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Symposium 1

EPILEPSY AND THE TEMPORAL LOBES

M.F. O'SHEA, M.M. SALING, P.F. BLADIN, & S.F. BERKOVIC.
Does Naming Contribute to Memory Self-report in Temporal Lobe Epilepsy?

The present study evaluated the hypothesis (Mayeux et al., 1980, *Neurology*, 30, 120-125) that confrontation naming deficits may underlie the memory complaint in temporal lobe epilepsy (TLE). Thirty-nine patients with left ($n = 23$) and right ($n = 16$) TLE were compared with an epilepsy control group with idiopathic primary generalized epilepsy ($n = 38$). All subjects completed subtests of the Multilingual Aphasia Examination and Wechsler Memory Scale (Form 1) and a measure of memory complaint. Verbal memory, confrontation naming, repetition, and comprehension did not contribute to memory self-report. Controlled Oral Word Association was the only measure to exert an influence on memory self-ratings, and this relationship was not specific to TLE. The hypothesis of Mayeux et al. (1980) was not supported, but the findings did suggest that variations in memory self-report may be related to limitations in language processing capacity.

G.R. SAVAGE, M.M. SALING, C.W. DAVIS, & S.F. BERKOVIC.
Masked Priming of Recognition Memory in Patients With Left Hippocampal Atrophy.

The hippocampus has been ascribed a role in forming conjunctions between arbitrary elements, prior to laying down a memory trace. Patients with left hippocampal atrophy due to medically refractory temporal lobe epilepsy perform poorly in cued recall of arbitrarily associated word pairs; an encoding basis of the deficit is assumed. However, implicit memories are said to be spared, suggesting compromised retrieval—perhaps contingent on poor encoding—but recent data are not convincing. A new paradigm is presented, borrowing from work in psycholinguistics, testing explicit recognition memory of only the second element of a pair: In normal subjects, reaction times are facilitated by the subliminal presentation of the first element. Data are presented for subjects with left hippocampal atrophy, to test the adequacy of an encoding account.

S.J. FIELD, M.M. SALING, & S.F. BERKOVIC.
Interictal Discourse Fluency in Temporal Lobe Epilepsy.

Systematic investigation of discourse fluency in temporal lobe epilepsy (TLE) is in its infancy. We investigated discourse fluency in 24 patients with TLE and 19 neurologically normal relatives. Narrative discourse was elicited with the Joannette and Goulet (1989) eight frame "Cowboy"

cartoon. A measure of viscosity, the Boston Naming Test (BNT) and the Controlled Oral Word Association Test (COWAT) were also administered. Fluency was defined as the rate of discourse production (words/min). The controls were more fluent than the TLE subjects. Superiority of the controls was maintained over three consecutive repetitions (cycles) of the task. BNT, COWAT, and viscosity scores were significantly correlated with discourse fluency. Reduced discourse fluency in TLE may represent a language component of viscosity.

L.A. MILLER, D.G. MUNOZ, & R. LAI.
Contributions of the Hippocampus, Amygdala and Entorhinal Cortex to Recall.

To investigate the relative importance of different mesial temporal lobe structures in verbal and visual recall, 34 patients who underwent temporal lobectomy were compared on Wechsler Memory Scale (WMS) subtests and the Rey Figure. Based on pathological findings, patients were classified as to whether intact hippocampal, amygdalar, and/or entorhinal tissue had been removed. Deficits after the excision of normal hippocampal tissue were seen for the Rey Figure and WMS Logical Memory. Postoperatively, a drop in performance occurred across groups on WMS Paired-Word Learning, whereas there was a trend towards improvement on WMS Visual Reproduction. The fact that no specific memory decrease occurred after the excision of normal entorhinal cortex suggests a possible difference between monkeys and humans in the role of this region.

Paper Session 1

NEUROPSYCHOLOGY OF SCHIZOPHRENIA

A.L. CLAIR & T. STEDMAN.
Olfactory Identification in Schizophrenia.
This study aimed to replicate a finding of impaired olfactory identification in schizophrenics, to investigate olfactory deficits' associations with attention, recognition, conceptual function, sensory integration, and general knowledge, and to investigate association between olfactory hallucinations and olfactory identification. Forty-six schizophrenic adults (37 M, 9 F) undertook olfaction (UPSIT), neurological (NES), neuropsychological and psychopathological assessment. The sample performed significantly below normal on olfactory identification. Only seven men, and no women, performed ≥ 10 th percentile for age. Seven men, and one woman, were "anosmic." WAIS-R Information and Vocabulary, WCST FMS, Rey Figure Reproduction, total NES and subscore Sensory Integration were all correlated with UPSIT percentile. Information and FMS significantly predicted UPSIT percentile ($F_{2,40} = 13.744, p < 0.000$), accounting for 41% of variance. Olfactory hallucinations were not correlated with olfactory identification.

W. BREWER, C. PANTELIS, V. ANDERSON, P. MCGORRY, D. COPOLOV, & B. SINGH. Longitudinal Olfactory and Neuropsychological Deficits in First Episode Psychosis, Schizophrenia Subtypes and Epilepsy.

Investigation demonstrating a strong relationship between olfactory agnosia, negative symptoms of schizophrenia, and deficits in neuropsychological function mediated by the prefrontal cortex is extended. Preliminary results from a temporal-lobe epilepsy group are compared with those from a chronic schizophrenia group. Here independent patterns of cognitive functioning indicate significant dissociations in function, implicating medial-temporal, prefrontal cortices, areas implicated in schizophrenic syndromal subtypes. Current longitudinal assessment of neuropsychological and olfactory function in never-medicated first episode psychotic patients enables assessment of the functional integrity of these systems. Preliminary findings indicate specific olfactory deficits emerge in early psychosis and are associated with independent cognitive patterns. Relationships between performance on components of these tasks and symptoms of schizophrenia are evaluated to highlight the utility of these measures prospectively to discriminate between and predict final diagnostic subtypes of schizophrenia. Important rehabilitation implications are outlined.

D. UPFOLD. Schizophrenia: Memory and Frontal Lobe Function.

Persons with schizophrenia often demonstrate "frontal lobe"-type deficits, notably poor performance on the WCST. Frontally lobectomized persons have demonstrated deficits on conditional learning and delayed alternation (DA) tasks. In nonhuman primates, a double dissociation of function within the frontal lobe has been demonstrated: Periprincipalis lesions lead to deficits on DA learning while periarculate lesions lead to poor performance on conditional learning tasks. The WCST can be seen to have elements of both delayed responding and conditional learning. This study examined performance of patients diagnosed as having schizophrenia on tests of neuropsychological function (WCST, WSCFT, oral word fluency, Rey-Osterreith complex figure, WAIS-R, WMS, CVLT) and computer presentations of DA and conditional learning tasks. The relationships among performances on these tests are discussed.

A.L. CLAIR. Working Memory and Schizophrenia Syndromes.

Goldman-Rakic (1991) nominated deficient working memory as the primary cognitive abnormality in schizophrenia, underlying symptoms. We examine this model and associations between performance on tests differing in reliance on working memory and major schizophrenia syndromes. Eighty-six schizophrenic adults undertook symptom and neuropsychological assessment. Analyses revealed that high working memory variables were significant predictors of Delusions and Hallucinations [$F(5, 78) = 2.708, p < .05$] accounting for 15% of the variance, and not significant predictors of Psychomotor Poverty or Disorganization. Austin Maze learning rate correlated with Delusions and Hallucinations ($F_{1,82} = 6.3, p < .05$). Low working memory variables were unassociated with the syndromes as a group, but Rey Figure Copy score was associated with Psychomotor Poverty ($F_{1,82} = 4.7, p < .05$).

Paper Session 2

ASSESSMENT ISSUES IN PEDIATRIC NEUROPSYCHOLOGY

P. ANDERSON, E. NORTHAM, V. ANDERSON, G. WERTHER & R. ADLER. An Examination of Executive Functions in IDDM Children and Normal Controls.

Previous research suggests that children with insulin dependent diabetes (IDDM) show selective impairments on neuropsychological tests. Diabetic patients typically experience large fluctuations in blood glucose levels throughout the day and the frontal lobes, which are particularly

sensitive to glucose disruption, may be susceptible to damage. A cohort of newly diagnosed IDDM children ($n = 124$) has been assembled and evaluated 3 mo post-diagnosis and 2 yr later on standardized tests of general intelligence, attention, memory, new learning, executive functions, and educational achievement. This paper will examine the executive functions of the IDDM children and normal controls ($n = 129$). Previous findings strongly support the hypothesis that the executive functions of IDDM children are not different from those of controls early in the course of the illness; however, it is hypothesized that children with diabetes will perform more poorly at the 2 yr follow-up assessment.

J. BOGAN. Training Adolescents With Brain Injuries to Use a Problem-Solving Plan (PSP).

A Problem-Solving Plan (PSP) involving 3 students with brain injuries attending mainstream junior secondary classes was implemented. A Control group of 2 students with brain injuries attending mainstream junior secondary classes received no intervention during the same time period. The PSP consisted of 12 individual intervention sessions conducted at the student's school and comprised a mix of generic and individualized components that were determined from teacher ratings and cognitive testing. Pretesting indicated that all 5 students were deficit in executive functioning (EF). Results of pretesting and posttesting revealed that all the PSP students displayed a positive increase in teacher-reported behaviors that were the target for intervention. Control subjects displayed a regression in teacher-reported behaviors. On posttesting, on a measure of EF, all PSP subjects made significantly less rule violations and reported less instances of forgetting. In comparison, Controls displayed no difference in performance.

E. PEZARIS, M.B. CASEY, R. NUTTALL, & M.B. BRONSON. The Effects of Types of Executive Processing on Children's School Functioning.

Executive functions allow the individual to form plans, carry them out, and evaluate their effectiveness (Luria, 1980). Three studies address these executive processes in children and how different components affect children's school functioning. We hypothesized that within executive skills tasks which require systematic search, there are two levels of skills. The first level of planning/search tasks tap children's ability to efficiently and systematically scan or search an array and to make simple decisions based on this search. The second level of tasks depend on systematic search but require higher level planning that involves the ability to use the information provided to make inferences and/or decisions. Furthermore, we hypothesized that it is the higher level planning/search tasks which relate to successful school functioning. In the first study (Prevost et al., in press), the tasks that required scanning and simple yes/no decisions (Wellman task) clustered separately from the tasks requiring higher level decision making (a Gauvian & Rogoff-type task). In the second study (Cohen et al., in press), which used Trail Making and a Classroom-based Planning task, the regressions showed that the more complex planning/search task predicted for grades, even after controlling for IQ, while the Trail Making search, a yes/no decision task, did not. In a third study (Casey et al., unpublished), we found that level-two task predicted for Study Skills as measured by a subset of the SAT, after controlling for IQ. We conclude from these series of studies on planning/search tasks that the tasks which employed careful scanning of information and simple yes/no solutions are not that effective as predictors of the type of planful search which children must perform in school.

T. GODBER, V. ANDERSON, E. SMIBERT, & H. EKERT. The Diagnostic Utility of Intrasubtest Scatter (ISS) in Children Treated With Cranial Irradiation (CRT) for Acute Lymphoblastic Leukemia (ALL). Intrasubtest scatter (ISS) is a tendency toward inconsistency in test item responses. Among the many claims made regarding the diagnostic utility of ISS are that it may indicate cognitive inefficiency, difficulty with recall of specific item content, or variable levels of arousal/attention. Surprisingly, these claims have attracted very little investigation in adults and no pediatric neuropsychological research. This study investigates

the clinical utility of ISS in a population of children experiencing difficulties with attention and information processing. The WISC-R item responses of 53 children who have received CRT for ALL were compared with those of 62 healthy children and 29 survivors of childhood cancer not treated with CRT. These results suggest that ISS has little diagnostic utility in this clinical population. Implications of these findings for neuropsychological assessment of other clinical populations are discussed.

