained scores. The groups differed significantly on delay after immediate recall was covaried. However, a subsample of patients and controls matched on immediate recall did not differ on delay. Similarly, covarying both immediate recall and IQ eliminated delay recall differences. Schizophrenic memory impairment is apparent on both immediate and delayed testing. The mild for-

getting deficits in schizophrenia appear to be a joint function of poor immediate recall and general cognitive competence.
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M.L. SILVERSTEIN, G. MAVROLEFTEROS, & D. CLOSE. Neuropsychological Functioning and Premorbid Adjustment in Schizophrenia.
This report addresses the relationship between premorbid asociality and compromised cognitive dysfunction in schizophrenic subgroups classified by level of premorbid social and school adjustment on the Premorbid Adjustment Scale (PAS). Findings indicate that premorbid asociality influences neuropsychological performance, particularly for school functioning. This involves both academic abilities and psychosocial adaptation to the school environment, such as enjoying being at school, sustaining interest in school work, extracurricular activities, disciplinary problems, and liking and being liked by teachers. Premorbid social functioning and withdrawal were not related to neuropsychological performance. WCST perseverative responses were also notably influenced by premorbid asociality, a finding that suggests that the WCST perseveration response may be influenced in part by premorbid adjustment.
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J.A. GLADSJO, R.K. HEATON, J.S. PAULSEN, & D.V. JESTE. Relationship of Neuropsychological Functioning and Psychiatric Symptoms in Schizophrenia: A One-Year Follow-up.
The present study examined the relationship between changes in negative and positive symptoms and neuropsychological functioning over a 1-yr period. Sixty-two schizophrenic (SZ) outpatients and 20 normal control (NL) subjects were administered comprehensive neuropsychological and psychiatric evaluations at baseline and follow-up. SZ subjects were categorized into three groups according to percentage change over time on SANS or SAPS total scores. Repeated-measures ANOVAs comparing the three SZ groups and NL subjects revealed significant group and time effects for most cognitive domains, except for memory. There was no evidence of any interaction effect. Change in neuropsychological performance over time was consistent with a practice effect for all groups. Results are consistent with the notion of neuropsychological functioning as a "trait" rather than a "state" ability.
Correspondence: *Julie Akiko Gladsjo, Geriatric Psychiatry CRC, VA Medical Center, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

D.A. BYRD, J.S. PAULSEN, R.K. HEATON, J.R. SADEK, W. PERRY, D. DELIS, D. BRAFF, J. KUCK, S. ZISOOK, & D. JESTE. A Qualitative Analysis of Intrusion Errors in Schizophrenia.
The semantic network of schizophrenia was examined through a qualitative analysis of intrusion errors on the California Verbal Learning Test (CVLT). One-hundred twenty-seven patients with schizophrenia (SC) and 118 normal comparison (NC) subjects were compared on five types of intrusion errors: semantically related, second-order semantically related, semantically unrelated, phonetically related, and words from the interference list. Most errors made by both groups were semantically related to the target words. SC subjects, however, made significantly more second-order and unrelated intrusion errors than NC. This pattern of errors may reflect a disrupted semantic network in schizophrenia.
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B. PALMER, R. HEATON, J. PAULSEN, & D. JESTE. Schizophrenia Patients with Normal Neurocognitive Functioning: Frequency and Characteristics.
The present study explored the prevalence and characteristics of schizophrenia patients (SCZ) having nonimpaired neurocognition. Subjects included 167 SCZ and 57 normal comparison subjects. Subjects completed a comprehensive neuropsychological evaluation and measures of clinical/motor functioning. Twenty-one percent of the SCZ were cognitively intact. Intact SCZ did not significantly differ from controls in any cognitive domain. Impaired SCZ had lower functioning than intact SCZ and controls in all cognitive domains except retention, which was normal in all groups. Relative to impaired SCZ, cognitively intact SCZ had fewer negative symptoms, higher likelihood of diagnosis of paranoid subtype, were slightly older, and had a later age of psychosis onset. Results confirm the presence of a subgroup of SCZ who have no impairment of cognitive abilities.
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E. GRANHOLM, W. PERRY, P. NELSON, & V. FILOTEO. Hemispheric and Attentional Contributions to Perceptual Organization Deficits in Schizophrenia.
At least three cognitive-neuropsychological hypotheses have been proposed to account for perceptual-organizational deficits in schizophrenia patients: a right hemisphere dysfunction, a left hemisphere dysfunction, and an attentional dysfunction. To examine these hypotheses, perception of hierarchical patterns on directed and divided attention versions of the global-local task was studied in schizophrenia patients and normal comparison subjects. In the divided attention condition, schizophrenia patients showed an abnormal global precedence effect (i.e., faster processing of "wholes" over "parts"). In contrast, when directed to allocate attention to specific levels of these stimuli, schizophrenia patients performed normally and appeared to process local information before global information (i.e., normal local precedence effect). This pattern of results is inconsistent with either a right or left hemisphere hypothesis of impaired perceptual encoding of global or local features and is more consistent with an impairment involving the availability and allocation of attentional resources.
Correspondence: *Eric Granholm, Department of Psychiatry, University of California, and VA Medical Center, 3350 La Jolla Village Dr., San Diego, CA 92161, USA.*

I.C. SMET, R.S. GOLDMAN, R. TANDON, S. TAYLOR, L. DECKER, G. LELLI, & S. BERENT. Neuropsychological Functioning in Patients with Schizophrenia: A Comparison of Typical and Atypical Neuroleptics.
The purpose of the present study was to identify differential effects of typical and atypical neuroleptics on neuropsychological functioning in schizophrenic inpatients. Seventy-four psychiatric inpatients meeting the diagnostic criteria for schizophrenia were placed in one of three groups according to their pharmacological treatment (typical neuroleptics, Clozaril, Resperidone). Significant differences were found between groups in length of illness, clinical symptomatology, and age. Group performances did not significantly differ on any neuropsychological measure, once length and age effects were accounted for. These findings suggest that differential effects of neuroleptics on cognitive functioning in schizophrenic patients, in this sample, are more related to effects of chronicity and clinical status. Consistent with findings of past studies, schizophrenic patients generally perform poorer on neuropsychological measures relative to a normative sample.
Correspondence: *Irma C. Smet, Neuropsychology Division, University of Michigan, 1500 E. Medical Center Dr., Ann Arbor, MI 48109-0840, USA.*

T. GOLDBERG, D. DANIEL, D. PICKAR, J. KLEINMAN, & D. WEINBERGER. Dissecting Neurocognition in Schizophrenia: Use of Atypical Neuroleptics.
In this study, we compared the effects on neurocognition in schizophrenia of two atypical neuroleptic medications, risperidone and clozapine. Because these drugs have differing pharmacological profiles, we hoped to ascertain if they also produced differential changes in cognition. The design of the study was of the crossover type. Fourteen patients with DSM-III-R-diagnosed schizophrenia participated. While receiving clozapine, patients performed better on a test of sustained attentional readi-

ness and reaction time (the CPT) than while receiving risperidone. This result may be related to findings that clozapine, by virtue of its low dopamine type 2 affinity, does not compromise basal ganglia-related functions including putatively, a CPT response readiness component. In contradistinction to these findings, risperidone had advantages over clozapine on working memory functions (as on the Wisconsin Card Sort) thought to be mediated by cortical dopamine type 1 receptors. Additionally, patients on clozapine performed worse on a test of visual memory. This result may be related to clozapine's anticholinergic potency at muscarinic receptor sites.

Correspondence: *Terry E. Goldberg, Clinical Brain Disorders Branch, IRP, NIMH Neurosciences Center at St. Elizabeths, Washington, DC 20032, USA.*

C. CARPENTER, S. BINKS, C. RANDOLPH, & J. GOLD. Neuropsychological Effects of Antipsychotic Medication in Schizophrenia.

There have been few recent studies of the effect of antipsychotic medications on neuropsychological performance in schizophrenia, and many investigators have expressed concern over possible iatrogenic effects. In this placebo-controlled, counterbalanced study, we assessed 26 schizophrenics on measures of attention, motor and processing speed, fluency, and memory after they were on and off medications for a minimum of 3 wk. Data were analyzed by paired *t*-tests. Medicated patients showed statistically significant improvement in their positive symptoms and performed significantly better on word list acquisition, recall, and on tests of vigilance and distractibility, although their scores still fell below the average range. These results thus failed to demonstrate iatrogenic effects on cognition, suggesting that the deficits observed in medicated patients are likely to be reliable.

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T. FERMAN, M. PRIMEAU, & C. JAMPALA. A Preliminary Examination of Schizophrenia Symptom Presentation on Perceptual Processing Efficiency and Distractibility.

Three symptom dimensions (disorganization, positive and negative) were examined in relation to performance on a global-local task that examines both perceptual processing priority and distractibility. Normals showed no global or local priority. Positive and negative symptom groups showed faster detection of local detail relative to the global configuration. Normals had difficulty ignoring unattended global input. Severe positive and mild negative symptom groups were distracted by competing local detail. The severe negative group resisted distraction. Hypothesized neural mechanisms include asymmetric temporal activation and frontal-subcortical dysfunction, respectively.

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D.M. MOSNIK, A.P. TRANEL, D.S. O'LEARY, & N.C. ANDREASEN. Planum Temporale (PT) Asymmetry in Groups Defined by Dichotic Ear Advantage: A Study of Female Schizophrenic Patients and Normal Controls.

The normal PT is larger on the left in most right-handers, but gender differences have been reported in schizophrenics. To follow up a recent study of males, right-handed females with extreme scores on a dichotic task were selected: six patients and six controls with right ear advantages (REA) and five patients and six controls with left ear advantages (LEA). PT and ascending rami were manually traced on successive sagittal MRI slices, and laterality indices were calculated. PT was larger on the left (though not significantly after covarying for brain size) in every group but the LEA patients. Our results suggest that the LEA group of female schizophrenics has decreased asymmetry due to increased size of the right PT. The expected rightward asymmetry was found in ascending rami.

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P.J. MOBERG, R.L. DOTY, R.N. MAHR, S.E. ARNOLD, B.I. TURETSKY, D.A. McKEOWN, R.C. GUR, & R.E. GUR. Olfactory Deficits in Young and Elderly Patients with Schizophrenia.

Sixteen elderly schizophrenia patients (ES), 21 young schizophrenia patients (YS), and 36 matched healthy controls were administered the University of Pennsylvania Smell Identification Test (UPSIT) and measures of positive and negative symptomatology. Results indicated that both ES and YS patients showed marked olfactory deficits relative to controls, and that ES patients were consistently more impaired on the UPSIT relative to the YS group. Independent of normal age and gender effects, both YS and ES groups showed a strong relationship between UPSIT scores and duration of illness, suggesting that olfactory abilities decline progressively over the course of the disorder. In contrast to ES patients, in YS patients lower UPSIT scores were associated with increased severity of negative symptoms. Results suggest that in contrast to studies that report general stability of neuropsychological deficits over the course of illness in schizophrenia, olfactory identification abilities do show significant deterioration, even in those patients with relatively recent onset.

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Birch Lecture/4:00–5:00 p.m.

CAUSES AND CONSEQUENCES OF DRUG AND ALCOHOL ADDICTION: A NEUROPSYCHOLOGICAL PERSPECTIVE

Ralph Tarter

SATURDAY MORNING, FEBRUARY 17, 1996

Paper Session 16/9:00–10:40 a.m.

HIV–2

T. FLYNN, E. FENNELL, J. SLEASMAN, & K. BERG. Infant Visual Attention as a Measure of Information Processing Ability in HIV-Exposed and Nonexposed Infants.

Twenty-eight infants between 6 and 9 months of age were tested using a habituation-dishabituation technique designed to measure aspects of visual attention, learning, and memory. The behavior of 14 infants born to HIV-infected mothers was contrasted with the behavior of 14 infants not exposed to the virus. The HIV-exposed infants demonstrated significantly longer fixation durations across repeated presentations of a stimulus than the contrast group of infants. In other subject populations, fixation duration has been found to be negatively correlated with concurrent and time-lagged measures of sensorimotor and cognitive functioning. Significantly greater variability of fixation duration from trial to trial was also found for the HIV-exposed group compared to the contrast group. Following a shift from a familiar to novel stimulus, 43% of the nonexposed contrast group showed recovery of looking time, compared with only 14% of the HIV-exposed group. This difference in response to novelty approached significance, but was not statistically significant. The results are interpreted with reference to studies of infant habituation-dishabituation in other at-risk groups and the literature on pediatric HIV infection.

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R. BORNSTEIN, M. BASSO, P. ROSENBERGER, H. NASRALLAH, & J. HENDERSON. Neuropsychological Effects of Non-IV Drug Use and HIV Status.

Past research has demonstrated neuropsychological deficits in individuals infected with HIV. However, the factors that predict cognitive declines are uncertain. One variable that may potentiate diminished function in HIV is non-IV drug use. The present study examined the neuropsychological performance of HIV^+ symptomatic, HIV^+ asymptomatic, and HIV^- individuals who had never abused drugs, had past histories of drug abuse, or currently abused drugs. The results revealed that with increasing proximity to time of drug use, HIV^+ groups began to have worse performances than the HIV^- group. Notably, there were no differences between the HIV^-, HIV^+ asymptomatic, and HIV^+ symptomatic groups who had never abused drugs. These findings provide robust evidence that drug use potentiates some cognitive deficits in HIV infection.

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J. BARTOK, E. MARTIN, D. PITRAK, R. FARINPOUR, R. NOVAK, K. PURSELL, & K. MULLANE. Working Memory Deficits in HIV-Seropositive Drug Users.

Frontal-subcortical circuits have been implicated in spatial working memory. HIV-1 selectively affects the basal ganglia, and previous studies from our laboratory suggest that spatial working memory may be impaired in HIV-seropositive subjects. In the current study, 18 HIV-seropositive and 20 matched seronegative drug users performed a new version of the Tower of London task (TOL-M) designed to test both delayed memory and planning. HIV-seropositive subjects were impaired on the TOL-M compared to controls, and results suggested that deficits were associated with delayed memory but not planning. Results are consistent with hypothesized working memory deficits in HIV-1 infection and support the utility of the TOL-M as a measure of working memory and planning.

Correspondence: *John A. Bartok, Department of Psychiatry, 912 S. Wood St., University of Illinois at Chicago, Chicago, IL 60612, USA.*

A.D. KALECHSTEIN, C.H. HINKIN, W.G. VAN GORP, & S. CASTELLON. The Effects of Depression on Episodic and Procedural Memory in HIV-Infected Persons.

The present study examined the differential effects of mood on episodic and procedural memory. Fifty-six HIV-infected patients completed the Beck Depression Inventory (BDI), a measure of episodic memory (California Verbal Learning Test), and procedural memory (Rotary Pursuit Task). Depression was shown to have a significant and adverse impact on procedural memory, but an inconsistent effect on episodic memory. One possible interpretation of the results in that depression is more likely to affect procedural memory because they are controlled by overlapping subcortical neurologic substrates. In particular, research has suggested that the basal ganglia affect mood and procedural memory.

Correspondence: *Ari Kalechstein, Department of Psychiatry and Biobehavioral Sciences, UCLA School of Medicine, Room C8-747, 760 Westwood Plaza, Los Angeles, CA 90024, USA.*

E.M. MARTIN, D.L. PITRAK, K.J. PURSELL, R.M. NOVAK, & K.M. MULLANE. HIV-Seropositive Subjects on Antiretroviral Therapy Are Faster on the RT Stroop.

In a previous experiment, we showed that HIV-seropositive subjects receiving antiretroviral therapy had faster simple and choice reaction times than untreated subjects. In the current investigation, 168 HIV-seropositive men and women performed a more cognitively complex task, a voice-activated reaction time version of the Stroop procedure. Consistent with our previous results, subjects currently receiving antiretroviral therapy were faster to name color-congruent, color-incongruent, and neutral stimuli compared with untreated subjects. Differences in RTs could not be attributed to differences in age, education, psychological distress, or substance-abuse history. These results provide further evidence that central information processing is faster in HIV-seropositive subjects treated with antiretrovirals and are consistent with recent speculations that antiretroviral compounds have a neuroprotective effect.

Correspondence: *Eileen Martin, Departments of Psychiatry and Medicine, University of Illinois College of Medicine-Chicago and Veterans Affairs Medical Center-West Side, 912 S. Wood St., Chicago, IL 60612, USA.*

T.D. MARCOTTE, R.K. HEATON, E. MASLIAH, C. WILEY, R. ELLIS, J. NELSON, M. KELLY, J.H. ATKINSON, J.A. McCUTCHAN, I. GRANT, & THE HNRC GROUP. The Relationship Between Midfrontal Dendritic Complexity and Pre-Agonal Neuropsychological Functioning in HIV.

Establishing a relationship between in vivo neuropsychological (NP) functioning and postmortem indicators of CNS damage in HIV patients has historically met with mixed results. This study examines the association between pre-agonal NP functioning and postmortem measurements of dendritic complexity in 12 subjects who completed an NP evaluation within 18 months of death. NP functioning in eight neurocognitive domains and the percentage of midfrontal cortex covered by dendrites was assessed. Significant correlations were found between dendritic complexity and performance on (1) measures of abstraction and perceptual-motor functioning, and (2) an index of global cognitive functioning. Results suggest that alterations in structure that occur prior to neuronal death may contribute significantly to the neurocognitive changes frequently seen with HIV patients.

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Paper Session 17/9:00–10:40 a.m.

ADHD–2

M. GAUB. A Clinic-Referred Sample of DSM-IV Diagnosed Subtypes Compared on Measures of Cognition.

A clinic-referred sample of DSM-IV diagnosed ADHD subtypes were compared on measures of cognitive and behavioral functioning, including central auditory processing, intellectual functioning, attention/concentration, and parent and teacher ratings of behavior problems. On behavioral ratings, ADHD/C children, as compared to ADHD/IA children, displayed more anxiety/depression, somatic complaints, and aggressive, externalizing, and delinquent behavior, as well as attention and thought problems. Additionally, group differences on cognitive measures demonstrated that ADHD/IA children were more impaired than ADHD/C children on VIQ and SCAN competing word subtest scores (a measure of central auditory processing). Current results were compared to previous findings. Theoretical implications, including potential lateralized differences in impairment between ADHD subtypes, are discussed.

Correspondence: *Miranda Gaub, Department of Psychology, Mezes 330, University of Texas, Austin, TX 78712, USA.*

G. GRODZINSKY & R. BARKLEY. The Predictive Power of Frontal Lobe Tests in the Diagnosis of ADHD.

A battery of eight frontal lobe tests was administered to 66 children with ADHD and 64 normal children, ages 6–11 yr. The 12 scores for these tests were analyzed using positive and negative predictive power and other statistics for evaluating the classification accuracy of each. Results

indicated good positive predictive power for seven of the scores, but only modest negative predictive power and low sensitivity resulting in low overall classification accuracy for all scores. Thus, while abnormal scores may indicate the presence of ADHD, normal scores may not be used to rule out the disorder. Great caution should be exercised in the application of these tests as the sole diagnostic instruments for ADHD. A more balanced diagnostic protocol is offered.
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M. SHAPIRO, R. MORRIS, C. FLOWERS, M. MORRIS, & W. JONES. A Neuropsychologically Based Assessment Model of the Structure of Attention in Children.
Traditional attentional assessment paradigms have often failed to separate factors relevant to components of attention from factors related to other cognitive or related processes or task-specific variance. This study attempted to validate various multidimensional assessment models that would permit a more complex and systematic analysis of interrelationships of components of attentional functioning. A neuropsychological assessment framework was used to examine various aspects of children's attentional functioning. A series of increasingly complex factor structures were proposed to explain second-graders' ($N = 107$) patterns of performance across multiple measures of hemispheric activation, verbal and nonverbal selective and sustained attention, and general ability. LISREL results suggested that a multidimensional factor structure that incorporated levels of processing components provided a more plausible explanation of the data than those based on lateralized processes or a unidimensional attentional factor.
Correspondence: *Marla Shapiro, Department of Psychology, Georgia State University, University Plaza, Atlanta, GA 30303, USA.*

D.A. CAHN & A.C. MARCOTTE. Recall and Rate of Forgetting in Attention Deficit Hyperactivity Disorder.
Rates of forgetting in children with Attention Deficit Hyperactivity Disorder (ADHD) were evaluated. Although children with ADHD are known to have poor organizational and attentional problems that may impair memory performance, we hypothesized that savings scores would be intact, insofar as poor recall reflects difficulty with executive dysfunction, as opposed to memory per se. Fifty-seven children diagnosed with ADHD were administered tests of nonverbal and verbal memory. Despite impairment relative to norms on immediate and delayed recall, subjects showed no evidence of rapid forgetting of nonverbal information (mean savings score = 93%). Recall and savings of verbal information was intact (mean savings score = 88%). Efforts for cognitive remediation should address teaching ways to initiate and execute organizational strategies to enhance initial learning.
Correspondence: *Ann C. Marcotte, Department of Pediatrics, Memorial Hospital of Rhode Island, 111 Brewster St., Pawtucket, RI 02860, USA.*

M. GRANT, N. NUSSBAUM, & E. BIGLER. Electrophysiological Components in Children with ADD or ADHD.
Electrophysiological waveform components recorded from multiple electrode sites during a unimodal, oddball, auditory discrimination task were assessed for a group of 10–12 yr-old, right-handed males, including normal controls ($N = 15$), children diagnosed with attention-deficit disorder predominantly inattentive type (ADD; $N = 13$), and children diagnosed with attention-deficit hyperactivity disorder (ADHD; $N = 15$). Performance accuracy scores were comparable across groups for discrimination of Target tones. Post hoc comparisons of statistically significant group by electrode site interactions (N100: $F(2,80) = 2.94$, $p = .02$; and P300: $F(2,80) = 2.94$, $p = .02$) revealed higher voltage amplitudes for rare Target stimuli at anterior-frontal electrode sites for the ADHD group compared to controls for both the early occurring negative N100 ($p < .0001$) and the late-onset positive P300 event-related potentials ($p < .0001$). Significantly larger P300 amplitudes were recorded at posterior/parietal electrode sites for ADD versus ADHD children ($p < .0001$) with no significant difference obtained between controls and ADD or ADHD. The results are discussed in terms of possible cognitive processing inefficiency or dysregulation of cerebral excitation in children diagnosed with subtypes of attentional difficulties.
Correspondence: *Mitzie L. Grant, James L. Dennis Developmental Center, P.O. Box 251708, Little Rock, AR 72225, USA.*

J. HALL, G.W. HYND, M.J. COHEN, & C.A. RICCIO. ADHD Subtypes: MRI Morphometric Analysis of the Corpus Callosum.
This study focused on the brain-behavior relationships between normal children and children diagnosed with ADHD subtypes across MRI obtained corpus callosum ROI. Neuropsychological tests were administered to facilitate ADHD diagnoses in accordance with DSM-IV criteria. A significant difference between ADHD and normal subjects was noted with ADHD subjects exhibiting larger area measurements on the midbody region. Analysis of ADHD subtypes and ROI indicates the ADHD-CT group exhibited a significantly larger ROI 3. This is in contrast to previous research findings of smaller genu and splenium area measurements. It is suggested that larger area measurements in the midbody region may represent excessive interhemispheric transmission resulting in over activity.
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Paper Session 18/9:00–10:40 a.m.

FACE PROCESSING

S.Z. RAPCSAK, A.W. KASZNIAK, S.L. REMINGER, & M.L. GLISKY. Neuropsychological and Psychophysiological Correlates of Confabulatory Face Misidentification.
We studied confabulatory misidentification of unfamiliar faces in a patient with frontal lobe damage. Tests of face processing did not indicate significant perceptual impairment. Skin conductance responses (SCRs) recorded during a familiarity judgment task revealed preserved autonomic discrimination of famous versus unfamiliar faces. Furthermore, SCRs to misidentified unfamiliar faces did not differ from SCRs to unfamiliar faces that were correctly rejected, suggesting that misidentifications were not induced by the spurious activation of memory representations for familiar faces. We propose that confabulatory face misidentification is related to an impairment of frontally mediated decision making and monitoring functions. Our observations, together with reports of covert recognition in prosopagnosia, suggest that the activation of memory representations for familiar faces is neither necessary nor sufficient to produce the sense of familiarity with a face.
Correspondence: *Steven Z. Rapcsak, Neurology Service (127), V.A. Medical Center, Tucson, AZ 85723, USA.*

S.Z. RAPCSAK, M.R. POLSTER, M.L. GLISKY, & J.F. COMER. Prosopagnosia and Face Misidentification.
We studied the relationship between prosopagnosia and face misidentification in a group of patients with focal brain damage. Our results suggest that the two types of face recognition impairment are dissociable and may have different neuropsychological mechanisms and neuroanatomical substrates. Right-sided or bilateral damage to the inferior and mesial temporo-occipital areas was associated with dense prosopagnosia. Damage to the right temporo-parieto-occipital region was associated with pervasive visuoperceptual impairment. Degraded visual input in these patients may result in apperceptive prosopagnosia and may also

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set the stage for perceptually-induced face misidentifications. Right frontal damage was a frequent finding in patients with face misidentification. We propose that frontal lobe damage contributes to misidentification by interfering with the ability to monitor and critically evaluate the output generated by the face recognition module.
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R. WEINER & S. CHRISTMAN. Categorical and Coordinate Processing of Facial Stimuli.
Kosslyn has proposed that the left versus right hemispheres (LH versus RH) are specialized for the processing of categorical versus coordinate spatial relations, respectively. This framework was extended to the domain of facial processing, with gender classification versus specific identification tasks being hypothesized to involve categorical versus coordinate processing. Consistent with Kosslyn's framework, LH versus RH advantages were obtained during the first block of trials for the gender classification versus face identification tasks. Subsequent blocks yielded no visual field differences, although a marginal trend toward a LH advantage on the face identification task did emerge on later blocks. Results are discussed in relation to those of Sergent (1985).
Correspondence: *R. Weiner, Psychology Department, University of Toledo, Toledo, OH 43606, USA.*

A. SHERMAN & T. SHAW. Development of a Test of Facial Affect Recognition.
Perception of affective states based on analysis of facial expressions is a fundamental and innate ability that is present at birth and intricately linked to social functioning. As a result, deficits in perception of affective facial expressions can lead to insidious social and interpersonal deficits in both neurologic and psychiatric patients. Although many researchers have investigated facial affect recognition, diversity in instruments, methodology, and task parameters limit the availability of a reliable and clinically practical instrument with which to assess these skills. This research describes the development of a Test of Facial Affect Recognition, the final version of which was administered to 78 normal controls and 43 neurologically impaired patients. Initial results indicate that in addition to demonstrating good reliability (Split half $r = .75$), the test appears highly sensitive to group differences. Patients with evidence of neurologic injury not only performed significantly worse than normal controls, but patterns were identified in their performance that may help to explain the interpersonal deficits often seen in this population. The distribution of normal subjects' performance suggests that this instrument may provide a useful clinical tool to assess various patient populations along this important clinical dimension. Applications of the instrument are considered and future research directions are discussed.
Correspondence: *Adam G. Sherman, Department of Neuropsychiatry, University of Pennsylvania Medical Center, 3400 Spruce St., 10 Gates, Philadelphia, PA 19104-4283, USA.*

B. DE GELDER, J. VROOMEN, & T. POPELIER. Lateral Presentation and Categorical Perception of Facial Expressions.
The notion that some emotions are biologically basic leads to the expectation that expressions of emotions will be perceived categorically. This prediction was borne out in a study using line-drawn facial expressions and with photographs. The present study examines whether lateral presentation enhances this categoricity of expression perception leading to a LVF advantage for expression processing or whether in contrast a RVF advantage would reflect the categorical character of the task. The materials consisted of two natural tokens of a happy and a sad expression of the same actor and a series of nine intermediate steps generated by computer program and presenting intermediate values between the two endpoints. A discrimination task (AX) and an identification task were administered. Stimulus presentation was lateralized to RVF or LVF. The results show that both identification and discrimination is influenced by lateral presentation.
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Poster Session 6/Saturday, 9:00 a.m.–12:00 p.m.