Paper Session 3

OUTCOME FROM TRAUMATIC BRAIN INJURY

J.M. FLEMING & J. STRONG. A One-Year Longitudinal Study of Severe Traumatic Brain Injury Using the Sickness Impact Profile.

This paper reports on a one-year prospective longitudinal study of 55 adults with severe traumatic brain injury (TBI) consecutively admitted to a head injury rehabilitation unit. Subjects were 40 males and 15 females with a mean age of 25 yr ($SD = 9.3$ yr). Interviews were conducted with subjects on four occasions during the first year postinjury. The Sickness Impact Profile was completed at each interview to identify areas of physical and psychosocial dysfunction as perceived by the individual. Discussion will focus on patterns of recovery of physical and psychosocial problems during the first year postinjury. Specific problems frequently encountered will be identified, and implications for support services and rehabilitation resources discussed.

J.L. PONSFORD, J.H. OLVER, & C. CURRAN. Outcome Following Traumatic Brain Injury: A Comparison Between Two and Five Years After Injury.

This study aims to examine long-term outcome in traumatically brain-injured individuals following discharge from rehabilitation. Of 254 traumatic brain injury (TBI) patients reviewed at 2 yr, 87 have been followed up at 5 yr using a structured interview format detailing neurological symptoms, mobility, independence in ADL, productivity status, relationship issues, communication, and the presence of cognitive, behavioral, and emotional problems. Visual difficulties, headache, and fatigue were persistent in a significant number of patients. Between 2-5 yr there was increased independence in personal, domestic, and community ADL, and the use of transport. On the other hand, there was a higher incidence of cognitive, behavioral, and emotional problems at 5 yr. Thirty-five percent of those working at 2 yr were not employed at 5 yr. The implications of these findings for the rehabilitation process will be discussed.

R.L. TATE. Neuropsychological Correlates of Posttraumatic Personality Change.

Posttraumatic personality change (PTPC) is a frequent sequel of severe traumatic brain injury (TBI), yet its measurement is problematic. This study examined the predictive value of selective neuropsychological variables to measure PTPC. Twenty relatives rated the character of TBI subjects on the Current Behaviour Scale (CBS) on two occasions: at admission (rating premorbid traits) and 6 mo posttrauma (current traits). Significant differences were found between occasions on the factors of Emotional Control and Motivation, with increase in disturbance at Time 2. Twenty TBI subjects were then examined neuropsychologically at 6 mo posttrauma, along with 20 noninjured controls. Significant group differences were found on 3/10 variables measuring excesses and deficiencies in behavior. The relationships between these variables and the respective factors from the CBS were, however, nonsignificant, raising the question as to different underlying mechanisms accounting for PTPC and neuropsychological performance.

S. FLANAGAN & S. McDONALD. A Review of Remediation Techniques for Social Skill Deficits Following Traumatic Brain Injury.

There is a growing awareness of the need for successful remediation techniques for social skill deficits following brain injury. A review of the

general psychology literature on social skills yields a wealth of knowledge on this complex subject. The difficulties in applying the principles and findings from the general psychology field to brain-injured populations is discussed in the context of recent efforts to carry out treatment programs with a group of chronically head-injured males and a pilot group of more acutely head-injured males. The major obstacles of applying cognitive retraining techniques to a cognitively impaired population are discussed, and some suggestions for the future direction of social skills training after brain injury are offered.

Paper Session 4

ALZHEIMER'S DISEASE

H.J. CHENERY, B.E. MURDOCH, & J.C.L. INGRAM. The Resolution of Structural Ambiguity With Reference to Discourse Context in Alzheimer's Dementia.

Of interest to researchers involved in investigating the dissolution of language associated with Alzheimer's dementia (DAT) is whether, and to what extent, the language deficit reflects isolable linguistic breakdown, or alternatively reflects deficits in centralized, higher order cognitive processes such as attention. The present experiment investigated the resolution of structural ambiguity in patients with mild DAT ($n = 8$) using a self-paced reading task, and compared their performances with healthy elderly controls. The DAT subjects evidenced considerable difficulty in accessing the discourse model via the development of attentional strategies to resolve an ambiguous prepositional phrase attachment. The results support the contention that the language deficits in mild DAT reflect disruption to more general, nonlinguistic cognitive operations such as attentional processing.

J.G. PHILLIPS, M.J. SLAVIN, J.L. BRADSHAW, K.A. HALL, I. PRESNELL, & D.W. O'CONNOR. Kinematic Analysis of Handwriting of Patients With Alzheimer's Disease.

Extrapyramidal signs may have prognostic value in Alzheimer's disease (AD). However, AD movements have received little systematic quantitative analysis and motor impairments may merely reflect old age. This study compared handwriting kinematics of 16 AD patients with that of age-matched controls, across variations in availability of visual feedback (no vision, hands-, writing-, guidelines-visible). Subjects produced 4 cursive lower case letter "l"s 15 times per condition and the size, speed, and efficiency of writing strokes were analyzed. While AD patients responded no differently to variations in visual feedback, and there were no differences in size or duration of writing strokes, AD patients had less efficient and more variable movements, indicating AD motor deficits are not simply due to age.

F.A. HUPPERT. Is She Demented? Clinical and Psychometric Issues in Neuropsychological Assessment of the Elderly.

An important task for neuropsychologists in the diagnosis of dementia is to establish that significant cognitive decline has occurred. A prerequisite is the availability of valid norms for the elderly population. The criteria for valid norms are a wide age range including the very old, large numbers in each age group, and unbiased population samples. Few published norms meet these criteria. This paper illustrates the misleading conclusions which may be reached using current methods. It discusses the problems of sociodemographic variation, co-morbidity, cohort effects, and assessment of longitudinal change. A proposed solution to these difficulties involves computer prediction of current performance and expected change, based on an individual's unique characteristics.

K.S. FOWLER, M.M. SALING, E.L. CONWAY, & W.J. LOUIS. The Use of Computerized Neuropsychological Tests in the Early Detection of DAT.

This ongoing 2 yr longitudinal study with regular reassessments examines the ability of the Cambridge Neuropsychological Test Assessment

Battery (CANTAB) to detect early dementia of the Alzheimer type (DAT) compared to standard neuropsychological measures. Normal controls (NC), patients in the early stages of DAT, and questionable dementia (QD) subjects were studied. At the initial assessment it was shown that while CANTAB subtests were able to discriminate between NC and early DAT subjects, no such distinction could be made between the NC and QD groups. At the 6 and 12 mo assessments almost half of the QD group exhibited lower scores on CANTAB subtests while maintaining their scores on standard testing. Over this time period NC subjects maintained their performance levels and DAT patients continued to deteriorate.

Paper Session.5

LANGUAGE PROCESSING

M.S. RADEL & K. McFARLAND. *Are We Right Up Front With Our Emotions? Hemispheric Processing of Emotional Prosody.*

Studies of emotional prosody over recent decades have consistently implied a special role for the right cerebral hemisphere in processing emotional information. Speech prosody has been identified as supplying both linguistic and emotional information, and it has been suggested that the particular purpose of speech prosody (i.e., linguistic or emotional) determines lateral preference for processing—that is, linguistic prosody is preferentially processed by the left cerebral hemisphere while emotional prosody is preferentially processed by the right cerebral hemisphere. Utilizing a dual-task procedure, the present study examines the selective interference effects of prosodic language tasks on specialized motor tasks, namely, a sequential tapping task and a manipulospatial tracing task. With brain-intact subjects, response time and spatial accuracy data on the motor tasks demonstrated selective interference effects of the prosodic language tasks suggestive of differential hemispheric processing. These data are compared with the responses of subjects who have sustained circumscribed unilateral lesions.

C.CODE & M.J. BALL. *Are Syllables Hard Wired? Evidence From Aphasic Recurring Utterances.*

We examined Sussman's (1984) hypothesis that syllabification in speech is "hard-wired" in the left hemisphere through an analysis of English and German nonlexical aphasic recurring utterances. Syllabification in

these utterances was found to be essentially normal. On the surface this might suggest that because syllabification survives severe left hemisphere damage, it must be hard wired. However, comparing our data to the data from left hemispherectomy subjects, whose syllabification is also intact, suggests that if syllabification is hard wired then it cannot be hard wired to the left hemisphere. Our results support either the alternative hypothesis that syllabification is simply an artifact of the speech production process, or that if it is hard wired then it may be more diffusely represented.

S.M. PEARCE, S. McDONALD, & M. COLTHEART. *Interpreting Ambiguous Advertisements: The Effect of Frontal Lobe Dysfunction.* Deficits in frontal lobe functioning have been associated with a diminished capacity for planning; rigid, inflexible thought processes; an inability to assume the abstract attitude; and a general failure to deal adaptively with nonroutinized activities. These deficits have implications for communication abilities. This study examined the ability of three patients with demonstrated frontal lobe pathologies to interpret lexically ambiguous advertisements (i.e., advertisements with a double meaning). When compared with a nonbrain-damaged control group it was found that the frontal lobe patients were poorer at comprehending the inferred meanings in the advertisements. The pattern of performance across the patients did nevertheless differ despite a similar end result. These findings are discussed in relation to theories concerning the contribution of the frontal lobes to language functioning.

L.J. TIPPETT, G. GLOSSER, & M.J. FARAH. *A Category-Specific Naming Impairment After Temporal Lobectomy.*

Unilateral temporal lobectomy subjects and normal subject performed a speeded naming task with pictures of living and nonliving things, equated for name frequency, familiarity, and visual complexity. Left temporal lobectomy subjects were disproportionately impaired in naming nonliving things whereas right temporal lobectomy and normal subjects performed equally well with both categories. This result supports the existence of category-specific naming impairments, and provides evidence of a left hemisphere asymmetry in the neural representation of nonliving things. It casts doubt, however, on the hypothesis that anterior temporal cortices are convergence zones particularly important for identifying living things, and that left anterior temporal cortex is particularly critical for naming living things.

THURSDAY AFTERNOON, JULY 6, 1995

Symposium 2

BIOLOGICAL RISK AND NEUROPSYCHOLOGICAL DEVELOPMENT

H. KLOVE. *Biological Risk and Neuropsychological Development.*

Prenatal factors seem to account for a large proportion of the variance with regard to learning and behavioral problems in children. Retrospective studies of ADHD and Low Birth Weight (LBW) children clearly demonstrate that such relationships exist. Studies of LBW children demonstrate an increased incidence of cognitive and behavioral problems, as compared to controls. No pregnancy or perinatal factors predicted outcome in these studies, whereas socioeconomic variables, parental education, and maternal IQ did. Two personality (PIC) patterns were identified in these LBW groups: internalization (anxiety and impaired social skills) and low tractability (impulsivity and attention deficits). The subgroups identified in these and other studies of risk children, that is, Non-verbal Learning Disability (NLD) children, clearly demonstrate the need for careful and extensive evaluation. Pediatric evaluation, extensive neuropsychological evaluation, and personality evaluation comprise an ideal diagnostic "package" for these children. In addition, psychophys-

iological evaluation of CNS activation is extremely valuable, not least when it comes to pharmacological treatment considerations. The importance of the activation (arousal) dimension has been seriously underestimated in this field, although both W.C. Halstead and A. Luria have asserted it (The Power Factor and The Energy Block, respectively).

K. SOMMERFELT, B. ELLERTSEN, & T. MARKESTAD. *Neuropsychological Outcome in Children With Low Birth Weight (LBW, < 2 kg).* Outcome studies of Very LBW (VLBW) children (< 1.5 kg) suggest that 20–40% of the survivors, without major handicaps, show deviant neurodevelopment. Two population-based studies were performed in the County of Hordaland, Norway. In the first study, VLBW children were compared with randomly selected controls at the age of 8 yr. This study comprised a pediatric neurological evaluation and extensive neuropsychological evaluation. In the second study, LBW children were evaluated at the age of 5 yr, using neurological examination, the WPPSI-R, sub-tests from the ITPA and selected neuropsychological tests. In general, full scale IQ was lower in LBW children as a group. There were significantly more neurologic soft signs, and anthropometrical measures showed that they were smaller than controls. No perinatal factors predicted outcome, whereas socioeconomic variables, parental education,

and maternal IQ did. There was also a relationship between certain pregnancy variables and outcome. Data from the two studies suggest that white matter lesions may account for at least part of the developmental deviations observed.

K. TROLAND, K. SOMMERFELT, & B. ELLERTSEN. Personality and Behavior in ADHD Children and Low Birth Weight (LBW) Children.

The personality inventory for children (PIC) was administered to the mothers of children with an ADHD diagnosis ($n = 30$). The PIC profiles obtained were very similar to those reported in other countries, indicating hyperactivity, emotional problems, and impaired social skills. The PIC was also given to the mothers of LBW (< 2kg) in two different cohort studies. A group of 29 Very LBW children (VLBW, <1.5 kg) was tested at the age of 8 yr. The VLBW children showed more learning problems and school coping problems than controls. The boys also showed more conduct and emotional problems. A group of 144 LBW children was tested at the age of 5 yr, and compared with 163 randomly selected controls. Two patterns were identified in the LBW group: internalization (anxiety and impaired social skills) and low tractability (impulsivity and attention deficits). The first pattern was more common in LBW girls and the second pattern in LBW boys. Behavioral problems involving inattention and internalizing behavior occurred three times more often in the LBW children, as compared to normal birth weight children.

H. KLOVE, K. TROLAND, & B. ELLERTSEN. Children at Risk: Diagnostic and Treatment Consideration.

Prenatal factors seem to account for a large proportion of the variance with regard to learning and behavioral problems in children. This view has been discussed in connection with "MBD," ADHD, Low Birth Weight (LBW) and Non-Verbal Learning Disabilities (NLD). A number of psychosocial factors interact with the biological factors and must always be taken into consideration. An extensive evaluation comprising pediatric neurological examination, neuropsychological examination, personality testing, and clinical observation is required in order to sort out the individual problem profile. We also recommend that psychophysiological methods are included in this evaluation, in order to obtain information about the Central Nervous System activation (arousal) level. This type of evaluation is valuable when it comes to pharmacological treatment considerations. ADHD children with low levels of arousal are, for instance, the best responders to Methylphenidate treatment. This has been repeatedly demonstrated both in group studies and single-case studies. Although expensive and time consuming, the extensive evaluation described is necessary in order to obtain correct diagnosis and plan proper treatment.

Paper Session 6

NEUROPSYCHOLOGICAL SEQUELAE OF CLOSED HEAD INJURY

C.E. SKILBECK & S.J. SKILBECK. Rey AVLT and Recovery Following Head Injury.

The study involved 42 head-injured patients who were administered the Rey AVLT at 1, 3, 6, 12, 24, and 36 mo posttrauma. A control sample of 10 subjects provided comparative data. Significant *t*-test differences between mild/moderate (M/M) and extremely severely (ES) head-injured groups in Rey performance were apparent from the 3 mo follow-up onward. Even at 2 yr posttrauma, the ES group scored significantly poorer on most Rey AVLT indices. Pearson correlation of data from examining length of PTA and consciousness in relation to Rey AVLT scores were also significant from the 3 mo point. The study also examined additional Rey AVLT indices including primacy/recency, recall consistency, and learning strategy, with patients producing and improving scores as they recovered.

J.R. CRAWFORD, R. WRIGHT, & A. BATE. Verbal, Figural, and Ideational Fluency in CHI.

A closed-head injured (CHI) sample ($n = 24$) was compared with matched controls on fluency tasks. Verbal Fluency (VF) deficits were significantly greater than deficits in general verbal ability; the 3 VF tasks employed (semantic, initial-letter, and excluded-letter) did not differ in their sensitivity when legitimate production scores were examined. However, when error scores were examined, the excluded-letter task produced a significantly greater difference between CHI and controls than the other tasks. Ruff Figural Fluency Test scores were significantly lower in the CHI sample, but this was attributable to slowed motor speed. A uses-for-common-objects test was used as a measure of ideational fluency; Discriminant Function Analysis revealed that ideational fluency was the most sensitive of the measures employed.

J.R. CRAWFORD, D. JOHNSON, & B. MYALCHIUV. WAIS-R Performance in Closed Head Injury.

WAIS-R performance can be analyzed at the level of the IQs, factor scores, or subtests. This study examined the relative utility of such analyses in a closed-head injured (CHI) sample of 233 U.K. subjects. Comparison of the CHI sample with the U.S. standardization sample and a healthy U.K. sample ($n = 200$) revealed that the factor structure of the WAIS-R was essentially identical in the 3 samples (Coefficients of Congruence ranged from .94 to .99). A series of discriminant function analyses revealed that factor scores (verbal, perceptual organization, and attention/concentration) achieved significantly better discrimination between the CHI sample and a sample of 356 control subjects than the IQ scales or indices of subtest scatter. Control subjects exhibited greater subtest variability than CHI subjects.

G.A. FOX, A.M. FOX, & T. DAVENPORT. A Neuropsychological Battery of Short Tests for Assessing the Effects of Mild Head Injury.

Current neuropsychological assessment of mild head injury is too gross. Memory should be assessed over a wider range of functions using tests which evaluate more of the facets of memory—verbal and visual immediate recall, delayed recall, retrieval, distributed memory process, sensory-motor sequencing—as well as complex reasoning. This paper will report on a program of tests sensitive to deficits which follow even "trivial" injuries. Individually, they accurately discriminate "normal controls" from the injured. A self-descriptive personality inventory has revealed clear patterns of psychosocial disturbance. Validity has been established through statistical analysis, by a twin case study and by follow-up radiological examination. New methods for assessing pre-morbid abilities are also explored.

Poster Session 1

PEDIATRICS, HANDEDNESS, AND MOTOR FUNCTION

O. ATHANASOPOULOUS, V. ANDERSON, & K. ROWE. Patterns of Information Processing Deficit in Subtypes of Attention Deficit Disorder.

Attention deficit hyperactivity disorder (AD/HD) is a common childhood problem. While some children exhibit pure attentional difficulties (AD), many experience additional learning (LD) and behavioral difficulties (BDD). This study investigated the characteristics of such subtypes in a clinic-referred AD/HD sample. Thirty-nine AD/HD children were classified into 4 subgroups: "Pure" AD ($n = 11$), AD & LD ($n = 13$), AD & ODD ($n = 10$), and Mixed (AD & LD & ODD). Children in all subgroups exhibited reduced sustained attention. In contrast, children with "Pure" AD had intact information processing skills, with the AD & LD group showing greatest deficits in these skills, including poor selective attention, encoding, and retrieval skills. Children with AD

& ODD were more impulsive and hyperactive, but had adequate information processing abilities. The Mixed group had generalized problems suggesting the additive effects of AD & LD & ODD for functional impairment.

K. BEASLEY, T. KELLY, P.G. BRITTON, A.D.J. PEARSON, & S. BAILEY. Neuropsychological and Behavioral Sequelae in Children With Supra-Tentorial Brain Tumors.

The aim of this study was to assess the long term intellectual, behavioral, and attentional outcome in children who have received supra-tentorial radiotherapy treatment for brain tumors when they were over three yr of age. The results indicated that the brain tumor patients had poorer intellectual, behavioral, and attentional outcomes than the sibling controls. Attentional deficits were not detected in every patient, but in those for whom attention deficits were detected, the deficits were specific and appeared to be related to the neuroanatomical site of the tumor and subsequent radiotherapy. The results are supportive of Mirsky et al.'s (1991) neuroanatomical model of attention.

J.M. BENNETT, J.S. CAROSELLI, W.N. MERCER, D.Z. KELLAND, & J.L. FISK. The Relationship Between Learning Efficiency and Retention Using RAVLT and WMS-R Logical Memory Subtests.

The Wechsler Memory Scale-Revised (WMS-R) and Rey Auditory Verbal Learning Test (RAVLT) are frequently used to assess memory functioning in clinical practice. The purpose of this study was to examine the relationship between learning efficiency, as measured by the RAVLT, with retention between Logical Memory I (LMI) and Logical Memory II (LMII) recall conditions. Forty-five adults referred for outpatient neuropsychological evaluation (females = 51%) were included in the sample. Age ranged from 18 to 55 yr ($M = 39.2$, $SD = 9.91$). Full Scale IQ ranged from 85-115 ($M = 97.15$, $SD = 8.37$). Each subject's learning curve (*b* weight) for the RAVLT was computed by regressing trials on recall performance. A multiple regression analysis was performed using the learning curve as the dependent measure with a retention index, computed from logical memory scores, as the predictor variable after the subjects' age, intellectual functioning, and LMI performance were partialled out. The results suggest retention on LM is positively associated with learning efficiency on the RAVLT.

M.P. BRYDEN & A. EDMONDS. An Objective Measure of Hand Preference.

Subjects were asked to turn one of three knobs, located to the left, to the right, and below the display, to control a cursor on a computer monitor. On each trial, a small light indicated which knob was to be used. Subjects were free to use either hand. The choice of hand was influenced by both the position of the knob and by the handedness of the subject. Subjects used their preferred hand in a greater region of space than their nonpreferred hand. Within handedness groups, estimates of the region of space in which the preferred hand was used correlated significantly with scores on a hand preference questionnaire. This technique can be used to provide an objective measure of the degree of hand preference.

T.K. ELLIOTT. Sex Differences in Full-Scale Intelligence Quotient (FSIQ) Following Hemispherectomy for Childhood-Onset Pathology. Review of 74 hemispherectomy studies identified 26 males and 34 females with onset of neural pathology before age 12 yr with no pathology in the preserved hemisphere and postoperative FSIQ derived using standardized measures. Sex failed to predict FSIQ, alone or in interaction with age of onset, failing to support the hypothesis that males would show lower FSIQ following late onset of neural pathology than females, due to a faster rate and greater degree of hemispheric specialization in males. While mean FSIQ's were similar, the groups differed significantly in degree of variability (11% of males, 0% of females had FSIQ above 100; 26% of males, 12% of females had FSIQ below 50). The male developmental pattern thus may hold both advantages and risks.

T.K. ELLIOTT, J. WATKINS, & B. LIPPE. Manual Laterality in Turner Syndrome (TS) Predicts Performance IQ (PIQ) and Educational Placement: Results From a Multisite Sample.

Motor skill, performance IQ (PIQ), and educational placement were examined to test competing theories relating laterality to visuospatial deficits in Turner Syndrome (TS). In our sample of 43 TS subjects (ages 6-16 yr), left-handed motor skill was significantly lower for subjects in remedial education than in standard classrooms. A near-significant ($p < .07$) positive correlation was found between left-handed skill and PIQ. These results support the theory that right-hemisphere dysfunction contributes to visuospatial and learning deficits common to TS. A curvilinear relationship emerged between PIQ and an index of motor laterality (linear relationship nonsignificant; addition of squared term yielded Multiple $R^2 = .17$, R^2 change = .14, F -change $p = .01$), consistent with studies linking either extreme in laterality with cognitive impairment.