ALZHEIMER'S DISEASE—4

N.L. CADIEUX & K.W. GREVE. Emotion Processing in Alzheimer's Disease.
The purpose of this study was to determine if the emotion processing deficits seen in AD are due to general cognitive decline or disruption of a specific emotion-processing mechanism. Alzheimer's disease (AD) patients were divided into subgroups based on their performances on neuropsychological measures of lateralized function. The performances of AD patients with predominant functional impairments of the left hemisphere (LHI) were compared to those with predominant functional impairments of the right hemisphere (RHI) on a battery of affect-processing tasks. The results indicated that while both groups were impaired, the cause of this impairment differs. LHI-AD patients failed on affect-processing tasks because they did not comprehend the task demands. In contrast, RHI-AD patients failed because of a specific emotion-processing deficit.
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V.J. ROBERTS, S.M. INGRAM, M. LAMAR, & R.C. GREEN. Prosody Impairment and Associated Behavioral Disturbances in Alzheimer's Dementia.
The ability to produce, repeat, and comprehend emotionally intoned sentences was examined in 20 patients with Alzheimer's disease (AD) and in 11 elderly normal controls. Mildly demented AD patients exhibited deficits in comprehension relative to controls, whereas moderately demented AD patients exhibited deficits in comprehension, repetition, and elicitation of emotional prosody relative to controls. An inverse relationship was observed between ability to correctly produce and repeat prosodic variation and frequency of agitated behaviors in moderately impaired patients. This finding suggests that inability to communicate emotional messages may be related to disturbances in mood and behavior. These results have implications for management of disruptive behavior.
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J. GREEN, F.C. GOLDSTEIN, K. GIRARDOT, & B.E. SIROCKMAN. Changes in Awareness of Abilities in Alzheimer's Disease and Aging.
This study evaluated differences in awareness of abilities as a function of normal aging and Alzheimer's disease (AD). We were interested in determining whether there were quantitative or qualitative differences in awareness between older controls and patients, and whether awareness showed age-related change. We compared AD patients, older controls, and younger controls on questionnaire discrepancy measures of awareness. Relative to family report, patients overestimated behaviors, while older controls underestimated behaviors. This difference was most pronounced for judgments of recent memory. Age-related differences were less consistent. The discrepancy between patient and family perception of recent memory may be useful in distinguishing individuals with mild AD from healthy older individuals. The implications of impaired awareness for independent functioning and patient treatment require further research.
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A.L. FRIEDMAN, S. BROWN, H. KATZEN, G. REY, J. CORDLE, & B. LEVIN. Depression and Awareness of Cognitive Deficits in Alzheimer's and Parkinson's Disease.

Depression has been documented in Alzheimer's disease (AD) and Parkinson's disease (PD) but remains a subject of controversy. We compared probable AD and demented PD subjects, matched on level of dementia, depression, and awareness of cognitive deficits. PD subjects reported significantly more depression than AD subjects. AD subjects exhibited significantly less awareness of cognitive deficits relative to PD subjects. Among PD subjects, women expressed significantly more awareness of cognitive deficits than men. Awareness of cognitive deficits was positively related to depression in AD subjects but not in PD subjects. These findings suggest an important dissociation between dementia, depression, and awareness of cognitive deficits.

Correspondence: *Andrea L. Friedman, Division of Behavioral Medicine and Oncology, University of Pittsburgh Cancer Institute, 3600 Forbes Ave., Suite 405, Pittsburgh, PA 15213, USA.*

D. MARSON, M. DYMEK, & L. HARRELL. Neuropsychological Correlates of the Factor Structure of Competency to Consent in Alzheimer's Disease (AD).

Loss of capacity to consent to treatment (competency) is an inevitable consequence of progressive dementias such as AD. Although competency assessment measures exist, little is known about the underlying factor structure of competency and its neuropsychological correlates. The investigators developed a clinical vignette that reliably and validly tests subject competency under a specific and stringent legal standard (capacity to "understand" the treatment situation and choices) (LS5). Sixty subjects with probable AD were administered the nine-question constituent to LS5 and also neuropsychological measures empirically linked to competency function. The factor structure of LS5 was analyzed and resulting subject factor scores correlated with the neuropsychological measures. Principal components analysis of LS5 revealed two orthogonal factors: Verbal Reasoning (factor 1) (42% of variance) and Verbal Memory (factor 2) (15% of variance). Stepwise regression analysis revealed that DRS Conceptualization and DRS Initiation/Perseveration predicted factor 1 ($R^2 = .44$, $p < .0001$), and that DRS Memory and WMS-R Verbal Paired Associates II predicted factor 2 ($R^2 = .40$, $p < .0001$). Our findings suggest that factors of Verbal Reasoning and Verbal Memory underlie LS5 competency performance in AD, and that frontally mediated cognitive functions are associated with the first factor and medial temporal functions with the second.

Correspondence: *Daniel Marson, Department of Neurology, University of Alabama at Birmingham, Birmingham, AL 35294, USA.*

D. MARSON, L. HAWKINS, B. McINTURFF, & L. HARRELL. Neuropsychological Predictors of Physician Competency Judgments in Alzheimer's Disease (AD).

In most medical settings physicians are called upon to assess the capacity of AD patients to consent to treatment (competency). Neuropsychological models of these competency judgments are needed to develop better objective measures for competency assessment. In this study, 45 subjects (16 normal older controls and 29 patients with mild AD) were evaluated for competency by five physicians experienced in competency assessment, and were also administered a neuropsychological battery empirically linked to competency function. Competency status of subjects (competent or incompetent) was determined by majority consensus of the five physicians. Using this approach, all 16 controls were competent, 21 AD patients were competent, and 8 AD patients were incompetent. Stepwise discriminant function analysis (DFA) identified one significant predictor of competency status for the sample: Benton CFL ($R^2 = .32$, $p < .0003$). Using parametric DFA, CFL classified the competency status of 82% of the sample (37/45). Nonparametric DFA resulted in 87% classification accuracy (39/45). When DRS Initiation/Perseveration ($R^2 = .20$, $p < .006$) was added as a second DFA predictor, the two-variable model classified 89% and 100%, respectively, of the sample. These findings suggest that competency judgments of physicians are strongly associated with declining AD patient capacities for verbal fluency/executive function.

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G. FOX, S. BOWDEN, G. BASHFORD, & D. SMITH. Driving and Alzheimer's Disease: Predicting and Assessing Save Versus Unsafe Driving Performance.

Review of the literature shows considerable uncertainty about whether a diagnosis of Alzheimer's disease (AD) is a sufficient criterion for revoking driving privileges. Few studies have examined actual driving performance of subjects with AD, however. Results of our study of a consecutive series of 23 drivers with a diagnosis of probable AD are reported. All subjects underwent a standardized neuropsychological, medical, and on-road evaluation. Nine were judged as safe and 14 as unsafe drivers. The predictive validity of the medical and neuropsychological evaluations, and of the MMSE, are reported. The on-road test was a reliable measure, and was strongly associated with the expert judges' ratings of driving. On-road evaluation is recommended to differentiate safe from unsafe AD drivers.

Correspondence: *Gillian Fox, A4-2 Jade Beach Villa, 3-7 Horizon Drive, Chung Hom Kok, Hong Kong.*

L.A. BIELIAUSKAS, B.R. ROPER, J. TROBE, & P. GREEN. Cognitive Measures, Driving Safety, and Alzheimer's Disease.

Nine individuals with Alzheimer's disease (DAT) and nine age-matched controls were administered selected neuropsychological tests (NT) and given an on-the-road driving test. Patients with DAT differed significantly from controls on all NT and measures of driving error. However, none of the NT correlated with driving errors for controls, while only Shipley Institute of Living Scale scores and Southern California Figure-Ground Test scores showed significant correlations with driving errors in subjects with DAT. Thus, while certain general cognitive measures predict some driving errors for those with DAT, NT continue to show relatively weak overall power in predicting driving errors. Driving may include relatively overlearned skills (procedural memory), which are somewhat independent of many specific NT measures.

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J.J. VASTERLING, B. SELTZER, & W.E. WATROUS. Longitudinal Assessment of Deficit Awareness in Alzheimer's Disease.

The purpose of this study was to conduct a longitudinal assessment of impaired awareness of deficit in Alzheimer's disease (AD) across varied functional domains. Each of 14 AD-diagnosed patients and their caregivers were asked to rate independently patient memory deficit, health status, self-care ability, anxiety, depression, and irritability. The identical protocol was repeated an average of 16.8 months later. Study results revealed that patients underestimated only a subset of problematic behaviors, including memory deficit, reduced self-care capacity, and irritability. These dissociations were maintained over time, with the discrepancy between patient and caregiver ratings of self-care decline increasing from time 1 to time 2. Findings will be discussed in the context of current models of deficit awareness.

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A.L. FOUNDAS, N.L. CADIEUX, K.W. GREVE, L. COLGIN, C. DALTON, J. WESSLES, T. SMITH, & N. ZAMORA. Neuropsychological Dimensions of Ideomotor Apraxia in Alzheimer's Disease.

Ideomotor apraxia is common in Alzheimer's disease, but the precise nature of the apraxic disturbance has not been well characterized. We

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studied several dimensions of limb praxis in Alzheimer's patients and healthy controls. When asked to produce transitive and intransitive gestures, the Alzheimer's patients were significantly more impaired than controls and were more delayed in producing gestures. Furthermore, the more degraded gestures took longer to produce, and the latency period was often filled with verbal cueing. Perhaps the Alzheimer's patients were attempting to verbally access the motor plan, since the praxicons stored in the left inferior parietal lobe are probably degraded. The Alzheimer's patients also produced significantly more content errors than controls, such that the differences in gesture production accurately discriminated the groups.

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A.L. FOUNDAS, N.L. CADIEUX, K.W. GREVE, L. COLGIN, C. DALTON, J. WESSLES, T. SMITH, & N. ZAMORA. Memory Loss and Limb Apraxia in Alzheimer's Disease.

Models of limb praxis suggest that two component systems exist: production and conceptual. It has been demonstrated that conceptual apraxia was dissociable from semantic language deficits and from praxis production deficits in Alzheimer's patients. These findings suggest that knowledge of tools is independent of verbal semantics and movement representations. The impact of memory loss on knowledge of tools is unknown. Therefore, we studied the impact of memory of the praxis production and praxis conceptual systems in Alzheimer's patients and normal controls. We found that Alzheimer's patients were significantly more impaired than controls on tests of the praxis production and praxis conceptual systems. Memory loss, however, did not account for these deficits, suggesting that limb praxis and its component systems are probably independent of the central conceptual system. Furthermore, our findings support the notion of a separable action semantic system.

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F.C. GOLDSTEIN, V.J. ROBERTS, A.P. AUCHUS, J.L. WOODARD, & R.C. GREEN. Symmetrical and Asymmetrical Presentations of Apraxia in Alzheimer's Disease.

The purpose of this study was to examine the frequency as well as the demographic and neuropsychological characteristics of symmetrical and asymmetrical apraxia in Alzheimer's disease (AD). Forty-five right-handed AD patients were administered an apraxia test as part of their dementia evaluation. Compared to demographically matched normal controls, a significantly greater proportion of AD patients displayed asymmetries in performance. AD patients with poorer left-hand praxis were younger than AD patients with poorer right-hand praxis. Additionally, patients with poorer left-hand praxis obtained lower scores on visuomotor/visuospatial measures than did patients with poorer right-hand praxis. These findings indicate the importance of examining praxis in both hands during the course of the neuropsychological evaluation of AD. They also suggest a contribution of the right hemisphere in apraxia affecting the nondominant hand.

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D. GILLEY, R. WILSON, L. BECKETT, & D. EVANS. Disease and Situational Characteristics Related to Aggressive Behavior in Alzheimer's Disease.

Disease and situational characteristics were evaluated in relation to the occurrence of aggressive behaviors in 270 community-dwelling Alzheimer's disease (AD) patients. Verbal and physical aggressive behaviors over a 12-month period were assessed using weekly structured interviews with an informant residing with the patient. The presence of verbal aggression ($N = 107$, 39.6%) was significantly associated with deficits in physical function and the presence of psychotic symptoms. Physical aggression ($N = 75$, 27.8%) was associated with deficits in cognitive and physical function and two behavioral disturbances (delusions and disinhibitory phenomena). Antecedents for 729 aggressive episodes were concentrated in two care-related situations: providing assistance with physical function ($N = 401$) and behavioral redirection ($N = 180$). These data indicate that aggressive behavior is common in AD and associated with a narrow range of disease and situational features.

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IMAGING—3

L.M. CLARK, W.M. McDONALD, K.A. WELSH, I.C. SIEGLER, D.V. DAWSON, L.A. TUPLER, & K.R.R. KRISHNAN. MRI Correlates of Depression in Early- and Late-Onset Alzheimer's Disease.