L.A. FOS, J. BROOKS, K.W. GREVE, & J.S. HAMMOND. Assessment of Executive Functioning in Mild Traumatic Brain Injury Patients.

This experiment explored the relative sensitivity to mild traumatic brain injury (TBI) of several neuropsychological tests. The test battery, which employed measures of frontal lobe function, language skills, and motor skills, included WISC-R Mazes, Trails A & B, Visual Confrontational Naming (VCN), Controlled Oral Word Association Task (COWAT), and Paced Auditory Serial Addition Task (PASAT-R). In a comparison of 11 mild TBI patients and 13 matched controls, the controls performed significantly better than the patients in Trails A & B, COWAT, and PASAT-R Subtests 2, 3 and 4. No significant differences were found for the Mazes, VCN, and PASAT-R Subtest 1. The results suggest that tests of frontal lobe functioning can be employed as valuable tools for diagnosing and monitoring recovery from mild TBI.

Y. IDA & M.P. BRYDEN. A Comparison of Hand Preference in Japan and Canada.

Equivalent hand preference inventories were given to 655 Japanese and 625 Canadian students. Analysis of the distribution of responses showed that the Japanese students were less likely to use the left hand and were more likely to endorse extreme response categories on many items, although many other items showed no cultural differences. Factor analysis of the data revealed three factors, a skilled activity factor, an unskilled activity factor, and a third factor relating to turning or inserting small objects. There are significantly more left-handers in the Canadian population when classification is based on the skilled handedness items (7.6% vs. 4.7% in Japanese). Unskilled activity scores do not differ between groups, while there are very highly significant cultural differences on third factor scores.

P. JOY, et al. Frontal Lobe Deficits Following Surgical Excision of Childhood Craniopharyngioma.

With increased survival rates in craniopharyngioma, attention turns to cognitive sequelae following surgical intervention. Resection of the tumor is complicated by its location around the pituitary, adhesions to nearby structures and surgical access which frequently requires frontal lobe retraction. Previous outcome studies have combined alternative treatments (surgery and radiotherapy), focused on psychosocial adjustment or failed to define neuropsychological impairments in relation to neuropathology. We present preliminary results from the detailed neuropsychological investigation of 13 children managed surgically, without radiotherapy. Initial analysis shows marked impairments in executive function (planning, organization, flexibility) and associated memory difficulties which are not attributable to number of procedures, age at surgery, or visual impairment. Results are discussed with reference to recent debate regarding frontal lobe deficits following surgical excision of craniopharyngioma.

W. MERCER, J. DEL DOTTO, A. BAIRD, J. BENNETT, J. FISK, & J. ROCK. Unfavorable Neuropsychiatric Outcome Following Surgical Resection of a Third Ventricle Colloid Cyst.

Colloid cysts of the third ventricle are uncommon, comprising 0.3% to 2% of intracranial space-occupying lesions. Techniques for surgical intervention of colloid cysts have received extensive research. However, to date, research has focused extensively on the surgical treatment of colloid cysts, with inadequate reference to the possible long-term neuropsychiatric sequelae of invasive neurosurgical techniques. While the majority of literature briefly mentions adverse medical consequences, little attention is directed to the possible neuropsychiatric repercussions. We report serial neuroradiological and neuropsychological assessment results of a 34-yr-old male who underwent a craniectomy for removal of a colloid cyst in the area of the foramen of Munro and who, 1 yr post-operatively, developed an organic delusional disorder. While this patient continued to exhibit improvement in his neurocognitive status, he experienced considerable neuropsychiatric decompensation. The relationship of informed consent, and the need to incorporate possible negative neuropsychiatric sequelae, is discussed.

M. MIMURA, M. KATO, F. SAITO, F. YOSHINO, & H. KASHIMA. The Effect of Dopamine on Attention and Perseveration in a Patient With Primary Progressive Aphasia.

This is a report of trial of dopaminergic medication in a patient with primary progressive aphasia. A 63-yr-old female presented with slowly progressive transcortical motor aphasia. MRI and SPECT demonstrated bilateral frontal lesions, more prominent on the left. She was given full neuropsychological tests four times: (1) before medication, (2) after Bromocriptine (D2 agonist), (3) after Pergolide (D1 and D2 agonist), and (4) off medication. Dopamine agonists did not have substantial effects on her intelligence, language, or memory. However, striking changes were noted in attention and perseveration. Dopamine agonists decreased omission errors in attention measures while they significantly increased commission errors. Increase in tonic (continuous) perseveration was also remarkable. Performance returned to the baseline after discontinuation of medication. Dopamine improved her general responsiveness, but deteriorated quality of responses.

H. NAKAMURA, T. HAMANAKA, A. MATSUI, R. NAKAJIMA, M. SUZUKI, T. MASUI, K. HADANO. Lexical Organization in Aphasic Patients: A Study on Semantic Similarity Judgement of Animal Names.

The present study investigated lexical organization of aphasic patients using a specially designed semantic similarity judgement test. The subjects were 42 aphasics following cerebro-vascular disease who could comprehend written stimulus words and 20 controls who were non-neurological patients. Nine animal names were selected as stimuli and triadic comparison tasks were performed. These data were analyzed on a single subject basis. In quantitative and qualitative analysis, the performance of the aphasic group was significantly inferior to the control group. In quantitative analysis, the performance of the low comprehension aphasic group was significantly inferior to the high comprehension group; however there was not conspicuous consistency within each of the Broca's, Wernicke's, nonfluent and fluent aphasic groups in both analyses. The results cast some doubt about other studies using pooled data for data analysis.

Y. OE, M. KATO, & H. KASHIMA. Relationship Between Motor Impersistence and WAIS, Degree of Encephalatrophy, and Amount of Cerebral Damage.

In 31 subjects with cerebral damage, we studied the relationship between motor impersistence (MI) and WAIS, the degree of encephalatrophy, and the amount of cerebral damage. We compared the frequency of MI occurrence to WAIS and to the amount of cerebral damage and the severity of encephalatrophy calculated from CTs. For all cases, a negative correlation was found between MI and PIQ and between a certain type of MI and the severity of encephalatrophy and the amount of cerebral

damage. The same tendency was observed for the cases with right-side damage. The overall severity of brain damage plays a part in the occurrence of MI; this tendency manifested itself especially strongly in subjects with right-side damage displaying high MI occurrence frequencies.

I. REINVANG, K. SUNDET, & C. NIELSEN. Validation of ERP Measures in Head Injury.

The objective is to ask if ERP measures in head injury patients are an informative and clinically relevant addition to neuropsychological test results. Patients with head injuries sustained 1 to 5 yr before testing were studied ($N = 37$) with neuropsychological testing, MMPI, and electrophysiological recording. The study focuses on long-latency ERPs (visual P3, auditory P3A, P3B, and N2). External validation measures included duration of unconsciousness, findings on CT or MRI, and work status 2 yr post injury. Combining ERP, neuropsychological, and MMPI variables in exploratory factor analysis showed that the variable sets were largely independent. A multiple regression analysis showed that combining the information from all the variables gave improved prediction of external criteria of severity, and ERP variables added significantly to the predictive power.

V.M. ROTH. Talking Pictures: A Simple PC-Program for Aphasia Therapy.

"Talking Pictures," are a tool for creating material that can be used in trying to overcome word-finding difficulties. A picture is scanned and the tool is first used in record mode. Two options are available: sound and written text. Speech therapists are advised to do (part of) this recording of speech or writing of text together with patients (and relevant others in case of very poor communication). Many aphasic (and some heavily dysarthric) patients can be trained in relatively short time to use the play-mode to do homework (with only little support by others in the beginning). "Talking Pictures" are one form of realization of the idea of "infotainment" for language-handicapped persons.

H. SAITO, M. KATO, & H. KASHIMA. An Investigation of the Dissociation Between Word Fluency and Idea Fluency in Frontal-Damaged Patients.

The Uses Test, an idea fluency task, and the Word Fluency Test were administered to 10 patients with frontal lesions (Frontal Group) and 10 controls. In the Uses Test, to evaluate answers from not only a quantitative but also a qualitative aspect, the answers are subdivided. In the Frontal Group, a case demonstrating high performance in the Word Fluency Test and low performance in the Uses Test, in other words, a dissociation of word fluency and idea fluency, was observed. In other cases with good word fluency, some disinhibition factor or perseveration may have an influence on the results of the Uses Test. All cases with good word fluency generated few answers in the Uses Test belonging to the subgroup, which most reflects creativity.

R.W. SMITH, G.D. SHEAN, & D.K. MOORE. Relationship Between Tardive Dyskinesia and Clinical Dementia in Geropsychiatric Inpatients. The relationship between neuroleptic history, tardive dyskinesia (TD), and cognitive impairment was examined in 38 geropsychiatric inpatients. Cognitive impairment was assessed using the Dementia Rating Scale and the Wechsler Memory Scale-Revised Logical Memory, and Visual Reproduction subtests. The results strongly support the hypothesis that severe cognitive impairment may be related to TD among geropsychiatric patients. Neuroleptic history, as measured, appeared to have no relationship to the onset or severity of TD nor to the level of cognitive functioning.

A.H. VAN ZOMEREN, H.J. TEN DUIS, M. SIPMA, & J.M. MINDERHOUD. Lightning Stroke and Neuropsychological Impairment. Three cases are described of adults with a lightning stroke. Type of accident and path of the current were different in all three cases. All subjects lost consciousness and had a period of amnesia. When they were

tested because of lasting cognitive complaints, mild and nonspecific deficits were found in verbal learning and recall and in visual reaction time. Although "fear of thunderstorms" had considerably increased in one patient, it seemed unlikely that the complaints were psychogenic. Possible explanations of the subtle impairments after this type of injury are discussed. In further research of lightning injuries, care should be taken to distinguish between negative effects of emotional reaction (Post-traumatic Stress Disorder) on cognition and impairments caused by possible damage to the brain or cervical structures.

G. VINGERHOETS, C. JANNES, G. VAN NOOTEN, & G. DE SOETE. Cognitive Dysfunction in Patients Scheduled for Cardiac Surgery.

The cognitive performance of 81 candidates for cardiac surgery, who did not suffer from carotid artery stenosis, was compared with the performance of 54 normal controls on 14 neuropsychological test measures. Gender, age, education, the Spielberger State Anxiety score, and the Beck Depression score were used as covariates. Multivariate analysis of variance showed a significantly decreased cognitive performance in the cardiac patients. Post hoc analyses using univariate *F* tests with the same covariates revealed a significantly impaired immediate verbal recall and verbal learning, psychomotor speed, word fluency, and manual dexterity. A stepwise multiple regression analysis revealed that preoperative variables indicating a more precarious heart function contributed modestly, although significantly, to the estimation of the proportion of variance of the results on several cognitive tests.

Paper Session 7

ISSUES IN THE NEUROPSYCHOLOGICAL ASSESSMENT

D.H.K. SHUM & A.C. ALPAR. Effects of Incentives and Preparation on Simulated Memory Deficits.

A simulation experiment was carried out to assess effects of incentives (\$20.00) and preparation (one week) on faked memory impairments. Eighty undergraduates were assigned to one of four conditions. Results using seven WMS-R subtests, Rey 15-Item Memory Test, and Multi-Digit Memory Test indicated that prepared subjects did not exaggerate memory impairment to the same extent as unprepared subjects. Main effect for incentive and interaction between incentive and preparation was not significant. Discriminant analysis was used to identify patterns of test performance that separated 15 head-injured, 40 prepared, and 40 unprepared subjects. Classification accuracy of 67% was achieved with WMS-R predictors. The addition of malingering-specific predictors increased classification accuracy to 77%, with 100% specificity. Findings will be discussed in terms of clinical practice and future research.