Depressive symptoms and/or syndromes are frequent complications of Alzheimer's disease. We hypothesized that AD patients with depression would be more likely than nondepressed patients to show the multifocal deep white matter and subcortical gray matter hyperintensities on MRI that have been associated with late-onset major depression. In a retrospective study of 31 patients, depression was characterized by clinical diagnosis (DSM-III-R Major Depression, Depressed Mood, or No Depression) and informant ratings of premorbid and current depression on the NEO Personality Inventory. There was no relationship between clinical diagnosis of major depressive episode and hyperintensities. In the early-onset group only, MRI abnormalities were related to greater premorbid depression and a lesser dementia-associated increase in depression as rated by informants on the NEO-PI.

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M. CHERRIER, G.W. SMALL, A. LA RUE, & S. KOMO. Mood State and Cerebral Metabolism in Persons with Age-Associated Memory Impairment.

Often people undergoing a positron emission tomography (PET) scan express anxiety and other feelings that may influence results. Previous studies have assessed the relationship of mood state to PET measures in young normals, but this relationship remains unexplored in older adults with memory complaints. In this study, we explore the relationship between self-ratings of mood state and cerebral glucose metabolism as measured by PET in 27 persons who met criteria for age-associated memory impairment (AAMI). Mood ratings of fatigue and boredom correlated significantly with increased cerebral glucose metabolism in the basal ganglia and mesial temporal regions, suggesting that subjective mood changes may influence brain regions implicated in emotional and memory function.

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R. KRIKORIAN, P. NEWMAN, D. LEVINE, M. FERNANDEZ-ULLOA, & M. KEYS. Enhanced Cerebral Perfusion with Risperidone Treatment in Three Cases.

Three patients with severe psychiatric disorders were studied with cerebral SPECT imaging before treatment and again several days later on risperidone. Clinical and neuropsychological observations also were made. The on-treatment SPECT studies documented enhanced perfusion in cortical and basal ganglia regions in all three cases. All patients showed improved clinical condition as well. This cerebral enhancing effect of the drug may also be related to its ability to improve negative

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symptoms of schizophrenia and suggests the possibility of cognitive executive function enhancement as well.
Correspondence: *Robert Krikorian, Department of Psychiatry, University of Cincinnati College of Medicine, 231 Bethesda Ave., Cincinnati, OH 45267-0559, USA.*

D. JOHNSON-GREENE, K.M. ADAMS, C. ANDERSON, S. ROSS, P. BERGLOFF, S. GILMAN, B. KOEPPE, L. JUNCK, K. KLUIN, S. MARTORELLO, M. LOHMAN, & S. BERENT. Paired Associate Learning and Cerebral Metabolism Measured Using [^{18}F] FDG PET in Chronic Alcoholics.
The goal of this study was to examine the effect of chronic ethanol consumption on paired associate learning and its relationship to functional neuroimaging. Thirty-two male chronic alcoholics (mean age = 47) were administered the verbal and visual Paired Associates subtests from the Wechsler Memory Scale-Revised and PET studies with [^{18}F] FDG were performed to study local metabolic rates for glucose (LCMRG) in several frontal and temporal regions. LCMRG was inversely related to performance on verbal and visual Paired Associates tasks. The cingulate region of the frontal lobes was best in predicting performance on the visual Paired Associates learning task. This study underscores, in part, the frontal lobes in attending to and encoding of novel stimuli and may, in part, explain the visuospatial disturbance common to alcoholics.
Correspondence: *Doug Johnson-Greene, Dept. of Psychiatry-Neuropsych., Med Inn 0840, University of Michigan Medical Center, 1500 E. Medical Center Dr., Ann Arbor, MI 48109-0840, USA.*

D. JOHNSON-GREENE, K.M. ADAMS, P. BERGLOFF, S. GILMAN, B. KOEPPE, L. JUNCK, K. KLUIN, S. MARTORELLO, M. LOHMAN, & S. BERENT. Deficits in Executive Functioning are Correlated with the Degree of Frontal Lobe Hypometabolism Measured Using [^{18}F] FDG PET in Chronic Alcoholics.
Persisting deficits in executive functioning have been found among chronic alcoholics. Few studies have attempted to correlate these cognitive deficits with dynamic indices of functional brain imaging. In this study, 59 male chronic alcoholics (mean age = 47) were administered the Halstead Category Test (HCT) and Wisconsin Card Sort Test (WCST) and were scanned using [^{18}F] FDG PET with quantitative analysis of local metabolic rates for glucose (LCMRG) in the cingulate, orbitomedial, and dorsolateral subdivisions of the frontal lobes. LCMRG of the cingulate region was significantly correlated with WCST performance and LCMRG of the dorsolateral and orbitomedial regions was significantly correlated with HCT performance. This study extends and amplifies our earlier findings with 37 patients, which have shown a relationship between frontal lobe hypometabolism and deficits on tasks of executive functioning.
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J.L. WOODARD, R.C. GREEN, J.R. VOTAW, & J.M. HOFFMAN. Attenuation of Right Frontal Cerebral Blood Flow During Episodic Memory Retrieval in Patients with Alzheimer's Disease.
Positron emission tomography (PET) activation studies have not previously investigated possible frontal lobe pathology that might contribute to impaired working memory in early Alzheimer's disease (AD). This study used PET to examine the pattern of cerebral blood flow activation associated with a memory rehearsal task in four AD patients and four matched controls relative to a continuous word reading task. Controls demonstrated candidate areas of activation in right dorsolateral prefrontal cortex, right parietal cortex, and bilateral cerebellum. These areas of activation were markedly diminished in AD patients. No activation of medial temporal lobe structures was noted in either group. These results are consistent with Tulving's model of hemispheric encoding/retrieval asymmetry and suggest possible dysfunction in prefrontal circuitry associated with working memory in early stages of AD.
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C.M. CULLUM, R. McCOLL, A. MADDREY, R. ROSENBERG, & F. BONTE. Functional Magnetic Resonance Imaging Activation During Verbal Learning and Recognition.
Functional magnetic resonance imaging (fMRI) is increasingly being used to study cerebral activation in response to specific cognitive challenge tasks. To date, no studies have reported on fMRI activation during verbal learning or memory tasks beyond the immediate or working memory phase. Two healthy adult male volunteers underwent fMRI during baseline, verbal learning, and delayed recognition testing. A series of concrete nouns was visually presented (learning phase), with subsequent recognition required from a longer series including targets and distractors. Significant bilateral orbitofrontal activation was observed during both testing conditions compared to baseline, with somewhat greater involvement of anterior right hemisphere regions. Additional task-subtraction analysis revealed no systematic differences between verbal learning and recognition conditions. Findings suggest prominent involvement of orbitofrontal brain systems during verbal learning and recognition memory processing.
Correspondence: *C. Munro Cullum, Department of Psychiatry, University of Texas Southwestern Medical Center, 5161 Harry Hines Blvd., Dallas, TX 75235-8898, USA.*

A.J. SAYKIN, H.J. RIORDAN, L.A. FLASHMAN, J.B. WEAVER, K. CARROLL, A. MAERLENDER, T. OXMAN, L. JENKYN, D. COFFEY, & A. MAMOURIAN. Functional MRI Studies of Auditory Verbal Memory in Alzheimer's Disease.
Functional MRI permits measurement of change in local cerebral blood oxygenation associated with activation tasks. We investigated activation during memory processing in patients with mild Alzheimer's disease (AD) and healthy controls by acquiring a time series of 5-mm-thick gradient echo images through the long axis of the hippocampal formation and temporal neocortex. In experiment 1, an auditory, low-imagery word memory task included encoding, silent free recall, and recognition conditions. In experiment 2, concrete nouns were presented aurally in a cyclical experimental paradigm, alternating conditions of Perception (listening only) and Encoding (explicit memory instruction). On ROI time-course and pixel-based SPM maps, AD patients showed absent or limited activation. Extent of atrophic changes appeared related to abnormal activation patterns, indicating a need for further structure/function investigations.
Correspondence: *Andrew Saykin, Departments of Psychiatry, Radiology, and Neurology, Dartmouth Medical School, Lebanon, NH 03756, USA.*

C. SHIGAKI, B. CROSSON, C. LEONARD, R. BAUER, R. GILMORE, S. ROPER, E. FENNELL, & J. SADEK. The Relationship Between Hippocampal Volume Differences and Performance on Neuropsychological Assessment Measures in Epileptic Patients.
This study explored effects of hippocampal atrophy (estimated from magnetic resonance images) on cognitive functions. Subjects were 28 consecutive presurgical candidates for temporal lobectomy due to intractable epilepsy. They met the following inclusion criteria: age ≥16, right-handed, and Full Scale IQ ≥80. Cognitive measures included California Verbal Learning Test (CVLT), Wechsler Memory Scale-Revised (WMS-R), Logical Memory and Visual Reproduction, Rey-Osterrieth Complex Figure Test, Wisconsin Card Sorting Test (WCST), and Trailmaking Test, A and B. Correlational analyses indicated worse performance with increasing left hippocampal atrophy on the following measures: WMS-R Logical Memory delayed recall and retention; CVLT percent retained on long-delay free recall and delayed recall intrusions; and WCST perseverative errors, perseverative responses, and categories achieved. In

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sum, current findings suggest that verbal memory is negatively affected by left hippocampal atrophy, consistent with the previous literature; however, findings for the WCST suggest greater dominant than non-dominant involvement, contradicting some previous findings.
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V.N. STARBUCK, R.C. PLATENBERG, J. BLEIBERG, C.A. EBERLE, C.S. LIN, K. WARD, & A.A. HARTLEY. fMRI of Working Memory: A Case Study of Signal Enhancement with D-Amphetamine Treatment Following Head Injury.
Functional magnetic resonance imaging (fMRI) was used to measure brain activation for a 54-yr-old head-injured man on two working memory tasks (Location and Identity) and a simple Motor Task. The subject was evaluated on and off D-amphetamine treatment. fMRI analysis demonstrated significantly greater activation when the subject was on drug. Drug effects were most salient for the Location task. The posterior slices yielded more differential fMRI activation compared to the anterior slices. Significant differential activation was also observed for the Motor Task. These findings support prior electrographic and behavioral studies of D-amphetamine-mediated performance changes. Findings also support Baddeley's model of working memory.
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S. KOTLER-COPE, J.B. MILBY, R. ROSWELL, T. BOLL, J. LAMARCHE, D. MARSON, T. NOVACK, & M. PLASAY. Neuropsychological Deficits in Persian Gulf War (PGW) Veterans: A Preliminary Report.
Fifty-five PGW veterans complaining of cognitive dysfunction underwent extensive neuropsychological testing. Scores selected for high sensitivity to brain impairment were converted to standard scores using available norms. Group data analyses revealed relative weaknesses in CVLT, Boston Naming Test, and Category Test performance. Analysis of individual protocols revealed only two subjects with a significant number of scores greater than 2 *SD* below the standard score mean. The results are not consistent with a neuropathological process, and suggest the possible influence of other factors, such as exaggeration, low premorbid functioning, and/or emotional distress.
Correspondence: *Susan Kotler-Cope, Psychology Service, DVAMC, 700 S. 19th St., Birmingham, AL 35233, USA.*

MEDICAL ILLNESS

W.H. PETTIBON, C.J. GOLDEN, & L. HELDER. Neuropsychological Functioning in Patients with Chronic Fatigue Syndrome (CFS).
This study surveys neuropsychological functioning in chronic fatigue syndrome (CFS) patients and compares their performance to matched normal subjects. Level of depression and anxiety are also accounted for. Results suggest that all group differences on performance measures could be accounted for by the BDI and STAI data alone, with the cognitive data adding no significant explanation of the residual variance. Differences among the groups in terms of CFS symptoms remained, however, when BDI and STAI scores were used as covariates, indicating that emotional factors did not account for medical symptom difference among the groups. These findings would indicate that while there may be differences in neuropsychological performance between persons with CFS and normals, these differences are dependent on emotional status, rather than on organic processes.
Correspondence: *William H. Pettibon, Center for Psychological Studies, Nova Southeastern University, Ft. Lauderdale, FL 33315, USA.*

M.W. HAUT, A.M. DUCATMAN, L. MORROW, & R.K. ECKERT. Neuropsychological Functioning in Railroad Workers Exposed to Organic Solvents.
This study examined the neuropsychological performance of railroad workers with an average of 19 years of exposure to organic solvents. Most of the subjects had liver abnormalities and were actively employed. The exposed workers were significantly different from normal control subjects on tasks requiring speeded responses and cognitive flexibility. The exposed subjects demonstrated typical psychiatric symptoms of depression, anxiety, and somatic focus. However, cognitive deficits appeared unrelated to emotional status. There were no differences observed between exposed subjects with and without liver abnormalities. Further study is needed to clarify the role of hepatotoxicity in the development of cognitive deficits in solvent exposure.
Correspondence: *Marc W. Haut, Department of Behavioral Medicine and Psychiatry, Box 9137, WVU School of Medicine, Morgantown, WV 26506, USA.*

G. LANGE, S.K. JOHNSON, S. ELLIS, B.H. NATELSON, & J. DELUCA. Cognitive Dysfunction in Chronic Fatigue Syndrome: The Influence of Psychiatric Status.
The present study was designed to examine whether cognitive impairments found in chronic fatigue syndrome (CFS) subjects are a function of psychiatric status. Subjects consisted of 36 CFS patients, divided into 15 CFS subjects with a concurrent axis I disorder and 21 CFS subjects without psychiatric illness, and 31 healthy, sedentary controls. All subjects were administered a standard neuropsychological battery. Results showed that only CFS subjects without psychiatric comorbidity differed significantly from controls on tests of concentration/information processing and memory. These groups did not differ on tests assessing higher cortical functioning. Findings suggest that cognitive dysfunction in CFS subjects without psychiatric status may be due to a mild encephalopathy.
Correspondence: *G. Lange, Kessler Institute for Rehabilitation, 1199 Pleasant Valley Way, W. Orange, NJ 07052, USA.*

B.K. CHRISTENSEN, V.A. DIWADKAR, & G.S. SOLOMON. Patterns of Neuropsychological Functioning Among Solvent-Exposed Individuals: A Cluster Analytic Approach.
The World Health Organization has suggested that cognitive deficits resulting from solvent exposure are progressive and can be taxonomically classified. The current study employed a cluster analysis to differentiate subgroups in a sample of 94 solvent-exposed industrial workers on the basis of selected neuropsychological test scores. Results indicated that three patterns of neuropsychological performance best represented the data. These clusters were characterized primarily on their level of cognitive functioning. Subjects in clusters 1 and 2 performed in the average range of functioning, while subjects in cluster 3 performed poorly across a number of neuropsychological domains, including memory, visual-spatial functioning, verbal intelligence, attention, and executive functioning. Conversely, psychomotor functioning was relatively spared. Furthermore, scores on measures of anxiety, depression, irritability, and fatigue were consistent with the accepted taxonomy. Clinical implications and recommendations for future research are discussed.
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G.G. KAY, C.A. EBERLE, E. KAUFMAN, & J. HORDINSKY. The Effects of Antihypertensive Medication, Hypoxia, and Orthostatic Stress on Cognition.
Twenty individuals with borderline hypertension were enrolled in a study of the effects of antihypertensive medication, hypoxia, and orthostatic stress on cognitive functioning. All subjects received atenolol (a beta-blocker), enalapril (a calcium channel-blocker), and the placebo for 6 wk each in a randomized, double-blind, crossover fashion. Subjects were tested on subtests from the CogScreen-AE battery breathing normal air or hypoxic gas mixture designed to simulate conditions of high altitude.

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Orthostatic stress was created using a tilt table. Significantly better cognitive performance was found when subjects were taking enalapril or atenolol, compared to the placebo. This improvement in cognitive functioning appeared to be attributable to improved blood pressure. Cognitive measures were found to be differentially affected by hypoxia, tilt, and level of hypertension. The present study also serves to demonstrate the sensitivity of CogScreen-AE subtests to the subtle changes in cognitive performance associated with these factors.
Correspondence: *Gary G. Kay, Department of Neurology, Georgetown University School of Medicine, 3800 Reservoir Rd., NW, Washington, DC 20007, USA.*

N. PHILLIPS & C. MATE-KOLE. Neuropsychological Function in Peripheral Vascular Disease (PVD).
PVD and cerebrovascular disease (CVD) result from atherosclerosis. Despite increased risk of stroke, PVD patients are assumed to have normal cognitive function. Neuropsychological function was compared in 29 PVD patients (mean age = 65) and two age- and education-matched control groups: 20 CVD patients and 30 normal controls. PVD patients were impaired in problem solving and abstraction, short-term memory, attention, and visuospatial constructional ability, relative to normals, but not in language or lateralized sensory-motor function. PVD patients performed as poorly as CVD patients in some areas (attention, abstraction). Cognitive impairment related to PVD severity and the presence of heart disease, indicating that peripheral manifestations of atherosclerosis may be indicative of undetected cerebrovascular dysfunction. These data have implications for the rehabilitation potential of PVD patients.
Correspondence: *Natalie A. Phillips, Department of Psychology, Dalhousie University, Halifax, Nova Scotia B3H 4J1, Canada.*

S.R. WALDSTEIN, M.F. MULDOON, J.R. JENNINGS, C.M. RYAN, A.P. SHAPIRO, J.M. POLEFRONE, & S.B. MANUCK. Neuropsychological Sequelae of Antihypertensive Medications.
The neuropsychological sequelae of six antihypertensive agents (atenolol, metoprolol, HCTZ, methyldopaz, enalapril, verapamil) were examined in a double-blind, crossover study of 88 white, hypertensive men (ages 23–56). All treatments were associated with comparable reductions in blood pressure. Neuropsychological testing was conducted at the end of each 2-wk baseline (placebo) period and 6-wk treatment period. Test scores were adjusted statistically for practice effects based on the performance of a demographically comparable, normotensive control group ($N = 50$). Significant decrements in attention/perceptuo-motor speed (accounted for primarily by Trails B performance) were associated with all medications ($p < .01$). Additionally, all treatments were associated with mildly improved memory function ($p < .05$). These data suggest differential effects of antihypertensive agents on cognitive performance.
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K. DOMINGOS, R. McGLINCHEY, W. MILBERG, & S. McGLYNN. Assessment of Insight and Metacognition (AIM) in Patients with Anterior Communicating Artery Aneurysms.
Although anosognosia is an important neuropsychological construct, no well-validated instruments currently exist to assess its depth and scope. We developed the Assessment of Insight and Metacognition (AIM) as a multifaceted test to assess domain-specific deficits in a variety of etiologically distinct patients. The AIM was given to a group of anterior communicating artery aneurysm (ACoA) patients, in whom confabulation is common, and their care givers. The patient and rater read statements and indicated how strongly they agreed based on a four-point nominal scale. Significant denial was found in the Emotional domain, and patients were more likely to report greater motor impairment. These findings are consistent with the "frontal lobe syndrome" commonly observed in these patients; however, the anosognosia of these patients is specific to executive functions and is not global.
Correspondence: *Kevin A. Domingos, Geriatric Research, Education, and Clinical Center, West Roxbury VAMC, 1400 V.F.W. Pkwy., West Roxbury, MA 02132, USA.*

K. MEADOR, P. RAY, & D. LORING. Perceptual Threshold and Extinction to Somatosensory Stimuli in Right Cerebral Infarction.
Because extinction can be produced in healthy subjects using masks of greater intensity, sensory deficits in stroke may contribute to extinction. We examined this relationship using brief electrical stimuli in eight healthy adults and four patients with right cerebral infarction. Perceptual thresholds to single stimuli were higher for patients on the left side, and to a lesser degree on the right. Double simultaneous stimuli were given with targets at each individual's perceptual thresholds (including trials at both minimal and absolute 100% correct thresholds) and with masks 2–4× threshold to the contralateral side. Healthy subjects exhibited extinction of 95% of minimal and 30% of absolute threshold targets. Patients extinguished 100% of all left-sided targets and even extinguished 95% of larger left-sided masks when given a right-sided stimulus at absolute threshold.
Correspondence: *Kimford J. Meador, Department of Neurology, Medical College of Georgia, Augusta, GA 30912, USA.*

G. LEE, K. MEADOR, D. LORING, J. BAUZA-ARMSTRONG, C. GOVER, & D. DRANE. Wada Testing Prior to Arteriovenous Malformation Embolization: New Neuropsychological Procedures.
Eighteen superselective Wada evaluations with simultaneous electroencephalography (EEG) were conducted in six patients undergoing microcatheterization for arteriovenous malformation (AVM) embolization. Wada/EEG evaluations were performed when feeding vessels were thought to also irrigate vital portions of brain. Neurological and cognitive functions were evaluated after injection of 50–75 mg of amobarbital into the target vessels. No change in EEG, neurologic, or cognitive functions were detected in the 18 superselective Wada evaluations. Embolization with polyvinyl alcohol particles and coils were performed following all negative Wada evaluations. The only irreversible complication after embolization was a superior quadrantanopia. No other permanent neurologic dysfunction resulted from embolization. These preliminary findings suggest that simultaneous Wada/EEG evaluation may be of use in preventing neurological complications during AVM embolization.
Correspondence: *Kimford J. Meador, Department of Neurology, Medical College of Georgia, Augusta, GA 30912-4010, USA.*

A.W. KASZNIAK, S.Z. RAPCSAK, & S.L. REMINGER. Dissociations of Emotion Experience and Expression Following Ventromedial Frontal Damage.
Two patients with ventromedial frontal lesions due to anterior communicating artery aneurysm rupture, one with greater right hemisphere damage and the other with primarily left hemisphere damage, rated their emotional experience in response to emotionally relevant slides. Both patients showed emotional experience ratings that were similar to those of a group of 24 healthy controls. The patient with primarily left damage also showed bilaterally normal facial EMG changes while viewing the slides. The patient with greater right damage showed normal increases in zygomatic EMG to the positive slides, but a bilateral absence of corrugator EMG change to the negative slides. These results are consistent with the interpretation that the right ventromedial frontal cortex plays a dominant role in the bilateral facial expression of negative emotion.
Correspondence: *Alfred W. Kaszniak, Department of Psychology, University of Arizona, Tucson, AZ 85721, USA.*

D.E. EVERHART & D.W. HARRISON. Hostility Following Right CVA: Support for Right Orbital Frontal Deactivation and Right Temporal Activation.
Topographical brain mapping and QEEG techniques were used to test hypotheses of concurrent decreased activation of the right orbital-frontal region with increased activation of the right temporal region and hostility. The patient was a 44-yr-old, right-handed woman with status-post right CVA, left hemiparesis, and feelings of hostility and suspiciousness toward others. Results support a priori hypotheses, in that a relative decrease in beta activity was displayed over the right orbital-frontal region concurrent with a relative increase in beta activity over the right temporal region. Implications for the utility of topographic brain mapping and QEEG in the neuropsychological evaluation are discussed.
Correspondence: *D. Erik Everhart, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061, USA.*

A. DE WINTER, C. MEYERS, H.J. HANNAY, & P. MASSMAN. The Effects of Brain Tumor Growth Rate on Neuropsychological Test Performance.
This study investigated how neuropsychological deficits vary with the rate of brain tumor growth. A group of patients diagnosed with a rapidly growing intrinsic cerebral neoplasm was compared to a group of patients diagnosed with a more slowly growing intrinsic cerebral neoplasm. When lesion size was controlled for increased rate of tumor growth, significant differences in neuropsychological test performance were not produced. Overall, findings suggest that patient age appears to have a greater influence on neuropsychological test results than either tumor cytology or tumor volume. These findings attest to the complex interaction of lesion-related and patient-related variables on behavior.
Correspondence: *Anne De Winter, Department of Neuro-Oncology, University of Texas, M. D. Anderson Cancer Center, Houston, TX 77030, USA.*

R.S. SCHEIBEL, C.A. MEYERS, & V.A. LEVIN. Neuropsychological Measures of Focal and Diffuse Dysfunction in a Brain Tumor Population.
The influence of focal and diffuse dysfunction on neuropsychological test performance was studied in 92 adult tumor patients. Factor analysis indicated the presence of two factors, with the first characterized by relatively high loadings for measures of verbal memory, naming, and Verbal IQ. The second factor had highest loadings for the grooved pegboard and Digit Symbol. Examination of factor scores indicated that the first factor was associated with lesion lateralization, whereas the second was related to the use of radiation therapy. Significant differences were not found for tumor malignancy (i.e., histopathology) for either set of factor scores. These findings suggest that the diffuse radiation therapy side-effects and the focal effects of the lesion, as reflected by lateralization, make separate contributions to neuropsychological test scores.
Correspondence: *Randall S. Scheibel, Division of Neurological Surgery, University of Maryland Medical Center, Baltimore, MD 21201-1595, USA.*

H. COHEN, H. FORGET, A. LACROIX, & M. SOMMA. The Neuropsychology of Cushing's Syndrome: Hormonal Imbalance and Specific Cognitive Impairment.
We investigated the neuropsychological correlates of Cushing's syndrome (CS), an endocrine disorder with sustained overproduction of steroid hormones (e.g., cortisol), to help elucidate the interplay between hormonal variations and cognitive operations. Twelve patients with ACTH-dependent CS were yoked to control subjects (age, sex, education, occupation) and administered tests of verbal and conceptual fluency, reasoning and executive functions, treatment of visual and spatial information, memory performance, and attention. Multivariate and univariate analyses revealed overall differences in fluency, reasoning, and on all tests related to treatment of visual or spatial information, with poorer performance on the part of CS subjects. Except for tasks with nonverbal material, both groups showed similar performance in tests of memory and attention. The pattern of deficits suggests that (1) deficits in most cognitive functions may be associated with elevated levels of cortisol; (2) treatment of visual information is explicitly affected; and (3) hormones play an important role in the modulation of cognition and affect, and their influence on cerebral structure and function merits closer scrutiny.
Correspondence: *Henri Cohen, Laboratoire de neuroscience de la cognition, UQAM, P.B. 8888, Stn. Centre-Ville, Montréal, Quebec H3C 3P8, Canada.*

M. PAVOL, C. MEYERS, M. HISCOCK, P. MASSMAN, & B. FOREMAN. Neuropsychological Function in Adults with von Recklinghausen's Neurofibromatosis.
The cognitive function of adults with von Recklinghausen's neurofibromatosis (NF-1), as compared to adult controls, was examined. Neuropsychological tests of visual skill, attention, and language were administered and test selection was based on research with children with NF-1. It was proposed that the NF-1 group would perform more poorly on tests of attention and visual skill but that the groups would not differ on tests of language. The results of a discriminant function analysis partially supported the hypothesis. Two of the tests of visual skill (Visual-Motor Integration, Judgment of Line Orientation) and one of the language tests (Peabody Picture Vocabulary-Revised) were found to be the best predictors of group membership. The relationships among the variables and suggestions for future research are discussed.
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J. DIJKSTRA, P. HOUX, J. LANGEMEIJER, R. ACKERSTAFF, & J. JOLLES. Coronary Artery Bypass Graft (CABG): Cognitive Recovery and Age.
Postoperative cognitive dysfunctions were assessed pre- and postoperatively in middle-aged and elderly patients who had undergone CABG surgery. Short-term cognitive impairments were found 10 d after the operation. Elderly patients had a disproportionately impaired performance on a learning task compared to middle-aged patients. After 6 wk, all patients were back at their preoperative performance level, when group means were considered. However, when assessed on an individual basis, 40% of the patients still had an impaired performance after 6 wk (this figure was 80% immediately before discharge from the hospital). Thus, it is important to analyze changes on an individual rather than group basis when evaluating cognitive dysfunctions after operation. The results support the notion that age plays a role in susceptibility to postoperative cognitive dysfunction.
Correspondence: *J. B. Dijkstra, Department of Psychiatry and Neuropsychology, University of Limburg, P.O. Box 616, 6200 MD Maastricht, The Netherlands.*