J.M. FISHER & N.V. MARSH. Estimating WAIS-R IQ From the National Adult Reading Test in Normal Subjects.

The National Adult Reading Test (NART) is commonly used in clinical settings to predict the level of premorbid intelligence. This study examined the test's ability to estimate the current level of intellectual functioning in a neurologically normal sample of New Zealand subjects. Eighty community volunteers with no history of substance abuse, neurological or psychiatric illness were administered the Wechsler Adult Intelligence Scale-Revised (WAIS-R) and the NART. Results indicated that the NART may be a useful predictor of premorbid levels of WAIS-R Full Scale and Verbal IQ; however, caution is needed when using the NART to estimate premorbid WAIS-R Performance IQ.

A.H. VAN ZOMEREN, B.M. DE JONG, A.H.J. PAANS, & A.T.M. WILLEMSSEN. Pattern of Increased Cerebral Blood Flow (rCBF) During a Paced Auditory Serial Addition Task in Normal Volunteers: A Pet Study.

Increases in rCBF were studied in subjects who were tested with the PASAT. It was hypothesized that this attention test, demanding infor-

mation processing under timepressure, would cause activation of the frontal attention system comprising the cingulate gyrus, Supplementary Motor Area, premotor area 6, and lateral prefrontal cortex (LPFC). Of these areas, only LPFC was not significantly activated by PASAT. This was explained by the fact that PASAT does not require an active strategy in performance, as responding is essentially stimulus-driven. Bilateral increases in rCBF were noted in the parietal areas 7 and 40. The resemblance of this pattern with circuitry involved in higher-order motor control suggests that the parietal cortex may serve as an "internal space" for the serial manipulation of digits as required by PASAT.

D. SMITH & A. SANSON. Effects of Systematic Manipulation of Two Situational Variables on the Attentional Performance of ADHD Children.

Using Sternberg's (1975) information processing model, the present study investigated effect of experimenter presence (EP) and reinforcement on the attentional performance on ADHD boys during the central stages of memory search and decision. Effects of comorbidity of ODD and LD with ADHD were also investigated. Subjects were 26 ADHDs and 21 normal controls (NC). Results indicated no information processing deficits for ADHD boys at the two stages compared to NCs. Greater improvement was found with ADHDs during EP. Reinforcement had no effect. ADHDs with ODD were found to make more errors when more effortful processing was required. Coexisting LD had no effect. Support was found for the hypothesis that ADHDs are less efficient than NCs, but this is not due to limited information processing at the memory search and decision stages.

Paper Session 8

CHILD NEUROPSYCHOLOGY

K.O. YEATES, E. BLUMENSTEIN, B.G. ENRILE, & D.C. DELIS. Profiles of Children With Neurological Disorder on the California Verbal Learning Tests.

This study examined whether the California Verbal Learning Test (CVLT) could successfully differentiate children with closed-head injuries (CHI) or myelomeningocele and shunted hydrocephalus (MM+SH), both from matched, unaffected controls and from one another. Participants included 27 children with severe CHI, 32 children with MM+SH, and 59 matched, unaffected controls, all between the ages of 8 and 15 yr. A multivariate discriminant analysis using 14 variables from the CVLT resulted in correct classification for 69% of the total sample, for a Kappa of .51. Sensitivity for CHI and MM+SH was rather poor (.59, .63), but it was much better for neurological disorder overall (.85). Specificity was acceptable (.76). The CVLT can be useful clinically in differentiating children with neurological disorders from unaffected children, but is less able to identify the specific disorder from which they suffer.

P.M. KAUFMANN, I.M. MOORE, K.A. ESPY, & J.J. HUTTER. Attention and Learning Strategies Following Triple Intrathecal Chemotherapy for Childhood Leukemia.

The neuropsychological sequelae of CNS cancer therapy are evident as more children survive acute lymphoblastic leukemia (ALL). ALL survivors (6-19 yr) were evaluated longitudinally from 23 to 60 mo post-diagnosis on the following measures: (1) Continuous Recognition Memory (CRM), (2) Wisconsin Card Sorting Test (WCST), and (3) California Verbal Learning Test (CVLT-C). Patterns of impulsive responding and distractibility were noted on CRM and WCST. Clustering by serial order rather than semantic category was preferred on the CVLT-C by ALL survivors in comparison to age peers. The gradual onset of attentional disturbance following CNS chemotherapy may result in less efficient learning strategies. Prophylactic interventions may be necessary to minimize the disabling consequences of CNS chemotherapy in ALL.

K.A. ESPY, D.J. FRANCIS, & M.L. RIESE. The Effect of Prenatal Cocaine Exposure and Medical Complications on Motor Development in Preterm Infants.

The effect of prenatal cocaine exposure on motor development may differ in preterm infants who carry preexisting risk for developmental delay. Motor skill was examined longitudinally in 42 preterm infants, hospitalized during the first weeks of life (184 evaluations). The compound effect of cocaine exposure and prematurity mitigated the negative effects of cocaine exposure and prematurity on the rate of motor development. Cocaine-exposed infants born at least 6 wk prematurely developed faster motorically than preterm peers. Medical complications did not contribute beyond prematurity to prediction of motor development in the cocaine-exposed infants. These findings suggest that (1) after the toxic cocaine exposure is terminated through birth, cocaine-exposed infants are able to "catch up" to preterm peers and (2) the relation of

medical complications and developmental outcome differs in cocaine-exposed infants.

W.R. LEVICK. Wide Range Assessment of Memory and Learning (WRAML) Long-Term Memory Measures in Specific Learning Disorders. While there has been considerable research into short-term memory deficits in developmental disorders, there has been limited investigation of long-term memory in such populations. Long-term memory measures from the WRAML are examined in subgroups of a learning disorders clinic sample of 100 children ranging in age from 6 to 15 yr. Comparisons between subgroups and relationships with levels of academic skill attainment are examined. Results are discussed in terms of validity of the WRAML, the role of long-term memory in the acquisition of academic skills, the status of long-term memory in developmental disorders, and implications for theories of memory development.

FRIDAY MORNING, JULY 7, 1995

Symposium 3

PEDIATRIC HEAD INJURY

K.O. YEATES & H.G. TAYLOR. Predicting Premorbid IQ Following Pediatric Closed-Head Injury.

This study examined the prediction of premorbid IQ using data from an ongoing prospective study of closed-head injuries (CHI) in children ages 6 to 12 yr. A prediction equation was first derived based on 39 children with orthopedic injuries, who serve as a comparison group for the children with CHI. Collectively, sociodemographic variables and a measure of word recognition skill predicted 50% of the variance in IQ, with an R^2 of .71. Predicted IQs were within 10 points of actual IQs for 68% of those children with actual IQs between 80 and 120. The prediction equation was then used to compute predicted IQs among 39 children with mild/moderate CHI and 21 children with severe CHI. Predicted and actual IQs were correlated significantly in both injury groups. More importantly, predicted IQs were significantly higher than actual IQs among children with severe CHI, but not among those with the mild/moderate CHI.

D. GRONWALL, P. WRIGHTSON, & V. MCGINN. A Followup Study of Children Who Sustained a Mild Head Injury During Preschool Years. Consecutive children aged between 2.5 and 4.5 yr treated at Emergency Departments but not admitted to the hospital were allocated to either a head injury (HI) or control group, depending on type of injury. They were assessed within 1 mo, then 6 and 12 mo after injury and again when they were aged 6.5 yr. There were no differences on any measure soon after injury, but by 6 mo the HI children were significantly below controls on a visual closure test and were also more likely to have had another head injury. By 1 yr the HI group were even further behind the controls on visual closure, and these scores were significantly correlated with reading ability at 6.5 yr in this group.

G. KINSELLA. Predictors and Indicators of Academic Outcome in Children Following TBI.

Sixty-two school-aged children were assessed on cognitive, academic and neuropsychological measures for a 2-yr period following closed-head injury. In comparison to children with mild injuries, those with severe injuries were impaired on Verbal and Performance IQ, on 6 indices of neuropsychological functioning, and on the arithmetic scale of the WRAT-R. Furthermore, these children more often required special assistance at school. Discriminant function analysis showed that injury sever-

ity, SES, and 3-mo Verbal IQ and Performance IQ were good predictors of 2-yr academic ability. Although measures of 2-yr neuropsychological functioning also discriminated well, only speed of information processing demonstrated differences after the influence of injury severity, SES, and 3-mo Verbal IQ and Performance IQ had been statistically controlled.

V. ANDERSON, S. MORSE, G. KLUG, C. CATROPPA, & F. HARITOU. Predicting Recovery From Head Injury in Preschool Children: A Prospective Analysis.

While recovery patterns following adult head injury are well documented, little is known about recovery following head injury in very young children, where interactions between possible recovery and normal development are difficult to differentiate. This study examines this issue using head-injured and healthy children, aged 2-6 yr and matched for age and gender. Head-injured children ($n = 30$) were evaluated on emergence from PTA, and again 6 mo and 12 mo postinjury. Controls were evaluated at equivalent intervals. Intellectual, language, and memory skills were assessed. Significant differences in development were found across groups, and these were evaluated with respect to possible predictors including injury severity, SES, and premorbid ability.

Paper Session 9

DEGENERATIVE DISEASES

J.M. GRAY, A. CURTIS, & W. BARKER. Level of Impairment and Rate of Deterioration of Verbal Memory in Huntington's Disease in Relation to Abnormal Repeat Length.

The causative allele for Huntington's Disease consists of an abnormal expansion of an unstable triplet repeat whose length has been weakly linked to age of onset. We have previously reported a pattern of changes in memory function among at-risk probands which reliably predicts presence of this allele. We now confirm this and report a strong correlation between the size of the expansion and the extent of these changes, when age and premorbid verbal ability are taken into account. Using data from those who have been reexamined, we examine the relationship between expansion size and deterioration.

N. GEORGIU, J.L. BRADSHAW, J.G. PHILLIPS, E. CHIU, & R. IANSEK. The Simon Effect and Attention Deficits in Gilles de la Tourette's Syndrome, Huntington's Disease, and Parkinson's Disease. The efficiency with which Tourette's syndrome (TS), Huntington's dis-

ease (HD), and Parkinson's disease (PD) patients could shift and direct attention was examined through the processing interference caused by an irrelevant stimulus-response (S-R) relationship known as the Simon effect, and by a counterdemanding conditionality signal. Arrow stimuli were used in five conditions of increasing complexity. HD patients, as compared to controls, were significantly slower in responding when there was S-R incompatibility or when there was conflict stemming from negation of an otherwise compatible S-R configuration. TS and PD patients, although significantly slower, were no worse in responding under such manipulations. Cognitive deficits observed in HD, and perhaps TS and PD, may stem from abnormalities in the basal ganglia and/or the frontal lobes to which they connect.