D. DEMAREST, J. HOGG, D. WILSON, & C. CHILDERS. Kluver-Bucy Syndrome Following Herpes Simplex Encephalitis: A Case Study.
A patient (S.W.) seen in a rehabilitation center presented with a classic presentation of Kluver-Bucy syndrome (KBS) status post-herpes simplex encephalitis. KBS is a rare behavioral syndrome, often chronic and irreversible. The KBS syndrome involves hyperorality, marked exploratory behavior (hypermetamorphosis), aggressive behavior or placidity, hypersexuality/abnormal sexual behavior, amnesia, visual agnosia (sometimes referred to as "psychic blindness"), and development of seizures. This patient presented with clear abnormalities of behavior across each of these domains. Cognitively, SW showed severe memory impairment (poor recent and remote memory), confused speech and impaired language functioning, severe visual-spatial impairment, decreased initiation, poor motor persistence, and anosognosia. Implications of her

particular behavioral disturbances and its prognosis for management post-hospitalization and difficulties of family care are discussed.
Correspondence: *D. Demarest, Department of Physical Medicine and Rehabilitation, University of Missouri Health Sciences Center, One Hospital Dr., Columbia, MO 65212, USA.*

R. HANLON. Motor Learning Following Stroke: Effects of Contextual Interference.
Recent research in motor learning has revealed that traditionally accepted ideas about learning motor skills are not invariably true. The effect of contextual interference, which involves the enhanced retention of skills learned under conditions of high intratask interference or random practice, has been consistently demonstrated in experimental motor learning paradigms. A controlled group study was designed to examine the effect of different learning schedules on rate of acquisition and retention. Twenty-four unilateral stroke patients with chronic hemiparesis were examined using a functionally oriented movement sequence. Retention of the task by subjects who learned the task under conditions of contextual interference was significantly better than subjects who learned the task across repeated uninterrupted trials. The implications of this finding for stroke patients undergoing neurologic rehabilitation are discussed.
Correspondence: *Robert Hanlon, Department of Neurology, Washington University School of Medicine, 660 S. Euclid, Box 8111, St. Louis, MO 63110, USA.*

M.-S. HUA & C.-C. HUANG. Neuropsychological Follow-up Study of Carbon Disulfide-induced Polyneuropathy.
In initial and follow-up investigations of neuropsychological function in eight and six patients, respectively, with carbon disulfide-induced polyneuropathy, patients' scores were compared with those of a group of normal control subjects matched for age and education. Each subject received a comprehensive neuropsychological examination. On the initial examination, the results indicate that the patients had deficits in visual perception of irregularly geometric figures, auditory and visual sustained attention, selective attention, cognitive flexibility and concept formation, manual dexterity of both hands, and motor speed of the nondominant hand and a depressive mood. Such an impairment picture is almost compatible with the previous observations of workers with chronic exposure of carbon disulfide. The follow-up study was undertaken about 2 yr later. The results show no remarkable changes of cognitive and emotional state. The issue regarding the reversibility of impaired neuropsychological function in persons with chronic carbon disulfide poisoning after a removal from the toxic environment together with medical treatment is discussed.
Correspondence: *Mau-Sun Hua, Department of Psychology, National Taiwan University, Taipei 10764, Taiwan.*

H.M. YURK, N.H. PLISKIN, L.T. HO, & J.G. UMANS. The Interaction of Neuropsychological and Psychological Functioning in Well-Dialyzed End-State Renal Disease Patients.
Psychological distress has commonly been reported in patients with end-stage renal disease (ESRD). However, variable findings across studies due to serious methodological inconsistencies have been documented. Thus, one of the purposes of the present study was to clarify psychological function in a group of ESRD patients with controlled treatment parameters. Additionally, the effect of psychological distress on the neuropsychological function of these patients was investigated. Sixteen patients with ESRD on chronic hemodialysis underwent a comprehensive neuropsychological evaluation. Results indicated that in this sample of well-dialyzed, well-nourished, and medically stable ESRD patients, significant psychopathology was not evident. Additionally, higher levels of psychological distress further compromised performance on neuropsychological measures. This investigation is critical given the fact that the neuropsychological function of these patients is directly related to their survival and quality of life.
Correspondence: *Helene Yurk, Department of Psychiatry, University of Chicago, 5841 S. Maryland Ave., Chicago, IL 60637, USA.*

A.C. MILLER, B. GIORDANI, S. BERENT, G.R. ANTROBIUS, D.E. SCHTEINGART, & M.N. STARKMAN. Learning and Memory in Cushing's Disease.
Few studies have examined the cognitive performance of patients with Cushing's disease (CD). We assessed memory ability in 22 patients with first episode, untreated CD matched one-to-one for gender, age, and education to 22 healthy, normal controls (NC). CD patients scored significantly lower than NC subjects on attention/concentration and initial learning of both verbal and visual material. Significant negative correlations also were found between patients' 24-h urinary free-cortisol levels and several of these measures. Percent delayed verbal and visual recall scores did not differ between the groups. Motivation and general health did not appear to underlie CD deficits, as no differences between patients and controls were found in mood or psychomotor ability. Learning and attention appear to be particularly vulnerable in CD.
Correspondence: *A.C. Miller, Division of Neuropsychology, Department of Psychiatry, University of Michigan, 1500 E. Medical Center Dr., Ann Arbor, MI 48109, USA.*

M. McCREA, C. RANDOLPH, A. BLEI, G. VESSEY, & J. CORDOBA. Neuropsychological Detection and Characterization of Subclinical Hepatic Encephalopathy.
The diagnosis of subclinical hepatic encephalopathy (SHE) is applied to those individuals with cirrhosis who have no overt mental status or neurological abnormalities on clinical examination, yet exhibit some type of neuropsychological deficits on formal testing. To date, however, there is little agreement as to the nature of neuropsychological deficits that characterize SHE or what tests are best suited for its detection. The present study attempted to elucidate a neuropsychological profile of SHE. A group of chronic liver disease patients was compared to controls carefully matched by age, sex, education, and alcohol history on a battery of tests. Findings suggest significant impairment of attentional functions and fine motor skills in liver patients compared to healthy controls, with relative preservation of general intellectual abilities, memory, language, visuospatial skills, and executive functions. The results are discussed with respect to the neuropsychological detection of SHE and hypotheses regarding the putative neuropathophysiology of the disorder.
Correspondence: *Michael McCrea, Departments of Psychiatry and Neurology, Northwestern University Medical School, 303 E. Superior, Chicago, IL 60611, USA.*

D.C. GARRON, C.L. GROTE, C.M. D'ANGELO, M.E. MENKEN, D.M. OLESKE, & W.G. RYAN. Phobias in Patients with Transsphenoidal Resections of Pituitary Adenomas.
Behavioral disturbances have been associated with pituitary adenoma (PA). However, reports are largely anecdotal, predate modern imaging techniques, and involve neurosurgical lesions and large PA compromising the hypothalamus, frontal, and/or temporal lobes. We report comprehensive psychiatric diagnostic telephone interviews (NIMH Diagnostic Interview Schedule III-R) of a representative sample of 37 adults who had transsphenoidal resection. PA were typed (intra- versus extra-sella, frontal and/or temporal lobe encroachment). The only diagnosis to exceed population base rate ($p < .01$) was "phobia" (11/37 = 29.7% versus 12.5% in the general population). Demographic, cognitive, and clinical variables were not associated with phobias. Anxiety theories implicating the hypothalamic-pituitary-adrenal axis in anxiety and mood disorders are consistent with the occurrence of phobias in PA.
Correspondence: *David C. Garron, Department of Psychology and Social Sciences, Rush-Presbyterian-St. Luke's Medical Center, 1653 W. Congress Pkwy., Chicago, IL 60612, USA.*

Symposium 5/11:00 a.m.–12:30 p.m.

ARE VARIATIONS IN COGNITIVE ABILITIES RELATED TO VARIATIONS IN BRAIN ORGANIZATION?

Organizer and Chair: Sheri A. Berenbaum

S. BERENBAUM. Are Variations in Cognitive Abilities Related to Variations in Brain Organization?
There has been increased recent interest in examining the ways in which individual differences in behavior can be tied to individual differences in brain structure and function. The participants in this symposium will discuss how variability in abilities can (or cannot) be traced to variability in the neural substrate(s) underlying those abilities. Data will be presented from both normal and clinical samples using various methods (cortical stimulation, anterior temporal lobectomy, regional metabolism, and morphological measures). Relationships between brain function and cognition are not simple, and suggestions are made for future investigations in this area.
Correspondence: *Sheri Berenbaum, Department of Behavioral and Social Sciences, 6517, Southern Illinois University School of Medicine, Carbondale, IL 62901, USA.*

K. PERRINE, O. DEVINSKY, S. PACIA, & W. DOYLE. Factors Related to Atypical Language Localization.
We examined the localization of naming and reading by subdural grid cortical stimulation in 31 left hemisphere language-dominant patients with left temporal lobe seizure onsets. Patients with anterior (<4.5 cm from the temporal pole) or inferior (middle or inferior temporal gyri) language sites were younger and had poorer preoperative language test scores than patients with more typical perisylvian language sites. Bilingual or Spanish-speaking patients more frequently had atypical than typical language representation. These results confirm findings of previous studies and suggest that baseline language functioning and patient variables affect the localization of naming and reading in the temporal lobe. Atypical language localization should be considered when planning surgery in bilingual patients or those with poor baseline language.
Correspondence: *Kenneth Perrine, Departments of Neurology and Neurosurgery, HJD-NYU School of Medicine, 301 East 17th St., New York, NY 10003, USA.*

S. BERENBAUM, M. SIEDENBERG, L. BAXTER, & B. HERMANN. Variability in Memory Outcome Following Anterior Temporal Lobectomy.
We examined effects of anterior temporal lobectomy on variation in memory. Women had higher memory scores than men before and after surgery, suggesting that sex differences in memory are not due to differences in the integrity of the hippocampus. With respect to individual differences in memory after surgery, the biggest predictor of postoperative memory was preoperative memory ($R^2 = .36$); there was additional significant variance attributed to hippocampal pathology (10%), side of surgery (7%), and the interaction between side of surgery and pathology (2%) (low scores associated with removal of a left nonpathological hippocampus). Inclusion of other ability measures generally did not improve prediction. Our data suggest that individual differences (including sex differences) in declarative memory are not simply reflections of differences in the hippocampus.
Correspondence: *Sheri Berenbaum, Department of Behavioral and Social Sciences, 6517, Southern Illinois University School of Medicine, Carbondale, IL 62901, USA.*

J. LEVY, N. WAGNER, M.P. GRATTAN, & M. COOPER. Covariations in Patterns of Brain Metabolism and Behavior.
We measured regional cerebral metabolism (rCM) on two occasions at least 2 wk apart in normal male subjects as they performed a visual monitoring task. A digital clock provided response-time feedback on each trial. Additionally, we assessed the subjects' perceptual asymmetries on verbal and nonverbal tasks. Patterns of rCM remained stable between the two scans, as did reaction time (RTs). Patterns of metabolism, as indexed by metabolic factor scores on a Principal Components Analysis, were predictive of subjects' behavioral factor scores for five behavioral measures.
Correspondence: *Jerre Levy, Department of Psychology, University of Chicago, 5848 S. University Ave., Chicago, IL 60634, USA.*

R.T. SCHULTZ. Conceptual and Methodological Issues in Structure-Function Relationships.
During the past decade, structural magnetic resonance imaging (MRI) of the brain has advanced our understanding of morphological variation associated with normal and disordered cognition. However, several critical methodological and conceptual issues regarding the measurement of tissue volume continue to impede progress. Methodological considerations include matching samples on age, sex, SES, IQ and handedness, and specific image measurement problems. Additionally, this review will focus on perplexing conceptual issues, including (1) sex differences in brain and body size, (2) interpretation of the all-positive correlation matrix for the size of separate brain regions, and (3) the meaning of tissue volume as it relates to cognitive ability. Examples from structure-function MRI studies of general intelligence, dyslexia, and autism will be given to illustrate these issues.
Correspondence: *Robert T. Schultz, Child Study Center, P.O. Box 207900, Yale University School of Medicine, New Haven, CT 06520-7900, USA.*

Symposium 6/11:00 a.m.–12:30 p.m.