J. BRADSHAW, D. SHEPPARD, J. PHILLIPS, & R. IANSEK. *Contingent and Noncontingent Cues in Parkinson's Disease.*

A defective internal cue normally generated by the basal ganglia (BG) may be partly responsible for slowed movements (bradykinesia) when Parkinson's disease (PD) patients perform sequential movements. External cues may sometimes substitute and provide the necessary trigger to switch from one submovement of the sequence to the next. We addressed the extent of PD patients' dependence upon external cues in a simple sequential button-pressing task. Although PD patients were indeed helped by advance visual information, irrelevant delayed cues behind the direction of movement did not disrupt performance. Auditory cues located at certain points in each movement cycle facilitated PD but not control performance, and this facilitation was limited to the movement cycle wherein the cue occurred. Regular repetitive noncontingent beats from a metronome may also differentially facilitate PD movement, though such patients were still unable to rescale the duration of long movements to match short movements. These findings may have implications for PD rehabilitation.

J.A. HARASTY, G.M. HALLIDAY, J.J. KRIL, & C. CODE. *A Comparison of Brain Volumes of the Cortical Language Associated Areas in Male and Female Controls and Patients With Alzheimer's Disease (AD).*

The present study used morphometric techniques to measure total and regional brain volumes for the language-associated areas in 13 patients with AD and 12 age-matched controls. With these subject numbers, no significant left/right differences were found in either the control or AD group. Despite males having larger brains overall, the superior temporal gyrus and Broca's area were significantly larger in females than in males. Significant bilateral disease effects were found in the hippocampus, inferior and middle temporal gyri, and the insula. Females with AD also showed significant loss in Broca's area and the superior temporal gyrus.

Paper Session 10

NEGLECT AND APRAXIC DISORDERS

L. WILLINCK. *Right Hemisphere/Neglect Dyslexia.*

Neglect dyslexia refers to the reading deficits secondary to right cerebral hemisphere lesions. This paper outlines the theoretical basis, symptoms, assessment, and management thereof. Symptoms of neglect dyslexia include word level errors (letter substitutions, additions, and omissions) and/or text level errors. Theories on neglect dyslexia postulate that it can be fractionated into two separate syndromes: one reflecting deficits of attention and scanning, and the other reflecting internal representation deficits. Currently no comprehensive assessment of neglect dyslexia exists. Suggested test stimuli with examples and rationale are provided. Rehabilitation of neglect dyslexia may involve a range

of restitution- and compensation-based therapies ranging from traditional visual scanning techniques to vertical reading strategies.

L. WILLINCK. *Right Hemisphere/Afferent Dysgraphia.*

Afferent dysgraphia refers to the writing deficits secondary to right cerebral hemisphere lesions. This paper outlines the theoretical basis, symptoms, assessment, and management thereof. Symptoms of afferent dysgraphia include visuospatial deficits (e.g., margin displacement, superimposed lines, undulating lines), omission and/or duplication of strokes and letters, and sentence/paragraph level errors (e.g., incomplete sentences, paucity of punctuation). Afferent dysgraphia can be fractionated into two dissociable syndromes: one resulting in neglect-based errors, and the other resulting in visual and kinaesthetic feedback dysfunction. Currently no comprehensive assessment of afferent dysgraphia exists. Suggested test stimuli are discussed. Rehabilitation may involve various restitution- and compensation-based therapies ranging from colored anchor lines to script modality education.

P.F. McCORMACK. *Speech Motor Programming in Ataxic Dysarthria: Evidence From Word Duration and Inter-Word Pausing.*

The duration of words and the interword pauses in the speech of 10 subjects with ataxic dysarthria and 10 matched controls were systematically investigated in a sentence reading task. In the ataxic group, unlike the control group, there was no relationship between the duration of a word and the stress pattern of the following word. However, the duration of the interword pause was directly related to the stress pattern of the word yet to be produced, but not related to the stress pattern of the word already produced. The results are interpreted as indicating that in the subjects with ataxic dysarthria, each word was being programmed separately without reference to the stress pattern of an upcoming word. Pauses between words were being used as programming time for a word before commencing its execution. Such a pattern suggests that the traditional description of the speech disorder arising from cerebellar damage as a "dysarthria" is inaccurate.

H. KASHIMA, K. SAKUMA, M. KATO, & M. MIZUNO. *On Motor Perseveration: Classification and Relation to the Site of Cerebral Damage.*

Perseveration is an extremely common symptom in patients with brain damage, but systematic study on this phenomenon is infrequent. In this study, motor perseveration was systematically studied in 87 brain-damaged patients using the comprehensive test for detecting motor perseveration constructed by the authors. Perseveration in a wide sense, regardless of type, is a nonspecific phenomenon occurring frequently in brain damage. However, some perseverations specific to a certain lesion site could be identified when perseveration was examined by type. Factor analysis of the 7 types of perseveration reclassified perseveration into three kinds: perseveration due to inertia in motor execution, perseveration due to inertia in motor program, and perseveration due to general cerebral dysfunction.

A. MAGUIRE & M.C. CORBALLIS. *Effect of Mental Rotation on the Frame of Reference Underlying Unilateral Spatial Neglect.*

Unilateral spatial neglect (USN) is a deficit in the ability to report information from the side of space contralateral to a brain lesion. Following a right-hemisphere lesion the question arises as to whether "left" is defined relative to viewer-centered, environment-centered, or object-centered coordinates. This study examined the neglect of a stimulus located immediately to the left or right of an asymmetrical letter which appeared in 8 different orientations. The individual tested demonstrated strong left-sided neglect when "left" and "right" were defined relative to a viewer/environment frame of reference. The results failed to show any influence of an object-defined reference frame in USN, even under conditions which encouraged mental rotation of the letter.

FRIDAY AFTERNOON, JULY 7, 1995

Paper Session 11

REHABILITATION

S.R. BEERS & G. GOLDSTEIN. Computer-Assisted Rehabilitation of Memory in Patients With Closed-Head Injury.

This study expands work demonstrating the efficacy of memory rehabilitation. Performance of a computer-assisted (CA) group ($N = 20$) is compared to a group cited in earlier results ($N = 10$). Ridiculously-imaged story (RIS) and face-name learning (FNL) procedures differed only in the application of CA training. "Before" and "After" training comparisons included a selective reminding task, a practical items test, and a face-name test. For RIS, selective reminding scores were significantly different ($p < .001$) for both groups, but the magnitude was greater for the CA group. Such comparisons of the list learning scores were significant ($p < .001$) for both groups, but indicated no training advantage. For FNL, learning curve comparisons indicated that 7 session scores reached significance ($p < .05$). Pretraining and posttraining scores were not different for the original group but were significant ($p < .01$) for the new sample. Apparently nothing is lost through CA training and for the FNL there is a clear advantage to such training.

J. COCKBURN & P. HAGGARD. Reciprocal Interference Between Cognitive and Motor Tasks in Neurological Rehabilitation.

The aim of this study was to identify the effects of concomitant exposure to cognitive demands, such as simultaneous instruction, on relearning motor skills following neurological damage. In line with recent findings on aging and physical rehabilitation, we found significant interference from a motor tracking task on a simultaneously performed spatial reasoning task among seven subjects with recent brain damage, with lesser interference to two other cognitive tasks. Impaired performance was also shown on the motor task during simultaneous attention to cognitive demands. We suggest interference between motor and cognitive tasks may result from damage either to the cerebellum or the frontal lobes and there may be compounded dual-task difficulties that interfere with rehabilitation from neurological damage to both areas.

A. STEWART-SCOTT & J. DOUGLAS. Reintegration of Students Following Traumatic Brain Injury (TBI)—Some Preliminary Findings.

Given that two-thirds of Victorians who sustain a TBI each year are under age 25 yr, it could be expected that some of these people were secondary or tertiary students at the time of their injury and would like to return to their coursework. The aims of this pilot study were to report the incidence of students with TBI admitted to the Head Injury Unit at Bethesda Hospital in 1991 and to document their educational outcome 3 yr later. An additional aim was to describe the group across a range of variables (e.g., severity of injury, etc.) and explore any potential indicators of performance. Approximately 26% of admissions in 1991 were enrolled in secondary/tertiary study at the time of their injury. Fourteen subjects were interviewed by telephone about their pre- and post-injury experience of being a student. Additional assessment and injury related information was gathered from their records. Seven out of fourteen subjects were still studying at the time of interview. Reduction in course load, the need for additional assistance, and changes in relationships with peers were some of the main changes reported by the group.

Paper Session 12

ASYMMETRY AND HEMISPHERIC TRANSFER

M.C. CORBALLIS. A Dissociation in Interhemispheric Transfer of Digit and Color Information in the Split Brain.

Pairs of green and red digits were flashed for 100 ms in the opposite

visual fields of L.B., a man with complete forebrain commissurotomy. L.B. scored well in naming both digits, and in naming either the green digits alone, or the red digits alone, regardless of field. When asked to name the colors only, L.B. was 100% correct at naming the right-visual-field (RVF) colors, but failed to score above chance in naming the left-visual-field (LVF) colors and in deciding whether the colors were the same or different. These results suggest that L.B.'s ability to name LVF information is due to subcortical transfer, which conveys reasonably accurate information about form but little (if any) information about color.

C. CODE. Do Asymmetries in Ear Movement Reflect Hemispheric Differences in Psychological Processing?

The ability of 442 male and female right- and left-handed subjects to move their ears and eyebrows was examined. It was reasoned that if a relationship was found between ear movement, sex, and handedness, this would reflect hemispheric processing. Approximately 21% of subjects could move one or the other ear and approximately 18% could move both ears simultaneously. Males were significantly better at both tasks, as well as at moving both left and right eyebrows. No differences emerged between handedness groups. However, significant correlations were observed between eyebrow raising and ear movement. Results are interpreted to mean that ear movement abilities reflect primitive skills no longer functional in modern humans and sex differences emerge because of the shared muscular control of eyebrow and ear movement.

N. NAIKAR & M.C. CORBALLIS. The Detection of Apparent Motion Across the Midline in the Split-Brain.

The ability of two commissurotomed subjects to detect apparent motion across the midline was tested. Subjects were required to distinguish a single light from two simultaneous lights, a single light from two sequential lights, two simultaneous lights from two sequential lights, and leftward apparent motion from rightward apparent motion. Both commissurotomed subjects were able to perform all tasks in either visual field and in the bilateral condition. However, in a more difficult task (which required the discrimination of a single light, two simultaneous lights, and two sequential lights) one subject was unable to perform the task in the bilateral condition. The findings clarify contradictory results from two earlier studies (Ramachandran et al., 1986 & Gazzaniga, 1987).

Paper Session 13

TOXIC EXPOSURE

M. LINDGREN, R. STENMARK, B. FAGHER, J. RISBERG, H. SJÖHOLM, & H. THOSTRUP. Calcium Antagonist Treatment in Three Cases of Organic Solvent-Induced Chronic Toxic Encephalopathy. Three male patients with solvent-induced chronic toxic encephalopathy were treated with the calcium antagonist felodipine for 3–5 mo. The patients were examined with semistructured interviews, Target Complaints, neuropsychological tests, and cerebral blood flow examinations (Cortexplorer and SPECT) on 2–3 occasions. The baseline examinations, conducted 12 wk before and immediately before the felodipine treatment, revealed severe symptoms such as sleep disturbance and headache, impaired performance in the neuropsychological testing, and pathological cerebral blood flow. At the examination after the treatment, the patients' symptoms were considerably reduced. The neuropsychological testing revealed improved functioning in tests assessing visuo-spatial memory ability, and marked increase in the cerebral blood flow was found in both the Cortexplorer and the SPECT examinations.

R.W. SMITH, D.K. MOORE, & G.D. SHEAN. Neuropsychological Function and Outcomes in Mentally-Ill Chemically-Addicted (MICA) Subjects.