PERSIAN GULF SYNDROME: COGNITIVE, PSYCHIATRIC, AND NEUROPSYCHOLOGICAL ASPECTS

Organizer and Chair: Lisa A. Morrow

L. MORROW. Persian Gulf Syndrome: Cognitive, Psychiatric, and Neurophysiological Aspects.
A number of veterans returning from the Persian Gulf War report multisystem health complaints, including changes in mood and cognitive abilities. Currently, there are few data available to document that deficits exist. This symposium presents findings from four Veterans Affairs centers investigating persons who served in the Persian Gulf War. Cognitive, emotional, and neurophysiological results (event-related potentials) are reported. Additionally, findings from a group of veterans exposed to a known toxin, depleted uranium, are presented. While all of the findings suggest significant emotional distress in this population, emotional state was not related to performance on the cognitive measures. The cognitive deficits tend to be mild and involve tasks that require complex memory processes and speed of information processing. Neurophysiological testing revealed significant delays in P300 latency. While the etiology of the Persian Gulf syndrome is unclear, it is likely that there are multiple etiologies and multiple subtypes.
Correspondence: *Lisa Morrow, Western Psychiatric Institute and Clinic, 3811 O'Hara St., Pittsburgh, PA 15213, USA.*

J. WOLFE, S. PROCTOR, J. DUNCAN, M. SULLIVAN, & R. WHITE. Association of PTSD with Health Complaints and Cognitive Deficits Following Persian Gulf Deployment.
The Ft. Devans ODS Survey assessed nearly 3,000 men and women following rapid deployment to the Persian Gulf in 1991. Findings from the 5-d return indicated mean PTSD rates of 6%, with higher rates in women. At 2 yr, rates of PTSD had increased moderately overall. Reports of physical health status revealed that 25% of the sample noted

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substantial adverse changes in health, with an average number of five discrete health symptoms, including memory loss. Although PTSD symptomatology was positively correlated with poor health, not all veterans endorsing health problems had symptoms indicating psychological distress, suggesting heterogeneity among both deployment exposures and subsequent outcome. Data on purported environmental exposures, psychological stressors, psychosocial and health status, and cognitive patterns on standardized neuropsychological testing are presented that help to elucidate a potential spectrum of Persian Gulf syndromes.
Correspondence: *Jessica Wolfe, National Center for PTSD and Boston Environmental Hazards Research Center, 150 S. Huntington, Boston, MA 02130, USA.*

J. MORGAN & D. DaSILVA. Neuropsychological Impairment Among Persian Gulf Veterans: A Preliminary Report.
The Persian Gulf syndrome has recently received much media coverage. Veterans returning from operation Desert Storm have reported numerous physical, psychological, and cognitive complaints at V.A. Medical Centers across the country. Cognitive complaints primarily concern memory impairment, attention/concentration deficits, and reduced judgment and overall cognitive efficiency. We report on the comprehensive neuropsychological evaluations of seven patients referred for evaluation of their subjective cognitive complaints. Results revealed severe impairment in three patients, mild impairment in one, and no impairment in three. An age effect was observed in which the oldest patients were the most severely impaired. The level of impairment noted is far greater than one would expect in functional affective disturbance alone (i.e., PTSD). Such impairment was noted primarily in the area of higher cortical functions.
Correspondence: *Joel E. Morgan, Gulf War Research Center, VAMC, 385 Tremont Ave., East Orange, NJ 07019, USA.*

R.L. KANE, R.K. DiPINO, B. KAUP, F. HOOPER, & J. KEOGH. Neuropsychological and Psychiatric Findings in Gulf War Participants Exposed to Depleted Uranium.
This study presents initial findings from 30 Gulf War participants exposed to depleted uranium (DU). Subjects were men with a mean age of 28 and a mean education level of 12.6. As a group, DU-exposed subjects performed various neuropsychological measures well. When data were analyzed for each individual, a number of patients performed poorly compared to their age-, education-, and sex-based norms. However, premorbid factors may have played a role and there was no substantial relationship between urine uranium and cognitive test performance. Mean scores for PAI validity and clinical scales were all within the normal range. However, 3rd quartile scores relating to traumatic stress and hypervigilance were above T-scores of 70. PAI and psychiatric assessment data both indicated PTSD was an important clinical factor.
Correspondence: *Robert L. Kane, Psychology, V.A. Medical Center, 10 N. Greene St., Baltimore, MD 21201, USA.*

S.R. STEINHAUER, S.R. BEERS, G. GOLDSTEIN, W.J. SHEMANSKY, & L.A. MORROW. Neurophysiological and Neuropsychological Characteristics of Gulf War Veterans.
Neurobehavioral characteristics of 21 Gulf War veterans were compared to controls and to individuals with histories of exposure to organic solvents. Veterans all reported complaints following their service in the Persian Gulf. The latency of the P300 component of the event-related brain potential was prolonged in the veterans compared to controls. A subgroup showed even more severe prolongation, similar to patients with solvent encephalopathy. The veterans and exposed patients showed equivalent visual sensitivity decrements on a Continuous Performance Test. An index of neuropsychological impairment was significantly greater for veterans than for healthy controls. Findings indicate that this group of veterans includes those with deficits similar to those observed in persons with organic solvent exposure.
Correspondence: *Lisa Morrow, Western Psychiatric Institute and Clinic, 3811 O'Hara St., Pittsburgh, PA 15213, USA.*

Special Topic/11:00 a.m.–12:30 p.m.

WHY THERE ARE COMPLEMENTARY LEARNING SYSTEMS IN THE BRAIN: INSIGHT FROM THE SUCCESSES AND FAILURES OF CONNECTIONIST MODELS

J.L. McCLELLAND. Why There are Complementary Learning Systems in the Brain: Insights from the Successes and Failures of Connectionist Models
I discuss the role of the hippocampus and neocortex in learning and memory, drawing on research in humans, primates, rats, and computers. The main claim is that the learning systems in the brain must do two very different things. They must extract the structure that is common to diverse experiences, and they must retain information that is specific to individual experiences. Connectionist learning models have produced breakthroughs in the extraction of common structure, but these same models are totally inadequate for memorizing specific items one after the other. Neuropsychological work with humans and physiological studies in rats and monkeys indicate that the hippocampus and related structures are necessary for memorizing specific items, but the removal of these structures leaves the gradual acquisition of many types of general skills intact. These observations led to a theory about the specific functions of cortical and hippocampal learning mechanisms that explains several aspects of hippocampal amnesia, including its temporally graded retrograde aspect. Simulations of retrograde amnesia experiments will be presented, and the possible significance of species, task, and age differences in the time course of retrograde amnesia will be considered.
Correspondence: *James L. McClelland, Center for the Neural Basis of Cognition, Carnegie Mellon University, Pittsburgh, PA 15213, USA.*

SATURDAY AFTERNOON, FEBRUARY 17, 1996

Paper Session 19/1:30–3:20 p.m.

EXECUTIVE FUNCTION

D. STRITE, H.J. HANNAY, & C.A. MEYERS. The Category Test Revisited: An Analysis of Memory, Perseveration, and Location.
In an effort to derive more information from the Booklet Category Test than just the Total Error score, several new measures were derived to investigate perseverative responses, responses to repeated items that may involve verbal and nonverbal memory, and qualitative differences in types of repeated items. Category Test data from 103 patients with malignant cerebral gliomas were subjected to ANCOVA analysis using the perseveration and memory measures as dependent variables, and treatment, age, education, and sex as covariates. The right hemisphere group scored significantly worse on total errors and the perseveration measures. No significant differences between temporal, parietal, and frontal groups were observed. These results suggest that the Category Test is sensitive to right-hemisphere lesions, but not to frontal lesions.
Correspondence: *Daniel Strite, Department of Psychology, University of Houston, Houston, TX 77204-5341, USA.*

D.D. CORREA & R.W. BUTLER. Complex Verbal Fluency: Differential Impairment in Patients with Frontal and Nonfrontal Intracranial Tumors.
The study examined the performance of patients with frontal ($N = 22$) and nonfrontal ($N = 13$) brain tumors on a measure of complex verbal fluency (i.e., possible jobs test) and on tests traditionally associated with frontal lobe functioning (e.g., WCST, Verbal Fluency test). The two groups were significantly different on the complex fluency task, with frontal patients producing fewer possible jobs than did nonfrontal patients. There were no significant group differences on any of the other tests. This confirms previous findings reporting lack of specificity for some of the frequently used measures of frontal lobe functioning. The findings also suggest that complex verbal fluency measures may be particularly useful to assess frontal lobe dysfunction.
Correspondence: *Denise D. Correa, Department of Neurology/Psychiatry, Memorial Sloan-Kettering Cancer Center, 1275 York Ave., New York, NY 10021, USA.*

M.A. PAVOL, M.C.S. HARNADEK, & J.P. GIRVIN. Executive Dysfunction Following Unilateral Supplementary Motor Area Resection.
This study describes a left-handed patient who, following unilateral right supplementary motor area (SMA) corticectomy, displayed prominent impairment of planning and organization skills. The patient's immediate postoperative behavioral changes were consistent with the reported effects of a motor-dominant SMA resection (e.g., alien hand syndrome, dyspraxia, motor sequencing deficits). These difficulties had resolved by 2 months, although a significant deficit in planning and organization skills persisted. Furthermore, changes in emotional and personality functioning were noted, including reduced self-initiation, flattened affect, blunted emotional expression, and reduced empathy. Postoperative MRI scans revealed the known right SMA lesion, but were otherwise unremarkable. This case is unique for demonstrating executive dysfunction following unilateral SMA resection.
Correspondence: *M.A. Pavol, Psychological Services, University Hospital, London, Ontario N6A 5A5, Canada.*

D. GANSLER, P. KODITUWAKKU, N. MOCZYNSKI, & P.K. DUFF. Deficient Planning Ability in Patients with Traumatic Brain Injury.
Planning is a complex cognitive ability subserved by a distributed neural network involving the prefrontal cortex and basal ganglia. Case reports have implicated planing impairments following frontal lobe lesion that result in psychosocial decline. Given the association of frontal dysfunction and traumatic brain injury (TBI), there is a surprising lack of systematic study of planning ability following TBI. Little is known of the incidence, severity, or neuropathological basis of planning problems following TBI. In this study 33 TBI patients performed significantly worse than 20 normal controls on the Progressive Planning Test (PPT). The PPT follows the Tower of London paradigm but is more sensitive. Motor vehicle accident survivors performed more poorly than survivors of falls or assaults, linking shearing lesions with planning deficits.
Correspondence: *David A. Gansler, Department of Psychiatry, Tufts University School of Medicine, 750 Washington St., Boston, MA 02111, USA.*

B. LEVINE, J.S. KIXMILLER, D.T. STUSS, & W.P. MILBERG. Time Estimation and Memory for Intentions: Comparison of Brain-Damaged Patients with Unique Lesion Configurations.
To investigate the role of frontal systems in the execution of intended behaviors and time estimation, we asked subjects with focal frontal lesions, traumatic brain injury (TBI), amnesia, and normal young and old subjects to estimate time prospectively by placing check marks at 1-min intervals when distraction was present or absent. Systematic differences in patterns of responding were observed across groups. When distraction was present, amnesics and, to a lesser extent, subjects with focal frontal lesions placed fewer check marks than their respective controls. Focal frontal lesions, TBI, amnesia, and aging were associated with delayed check mark placement when distraction was present, but accelerated check mark placement when there was no distraction. The findings were attributed to group differences in the application of strategies across the two conditions.
Correspondence: *Brian Levine, Rotman Research Institute, Baycrest Centre for Geriatric Care and University of Toronto, 3560 Bathurst St., North York, Ontario M6A 2E1, Canada.*

N. RAZ, D. HEAD, F. GUNNING, & J.D. ACKER. Neural Correlates of Working Memory and Strategic Flexibility: A Double Dissociation Study.
We examined dissociation of the neural substrates of nonverbal working memory and strategic flexibility. Two tests of nonverbal working memory (WM) with a substantial mental imagery component and the Wisconsin Card-Sorting Test (WCST) were administered to 49 healthy adults (age 18–77 yr). The volumes of dorsolateral prefrontal cortex (DLPFC) and the fusiform gyrus (FG) were estimated from MRI images and adjusted for height. Path analysis of hierarchical four-variable models revealed a double dissociation. Both chronological age and the height-adjusted volume of the FG explained significant and unique proportion of variance in nonverbal WM; the height-adjusted volume of DLPFC, but not age, predicted perseveration on WCST. There were no significant effects of FG volume on perseveration or DLPFC volume on WM.
Correspondence: *Naftali Raz, Department of Psychology, University of Memphis, Memphis, TN 38152, USA.*

I. KISS, C. PISIO, & H. PAZDERKA-ROBINSON. Electrophysiological Evidence for Modality Independence of the Central Executive.
Event-related potentials (ERPs) were used to test Baddeley's model, which posits a single central executive (CE) that applies processes to working memory (WM) stores, regardless of stimulus modality. Random length series of three to nine single digits were presented auditorily and visually. Each series was followed by a cued target set of three digits. Each set was compared to the preceding three individual digits, requiring ongoing revision of WM contents (updating). ERPs were recorded separately for each serial position. Digital subtraction minimized perceptual and response-related influences to permit isolation of ERP correlates of cognitive processes. Visual and auditory ERP magnitudes increased with serial position when subjects revised a stored memory set, but not during storage, consistent with CE activity. ERP latency and topographic similarities across modalities further support a single CE.
Correspondence: *Ivan Kiss, Department of Psychology, Edmonton General Hospital, 11111 Jasper Ave., Edmonton, Alberta T5K 0L4, Canada.*

Paper Session 20/1:30–3:20 p.m.