Two studies were undertaken investigating neuropsychological function in MICA subjects. Neuropsychological measures included the Wechsler Memory Scale-Revised, Logical Memory and Visual Reproduction tests, Shipley Institute of Living, Grooved Peg Board, Finger Oscillation, Trail Making Test A and B, and the Reitan-Indiana Aphasia Screening. Study One examined 29 MICA subjects' functioning. Significant impairment was found on 11/12 neuropsychological measures. Study Two examined 150 MICA subjects' neuropsychological functioning and the corresponding relationships to clinical outcomes using multiple regression analyses. Implications for treatment planning are discussed.

A.A. RAHILL, B. WEISS, M. UTELL, M. FRAMPTON, P. MORROW, & C. COX. Neuropsychological Assessment of Threshold Level Toluene Inhalation.

Two computerized neuropsychological batteries were administered three times during 6 h of toluene inhalation at 100 ppm. One battery required continuous performance (60 min) on a complex synthetic work task requiring subjects to simultaneously remember letters, perform addition, and monitor visual and infrequent auditory warning signals. The other battery presented brief, single standard neuropsychological tests similar to a battery prepared for NATO human performance assessment. Six subjects were tested on a protocol which included subjective measures of symptom and mood, a 30-min period of mild physical work to simulate common workplace situations, and analyses of expired air, urine, and blood. Results indicated that the composite performance score for multiple tasks was a sensitive indicator of performance capacity during toluene inhalation, and for brief standard neuropsychological tests, response time was a more sensitive indicator than accuracy.

S.B. ROURKE & I. GRANT. Neuropsychological Deficits in Male Alcoholics: Part I. Using Repeated Measures MANOVA to Separate Practice Effects From the Influence of Age and Resumption of Drinking. To explore how age affects neuropsychological (NP) recovery and deterioration in alcoholics, 97 men were examined who were abstinent a mean of 30 d, and again 2 yr later, at which time 62/97 had resumed drinking (RES) and 35/97 had maintained interim abstinence (ITA). To separate practice effects from NP recovery, the NP recovery of RES and ITA was compared to 29 long-term abstinent (LTA) men (abstinent 4 yr) and 49 male nonalcoholic controls (NAC). Sample mean (SD) age and education were 49 (9) and 14 (3) yr, respectively. Results of 14 NP tests were reduced to 6 NP abilities which formed dependent variables in 4 groups \times 2 ages (median split at 51 yr) repeated measures MANOVA. Results show (1) ITA improved on abstracting ability more than other groups ($p = .009$); (2) RES deteriorated on motor tests ($p = .03$); and (3) all younger alcoholics exceeded practice effects on abstracting ability, while older RES deteriorated (3-way interaction, $p = .03$). These results indicate the extent and features of NP recovery and worsening among alcoholics are related to age, length of abstinence, and interim drinking.

S.B. ROURKE & I. GRANT. Neuropsychological Deficits in Male Alcoholics: Part II. Using Clinical Ratings to Delineate the Effects of Interim Drinking and Length of Abstinence on the Prevalence of Deficits. Clinical ratings of individual neuropsychological (NP) protocols were performed at baseline and 2 yr later to assess how length of abstinence (LOA) and interim drinking affect the prevalence of NP deficits in male alcoholics. Subjects were 97 recently detoxified (RDA: LOA = 30 d) and 29 long-term abstinent (LTA: LOA = 4.1 yr) alcoholics who were compared to 49 age- and education-matched nonalcoholic controls (NAC). Sample mean (SD) age and education were 49 (9) and 14 (3) yr, respectively. Results show 36% of RDAs were NP impaired, compared to 10% and 12% of LTA and NAC. Two years later, 62/97 RDA subjects resumed drinking (RES) and 35/97 maintained interim abstinence (ITA).

While the NAC group showed little change with retest (92% did not change), alcoholic groups exhibited considerable change in NP deficits according to drinking status and LOA. Deterioration was noted in 27% of RES compared to 6% and 3% of ITA and LTA groups, respectively, and improvement in NP deficits was noted in 29%, 23%, and 17% of ITA, RES, and LTA groups, respectively. LTA and NAC subjects were indistinguishable on NP deficits.

Paper Session 14

OUTCOME FOLLOWING PEDIATRIC HEAD INJURY

F.M. JORDAN & R.S. ASHTON. Language Performance of Children With a Severe Closed-Head Injury.

The language functioning of a group of children who had sustained a severe closed-head injury (CHI) was evaluated. The subjects were administered a battery of language assessments including measures of syntax, semantics, and pragmatics. Performance of the experimental group was compared with that of a control group matched for age and sex. Results indicated that all areas of language competence assessed (syntax, semantics, and pragmatics) appeared to be compromised by the childhood CHI. The findings of this study are considered in light of the implications for the existence of a specific linguistic impairment in the childhood CHI population as opposed to a more generalized cognitive decline expressed as an overall decrease in performance across all domains of language skill.

C. WILLMOTT & V. ANDERSON. Attention Deficits Following Pediatric Head Injury: Impact of Age at Injury.

In recent years the robust finding of the compromising effects of early brain injury has cast contention upon the previously adhered to notion of plasticity in the young brain. The process of rapid myelination that occurs in these critical years is disrupted by traumatic brain injury. Deficits of attention are attributable to the vulnerability of the frontal lobes and brainstem in particular. Forty-one children with a history of mild-moderate head injury were compared on measures of cognitive and education ability. Very young children who sustain a head injury are expected to be more compromised cognitively due to the immediate disruption to development which subsequently causes them to fall behind their peers.

S.A. LLOYD & G. KINSELLA. Implicit and Explicit Memory Following Mild Traumatic Brain Injury in Children.

Anecdotal evidence suggests that mild traumatic brain injury (TBI) may result in memory impairment. The characterization of the amnesic syndrome has provided TBI researchers with models of memory functioning. Of recent interest is the nature of implicit and explicit memory in amnesic and normal subjects. Existing data do not provide a clear picture of whether deficits occur in these areas following mild TBI. Initial data from this study suggests that in the early days following mild TBI, children are impaired on implicit and explicit memory tasks. This goes against current beliefs and suggests a pattern distinct from the classic amnesic syndrome usually identified with TBI. This research addresses a number of important theoretical and clinical issues arising from the data.

J. TODD, L. PENTLAND, & V. ANDERSON. Can You Plan a Party? Assessing Planning Skills in Head-Injured Adolescents.

Examination of executive skills in head injury (HI) adolescents has received little attention, yet the day-to-day difficulties that HI adolescents experience suggests considerable problems with planning/organization. Executive skills of adolescents sustaining mild ($n = 17$) and severe ($n = 16$) HI were compared to those of healthy controls ($n = 17$) using functional measures of planning ability. Groups were matched for age (range 12-16 yr) and gender. IQ was measured and the Party Planning

Test was given as a functional measure of planning ability. Error measures and planning efficiency were recorded and analyzed. No differences were detected between controls and the mild HI group, but adolescents with severe HI experienced significant planning difficulties. However, even healthy adolescents did not display mature planning skills, suggesting that planning difficulties need to be interpreted from a developmental context.

Poster Session 2

HEAD INJURY ASSESSMENT

H. BORRILL, T. KELLY, J. WELCH, & C.P. WONG. Early Data From a Prospective Neuropsychological Study of Nontraumatic Coma in Children.

Acute nontraumatic coma is increasingly recognized as a major cause of mortality and morbidity in children. At present there is no population-based prospective data available concerning the neuropsychological outcome of this group. A prospective study assessing outcome of nontraumatic coma in children, including measures of intelligence, attention, academic, and motor skills, as well as activities of daily living and behavior, is therefore being conducted on a population of children in the Northern Health Region in England. Early results suggest that a high percentage of these children experience neuropsychological impairments, and thus contradict the current belief which suggests only a small number of these children will suffer adverse consequences from nontraumatic coma.

J. BROOKS & K. GREVE. Fractionation of Problem Solving and Language Skill Following Left Temporal Lobe Resection.

Problem solving involves distinct, interactive processes. Many measures have shortcomings interfering with understanding performance mechanisms. We studied problem solving postoperatively utilizing the California Card Sorting Test (CCST) in two right-handed patients with complex partial seizures. The CCST fractionates problem solving and distinguishes sorting skill and concept verbalization. A task-specific deficit in concept description and a verbal material-specific deficit were hypothesized. CCST performance revealed a task-specific deficit in nonverbal concept description and difficulty processing verbally mediated cues. Results suggest aphasic and verbal conceptualization disturbances. Findings parallel Petrides and Milner (1982) whose left frontal excision patients were impaired on verbal and nonverbal tasks and whose right excision patients were impaired on nonverbal tasks. This study underscores the importance of language and verbal conceptualization on verbal/nonverbal tasks.

S. DONNELLY, A. OLDFIELD, T. MACKNEY, & K. SHARWOOD. Guess Who's Coming for Dinner—Motor Apraxia!

Eating for a person unaffected by brain damage is not consciously demanding. Over time and with practice the intricacies of eating are forgotten; however, for a person with brain damage this self care task can be a significant challenge. A person with motor apraxia may understand all that is required of eating, but present with an awkward, inflexible, or clumsy grasp, be unable to apply the required pressure to cut the food, and poorly adjust the wrist and forearm when approaching the mouth. Lesions in either the frontal or parietal lobe may result in motor apraxia, as will a disruption in the pathways between the two lobes (Arnadotir, 1990). Motor apraxia can present either unilaterally in the left extremities or bilaterally.

M.-S. HUA, Y.-C. CHU, & C.-S. LU. A Reexamination of Visuospatial Function in Patients With Parkinson's Disease.

This study was designed to discover any factor structures for a series of conventionally used tests of visuospatial function and to determine by use of factorial scores whether idiopathic parkinsonian patients had any

difficulty in performing these tasks. Eighty-six adults, including 41 patients with idiopathic Parkinson's disease and 45 adult normal control subjects, participated in the present study. Members of these two groups were matched for age, educational level, and Verbal IQ. Principal component analysis revealed four factors: visual analysis and synthesis, mental transformation and rotation, judgment of angles and directions, and visuoconstructive praxis. Further analysis with factorial scores indicated that only visual analysis and synthesis and mental transformation and rotation abilities were affected in patients with idiopathic Parkinson's disease.

B. KAMMERER, H. COFFMAN, M. BROWN, & T. CLARK. Clinical Use of the Rey-Osterrieth Complex Figure (ROCF) in Neuropsychological Assessment of Deaf Children.

This study addressed variable clinical results with the Rey-Osterrieth in a pediatric deaf population. One hundred seventy-four deaf children were administered the ROCF along with cognitive and achievement tests. Predictability of organizational levels was increased when scores compared with a deaf normative sample. Overall, results varied significantly with cause of deafness, communication mode, and presence/absence of learning disability. Results are discussed in terms of applicability of the ROCF and impact of varying linguistic and auditory environments on the developing brain.

T.P. KELLY. Do Purported Tests of Frontal Lobe Function Predict Behavioral and Psychiatric Outcome in Children Following Closed-Head Injury?

Children aged 8–16 yr who had experienced closed-head injuries resulting in admission to pediatric intensive care and who scored significantly below age-related expectations on a range of tests of purported frontal lobe function were compared with children whose measured frontal lobe function was intact. Those with impairments showed significantly higher levels of internalizing and externalizing pathology and were significantly more likely to have been diagnosed as having a psychiatric disorder in the first year following head injury. Tests of frontal lobe function may be important prognostic indicators of behavioral and psychiatric outcome in children with closed-head injuries.