MEMORY—2

J. BARRASH. Neuropsychological Correlates of Route Learning: The Roles of Scene Recognition and Spatial Learning.
Neuropsychological impairments contributing to defects in real-life route learning (RL) were investigated in 42 patients with focal lesions. In addition to established measures, the Scene Recognition Test (SRT) and Visuospatial Route Learning Test (VRLT) were developed, respectively, to assess RL solely by visuoperceptual information, or solely by spatial cues without distinctive visual features. SRT performance predicted 35% of RL variance ($p < .001$), whereas VRLT predicted only 9%. Regression analysis showed that Rey-Osterrieth CFT-delayed recall and SRT together predicted 58% of RL variance ($p < .0001$). Ability to learn distinctive visual features (of relatively ambiguous scenery or a geometric figure) make significant unique neuropsychological contributions to RL. This is consistent with earlier findings that route learning defects are

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associated with lesions in visual association cortices and hippocampal regions.
Correspondence: *Joseph Barrash, Department of Neurology, The University of Iowa College of Medicine, Iowa City, IA 52242-1009, USA.*

R. KRIKORIAN. Configural Processing in Spatial Paired Associate Learning.
Performance data for a newly developed spatial paired-associate learning (PAL) procedure are reported for a young adult sample. Performance on the spatial PAL was predicted exclusively by a configural attention measure. Men performed better than women, and there was no relationship with performance on a verbal PAL. The results supported the notion that this procedure elicits configural, as opposed to sequential and verbal, information processing and that configural processing demands may be quite different from those involved in parallel verbal procedures. The data, overall, suggest that this instrument may be useful in both clinical and experimental contexts.
Correspondence: *Robert Krikorian, Department of Psychiatry, University of Cincinnati College of Medicine, 231 Bethesda Ave., Cincinnati, OH 45267-0559, USA.*

A. DOMINICK & R.S. LEWIS. Priming and Prospective Remembering.
Despite the fact that indirect tasks have been extremely useful in discoveries of dissociations between explicit and implicit processing of information in a variety of neuropsychological populations, there have been virtually no studies using indirect measures, such as priming, with prospective remembering tasks. As the first step in understanding priming associated with prospective remembering tasks with neuropsychological populations, priming associated with retrospective and prospective tasks were studied in normal participants. Eight-one undergraduates were administered a retrospective task on a Monday and told to complete a prospective task on Wednesday (without use of memory aids). Independently, subjects were asked to participate in a category free-association study, which was used to measure priming associated with the two tasks. Priming associated with the two tasks did not differ over the course of the week except for Wednesday, just prior to when the prospective task was to be completed. Priming associated with the prospective task was more significant than for the retrospective task. Furthermore, greater priming was found for subjects remembering to carry out the intended task. Together, increasing priming prior to carrying out an intended task and higher priming in participants who remembered to carry out the intended task suggest that priming is associated with successful prospective remembering. If this is true, priming may be a memorial mechanism that facilitates prospective remembering, and may be impaired in neuropsychological populations with deficient prospective remembering.
Correspondence: *A. Dominick, Department of Psychology, Pomona College, Claremont, CA 91711, USA.*

A. SCHNIDER, C. VON DÄNIKEN, & K. GUTBROD. Spontaneous Confabulations: A Temporal Order Recognition Failure.
Recent hypotheses consider confabulations to be based on the combination of amnesia with a frontal dysexecutive syndrome. Spontaneous confabulations are thought to differ from provoked confabulations in degree rather than mechanism. We examined a series of amnesic patients and found that: (1) Spontaneous confabulators do not produce more provoked confabulations than other amnesic subjects, implying that spontaneous and provoked confabulations are not simply different degrees of the same disorder. (2) Amnesia measured in a recognition task predicts neither the presence, severity, or type of confabulations. Thus, a failure to simply store new information is irrelevant to both types of confabulation. (3) Spontaneous, but not provoked, confabulations are associated with a failure to recognize the temporal order of stored information.
Correspondence: *Armin Schnider, Division for Neuropsychological Rehabilitation and Department of Neurology, University Hospital, CH-3010 Bern, Switzerland.*

S.P. CERCY & J.B. RICH. Phonemic and Semantic Verbal Fluency in Amnestic Syndrome and Alzheimer's Disease.
Alzheimer's disease (AD) patients' disproportionate impairment on semantic relative to phonemic fluency tasks has been attributed to a breakdown in the structure of semantic knowledge. This study examined semantic (supermarket items, animals) and phonemic (C, F, and L) verbal fluency in 13 patients with amnestic syndrome (AS), 20 patients with AD, and 40 normal control (NC) subjects. Although semantic fluency was superior to phonemic fluency overall, this effect was most pronounced in the NC group. Both patient groups demonstrated relatively worse semantic than phonemic fluency compared to NC subjects. Given the AS patients' intact intellectual functioning, this finding suggests that impaired memory rather than impaired intelligence is a primary determinant of semantic fluency deficits in both AD and AS.
Correspondence: *Steven P. Cercy, Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287-7218, USA.*

B.J. DIAMOND, A.R. MAYES, & P.R. MEUDELL. Stochastic and Nonstochastic Processes in Amnesia: Implicit and Explicit Indices of Memory and Relationships to Awareness and Frontal Lobe Function.
The subjects in this experiment consisted of six amnesics representing a diverse aetiological spectrum, which included one Korsakoff amnesic (B.D.) two postencephalitic amnesics (J.E. and R.S.), one amnesic meningitic patient (N.M.), and two amnesic patients who had had ruptured and repaired anterior communicating artery aneurysms (D.F. and A.B.) and a matched control group. Four important findings emerged from this study. First, autonomic discrimination and recognition exhibited an inverse relationship. Second, lower levels of autonomic activity at learning appeared to be better predictors of subsequent autonomic discrimination in amnesics, while the inverse was true in controls. However, both groups showed better recognition for those items for which they had evinced greater levels of activity at encoding. Third, greater frontal involvement appeared to be associated with better autonomic discrimination. Fourth, no relationship could be found between the extent of frontal involvement and recognition. These results may suggest that those mechanisms that mediate explicit (recognition) and implicit memory (as indexed by autonomic measures) do not show stochastic independence. Interestingly, while greater frontal involvement appeared to predict better autonomic discrimination, frontal involvement did not appear to be related to in any systematic way to recognition. Overall, mechanisms mediating awareness and frontal activity appear to exert differential effects on the processes mediating recognition and autonomic discrimination.
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A. SCHNIDER, C. VON DÄNIKEN, & K. GUTBROD. Mechanism of Disorientation in Amnesia.
Disorientation is generally considered to be due to acute confusion or amnesia. Alternatively, it might be based on an inability to recognize the temporal order of stored information, making it difficult to keep track of ongoing events. We tested a series of severely amnesic subjects with two runs of a continuous recognition task. The first run measured item recognition (IR). Comparison of the second run with the first run measured temporal order recognition (TOR). We found that all dimensions of disorientation and both wrong orientation and lack of orientation were very accurately predicted by the TOR failure. IR contributed very little to the prediction of disorientation. Given the known anatomical basis of failed TOR and IR, disorientation represents an impairment of the frontal lobe contribution to memory.
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Paper Session 21/1:30–3:20 p.m.

PARKINSON'S DISEASE

D.L. HARRINGTON & K.Y. HAALAND. Neural Systems In Temporal Processing.

Controversy exists about whether timing is a localized or a distributed process. This study examined the role of the basal ganglia and the cerebral hemispheres, as temporal processing functions have been ascribed to these systems. We studied 23 right-hemisphere (RH) and 23 left-hemisphere (LH) stroke subjects, 34 subjects with Parkinson's disease (PD), and 47 control subjects. Subjects completed two motor timing tasks (a fixed 300 or 600 ms intertap interval), two perceptual timing tasks (a 300 and 600 ms SOA between tone pairs), and an auditory processing control task (frequency perception). The total variability in motor timing was decomposed into a clock and a motor implementation source. The PD group was impaired in the clock, but not the motor variance. Both stroke groups were impaired in the clock variance and deficits in motor variance were found for the 600 ms intertap interval. Perceptual timing was impaired in the PD and RH groups, but not in the LH group. Only the two stroke groups showed auditory processing deficits. The results implicate the basal ganglia and/or the thalamocortical circuits in timing. The potentially confounding role of auditory processing deficits with hemispheric damage is discussed and further explored in analyses of intrahemispheric lesion location.

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T. LINEWEAVER, W. HEINDEL, D. SALMON, V. RICE, & N. BUTTERS. Memory for Motor Movements in Patients with Parkinson's Disease.

Memory impairment has been studied extensively in a variety of dementing disorders, but primarily with verbal or visual stimuli. In the present study, 10 nondemented, 8 demented Parkinson's disease (PD) patients, and 18 normal control subjects were compared on a movement memory recognition test that utilized high and low imagery movements. Demented, but not nondemented, PD patients were impaired on this task relative to the normal control subjects primarily due to a tendency to respond "yes" to high-imageable and "no" to low-imageable movements. Thus, impaired memory for movements may be a salient feature of the dementia associated with PD and may be related to known deficits in visuospatial information processing and procedural motor skill learning.

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J.V. FILOTEO, D.C. DELIS, D.P. SALMON, E. FORD, T. DEMADURA, & M.J. ROMAN. Endogenous and Exogenous Shifts of Attention in Patients with Parkinson's Disease: Impairment in the Inhibition of Attentional Shifts.

Endogenous and exogenous shifts of attention were examined in nondemented patients with Parkinson's disease. In the endogenous condition, an arrow was used to cue subjects' attention to the possible location of an impending target, whereas in the exogenous condition, a brightened box was used to cue attention. Cues were either valid (i.e., the target appeared in the cued location) or invalid (i.e., the target appeared in a non-cued location). The time between cue onset and target onset (stimulus onset asynchrony or SOA) was varied in each condition. The results indicated that PD patients were not differentially impaired in shifting attention at the shorter SOAs relative to normal controls. However, at longer SOAs, the PD patients demonstrated less of an effect from cueing than did the normal control subjects. PD patients' differential effect from cueing was evident in both exogenous and endogenous conditions. These results indicate that PD patients may be impaired in inhibiting the shifting of attention back to a previously cued location. Moreover, these findings further support the notion that the basal ganglia may play an important role in inhibitory processes.

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D. KEMMERER & L. HERSHEY. Impaired Comprehension of Raising-to-Subject Sentences in Parkinson's Disease (PD).

Previous studies have reported sentence comprehension deficits in PD patients. The purpose of this study was to investigate 15 mild PD patients' comprehension of raising-to-subject sentences (e.g., "Susan seems to Bill to be nice" and "Susan is easy for Bill to catch") and their canonical counterparts (e.g., "It seems to Bill that Susan is nice" and It's easy for Bill to catch Susan"). We found that roughly 60% of the patients have impaired comprehension of the former sentence types, but intact comprehension of the latter sentence types. We argue that these results are best explained by the hypothesis that sentence comprehension deficits in PD patients are due to a disorder of executive attention.

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J.V. FILOTEO, L.M. RILLING, B.J. WILLIAMS, B. COLE, & J.W. ROBERTS. Heterogeneity of Cognitive Impairments in Patients with Parkinson's Disease: Cortical and Subcortical Features.

Twenty-two patients with Parkinson's disease (PD) were categorized into one of three subgroups using discriminant function analysis and three key indices from the California Verbal Learning Test (CVLT). Patients were classified as having one of three memory profiles: (1) a normal profile, (2) a prototypical subcortical memory profile (based on performances of patients with Huntington's disease), and (3) a prototypical cortical memory profile (based on performances of patients with Alzheimer's disease). Twelve of the PD patients were classified as having a normal profile, five as having a subcortical profile, and five as having a cortical profile. The three PD subgroups were then compared on the remaining CVLT indices and on a variety of other neuropsychological measures known to differentiate cortical and subcortical dementias. PD patients who were classified as having a subcortical profile tended to be more impaired on the free- and cued-recall measures of the CVLT, whereas PD patients who were classified as having a cortical profile performed worse on the recognition measures of the CVLT and on a test of category fluency. The three subgroups did not differ, however, on measures of global cognitive functioning, verbal recall errors, memory retention, letter fluency, confrontation naming, or visuo-construction. These results demonstrate that the cognitive deficits associated with PD can be characterized by both cortical and subcortical features, and argues against the notion that PD is a homogeneous neurological disorder.

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R. FAMA, E.V. SULLIVAN, P.K. SHEAR, M. STEIN, J.A. YESAVAGE, J.R. TINKLENBERG, & A. PFEFFERBAUM. Extent and Pattern of Remote Memory Impairment in Alzheimer's (AD) and Parkinson's (PD) Disease.

Remote memory impairment has been reported in AD and PD, but the extent and pattern of this impairment have not been clearly delineated. We compared 15 AD, 20 PD, and 38 normal controls (NS) on a remote memory measure and other neuropsychological tests to assess remote memory and its relationship to other cognitive abilities. Results from this study suggest that AD patients experience temporally extensive remote memory impairment and that dating ability is even further compromised. These results also suggest that the poorer dating relative to recognition of recent events evidenced in the PD patients was associated with impairment in sequencing, assessed by the WAIS-R Picture

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Arrangement subtest. This relationship in PD supports a frontal lobe dysfunction hypothesis explanation for dating disability.
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B. GIORDANI, S. BERENT, S. MINOSHIMA, M.J. BOIVIN, K.A. FREY, K.E. GUIRE, R.A. KOEPPE, & D.E. KUHL. Cerebral Hypometabolism in Nondemented Parkinson's Disease is Associated with Neuropsychological Performance.

We compared 30 nondemented Parkinson's disease (PD) and 30 normal control (NC) subjects on resting cerebral metabolic rate (CMRglu) using [^{18}F]fluorodeoxyglucose positron emission tomography scanning and a brief neuropsychological (NP) screening battery. PD patients had lower absolute (MANOVA $F(14,45) = 3.6$, $p < .0005$) and normalized (MANOVA $F(13,46) = 3.9$ $p < .0003$) CMRglu, with individual regional comparisons significant except for putamen, cerebellum, and pons. Although the groups did not differ in NP performance, significant positive correlations were evident between aspects of NP ability and regional CMRglu in PD patients, with negative correlations among NC subjects. The pattern of correlations, evident even in patients without performance impairments, suggests that different neuronal mechanisms may be involved in cognitive declines in PD.
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