M. KORSNES & I. REINVANG. Event-Related Potentials and Serial List Picture Memory in Parkinson's Patients.

Short-term memory for order information was investigated in 6 patients diagnosed with Parkinson's disease (PD) while event-related potentials (ERPs) were recorded after presentation of each stimulus. They were tested for recognition with abstract spatial patterns and words, after a 5-s retention interval. Accuracy performance on the spatial abstract task showed a marked recency deficiency, but no significant serial position effects were found for words. Serial position effects were found for FZ, CZ, and PZ electrodes for both stimulus categories at the probe recognition position. Higher average amplitude for first-list items in abstract spatial patterns, and for last-list items in words, was found in ERPs for memory-set items. It is demonstrated that recognition memory is affected in PD relative to healthy young and older adults. The results indicate processing and attentional difficulties in PD.

E.I. KUMKOVA & F.F. LEFEVER. A "Good Figure" Nonverbal Memory Test: Refinement and Preliminary Validation by Concurrent Tests and by Lateral Biases in Performance.

Despite early reports of modality-specific memory deficits with ablation of right versus left temporal foci, epilepsy centers have difficulty identifying them presurgically—using the most commonly used memory tests. Face recognition tests show promise in right focus identification (Barr et al., 1993; LeFever, 1993), and here we explore feasibility of an alternative to them with easily reproduced nonrepresentational line drawings intended to elicit "whole object" responses, as opposed to the itemizing of details some tests elicit. Using the format of Warrington's Recognition Memory Test (RMT), subjects judged each of 64 "Good-

Fig⁷ items as pleasant or unpleasant to aid memory. Forced-choice discrimination from 64 new items yielded low success, so a second group was tested with two blocks of 32 items, with success closer to RMT. GoodFig tended to correlate better with RMT Face than with RMT Word; subjects tended to miss more correct Face and GoodFig items on the right, congruent with greater right hemisphere involvement, and subjects with this bias showed an opposite bias with Word items.

E. LANNOO, S. BAUWENS, & E. THIERY. Neuropsychological Test Performance Versus Postconcussional Complaints After Moderate-to-Severe Head Injury: A Two-Year Follow Up.

Neuropsychological test performance and postconcussional complaints of 28 adult patients with moderate-to-severe head injury were investigated over a 2-yr period. Compared to a control group of 23 normal healthy volunteers, patients performed significantly worse on most neuropsychological measures at 1 mo postinjury. At 2 yr postinjury, there was a marked improvement on many of these tests, but a number of neuropsychological functions remained impaired. Compared to their situation before the injury, patients reported a highly significant increase in postconcussional symptoms. At 2 yr postinjury, the experienced severity of these symptoms was markedly higher than at 1 mo. No consistent correlations between self-reports on postconcussional symptoms and neuropsychological test performance were found.

E. LANNOO, A. DE PAEPE, B. LEROY, & E. THIERY. Neuropsychological Test Performance in Patients With Marfan Syndrome.

In this study, the neuropsychological status of 13 patients with Marfan syndrome was evaluated. Compared to a matched control group of 13 normal healthy subjects, Marfan patients performed significantly worse on sustained attention and visuoconstructive abilities. Because these tests explicitly require visual processing, the known visual problems associated with the syndrome might explain these findings. On the other hand, other tests that also require visual processing showed no significant differences between both groups. This finding suggests that problems with visual attention and visuoconstructive skills may be present in Marfan syndrome over and above associated visual problems. Further research is needed, using larger patient groups screened for severity of visual impairment, and control groups such as nonaffected siblings and matched controls with similar visual problems.

D. LARKIN & G. REVIE. Foot Preference and Skill in Children.

The link between the preferred foot and skill was explored in this study of 351 boys and girls aged 5, 6, and 7 yr. The children were also grouped by the foot preferred for hopping. Measures were then taken of the distance hopped with each foot. There was an increase in the frequency of right foot preference from 51% at age 5 yr to 64% at age 7 yr. Overall, the right foot performed better than the left, but preference interacted with hopping foot such that the right-preferring group hopped further with the right foot. Gender also interacted with hopping foot, with boys showing better skill with the right foot. In this age grouping it appears that preference and skill are linked for children who self-select the right foot.

F.F. LEFEVER. Brain Mast Cells: An Unexplored Dimension in Mild Head Injury Research?

Mast cells (MC) capable of selective and graded release of numerous agents they synthesize or take up and store (not just degranulation and explosive release of histamine in extreme reactions) are found in the brain, especially the hippocampus and thalamus, and are activated and proliferate in response to nerve damage. Even mild cranial impacts can damage axons, but MC are ignored in studies of brain response to trauma, although they can secrete cytokines, as cited in some studies. Complex communication between neural and immunological systems is mediated by numerous cytokines and other ligands, which MC can secrete or modulate. IL-1 is emphasized here heuristically and for its likely role in normal sleep. Selective cytokine effects on hippocampal LTP and

on specific hypothalamic nuclei, and dissociability of acute febrile responses from persisting cognitive/behavioral effects, suggest mechanisms for persisting lethargy and poor concentration or memory after mild head injury. These mechanisms might be relevant to similar complaints in chronic fatigue syndrome or after Lyme disease, involving upregulated cytokine production by MC. Differences (e.g., myalgia) might reflect peripheral versus brain production sites.

A. LITTLE. Epilepsy—Social Systems and Personal Power.

Four hundred ninety-five persons with epilepsy participated in an extensive research study to investigate the issues that confront people with epilepsy. Three methods were used to gather data: a questionnaire, individual semistructured interviews, and focus groups. Research was focused on 6 areas: biographical details; nature and severity of epilepsy; individual and community support and service access; psychosocial adjustment; perceived limitations; and perceived stigma. The results indicated experiences of powerlessness (81%) and lack of understanding of epilepsy in the community (87.3%). Prejudice, discrimination, and stigma were seen to be directly linked to poor community awareness. This data substantiates the need for educational programs that will empower the community with knowledge, skills, and values and demystify the condition.

L. PENTLAND & V. ANDERSON. Attention Skills in Head-Injured Adolescents and Their Peers.

Attention deficits are frequently reported in adults following head injury. However, potential deficits in these skills following childhood head injury have not been adequately investigated. The present study evaluated the attention skills of severely injured adolescents ($n = 22$) and healthy controls ($n = 22$). Five attention tests were administered. Tasks were selected to assess the elements of attention proposed by Mirsky et al. (1991). Group differences were found across the range of tasks and were more pronounced on speeded measures. Principal Components Analysis did not replicate the model proposed by Mirsky et al. (1991), but rather was dominated by a general information processing factor. These results suggest that pediatric head injury results in generalized dysfunction to the attentional system, as opposed to impairment to separable, discrete elements of attention.

E.M. PICARD & B.P. ROURKE. The Expression of LD Subtypes as a Function of SES.

A fundamental problem confronting researchers in the field of learning disabilities (LD) concerns the use of exclusionary definitions. The present study sought to determine the empirical validity of including low SES among "traditional" exclusionary criteria. The neuropsychological test performance of 441 children aged 6.0 to 15.9 yr and representing both high-SES and low-SES groupings was subjected to a cluster analysis. The results revealed that the economic groups were equally represented among the clusters generated. Differences between the children appeared to be restricted to discrepancies in levels of performance. The results are discussed in terms of their implications for research in the field of LD.

K.D. TSATSANIS & B.P. ROURKE. Psychosocial Dimensions of Learning Disabilities: External Validation of Personality Subtypes and Relationships to Age and Academic Functioning.

In a group of 157 children (aged between 7 and 13 yr) with learning disabilities, this study was designed to assess: (a) the relationships between age and psychosocial functioning; (b) the relationships between psychosocial functioning and cognitive and academic achievement; and (c) the external validity of statistically derived psychosocial subtypes. The subjects were assigned to 1 of 7 subtypes on the basis of a profile matching algorithm. Overall, results showed there was no increase in psychopathology with advancing age. There were clear relationships between academic achievement patterns and personality subtypes. The subtypes could be distinguished on the basis of a behavior problem checklist not used for the construction of the subtypes.

H. VAN DER VLUGT & F. VAN SCHIJNDEL. An International Computerized Screening Battery for Learning Disabled Children.

Within the European Community (EC) about 10,000 children are transferred regularly from one school in one country to another school in another country. Because a child stays at the same school only for one year, a standard screening procedure to identify the learning disabled child is needed. We developed a one-and-a-half hour computerized neuropsychological screening procedure (with instructions in six different languages) allowing the school to detect the child at risk. The program was applied to 330 children from 24 different nationalities. Of the children at risk for learning disabilities, 92% were correctly identified. Additional neuropsychological testing allowed us to propose remediation plans.

G. VINGERHOETS, G. VAN NOOTEN, & C. JANNES. Moderate Asymptomatic Carotid Artery Disease Has No Effect on Cognitive Outcome After Cardiopulmonary Bypass.

This prospective study investigates the effect of asymptomatic carotid artery disease on the cognitive outcome after cardiopulmonary bypass. Patients ($N = 104$) scheduled for cardiac surgery were classified in one of two groups based on the result of a preoperative duplex B mode Doppler scan. All patients received a neuropsychological examination prior and 8 d after surgery. We found no indications that the presence

of mild-to-moderate asymptomatic carotid artery disease increases the incidence of cognitive disturbances after extracorporeal circulation. We conclude that mild to moderate carotid disease does not appear to play a major role in the genesis of early postoperative neuropsychological sequelae.

K. WATERLOO, R. OMDAL, & S.I. MELLGREN. Neuropsychological Deficits in Systemic Lupus Erythematosus (SLE).

An SLE patient group ($n = 36$) and a chronic whiplash ("control") group ($n = 31$) underwent an extensive neuropsychological examination that sampled a wide range of cognitive functions, including measurement of full-scale intelligence quotient (IQ), memory, and measurement with tests from Halstead-Reitan Test Battery. Data analysis included the student's two-tailed t test and simple linear regression analysis. Our results indicate that the SLE group is significantly more impaired than the control group (whiplash) in performance IQ, visuospatial skills, complex attentional processing, and cognitive flexibility. There was considerable variability in the profiles of cognitive impairment in the SLE patients, showing the diversity of CNS involvement in these patients. The impairment profiles for SLE patients seems to reflect diffuse or multifocal CNS dysfunction. No significant correlation between cognitive function and corticosteroid dosage or disease duration was found.

SATURDAY MORNING, JULY 8, 1995**Special Session—Part 1****QUANTITATIVE ASSESSMENT OF THE MINIMALLY RESPONSIVE PATIENT****J. Whyte and M. Di Pasquale****Special Session—Part 2****QUANTITATIVE ASSESSMENT OF THE MINIMALLY RESPONSIVE PATIENT****J. Whyte and M. Di Pasquale****J. WHYTE & M. DI PASQUALE. Quantitative Assessment of the Minimally Responsive Patient.**

Minimally responsive or "slow to recover" patients present a unique challenge to the health care industry. Inconsistencies in performance, and reflexive and spontaneous behaviors prevent clinicians from confidently assessing sensory, cognitive, and functional status, and interfere with evaluating spontaneous or treatment-induced change. Because traditional neurologic and neuropsychological evaluations rely on a patients' consistent participation and/or complex responses, their utility is limited in this population. During 3 yr of intensive clinical research, we developed a quantitative assessment method for such patients that utilizes the principles of single-subject experimental design. Over 100 clinical questions regarding sensory, cognitive, and communication function and spontaneous or treatment-induced change have been addressed in 16 minimally responsive patients. A training curriculum including detailed case discussions is presented.

Paper Session 15**LANGUAGE****E. YIU. The Pattern of Grammatical Disruption in Chinese.**

Chinese, or any of its dialect, is characterized by the lack of inflectional morphology and frequent use of elliptical sentences because of its unusual omission of topics and grammatical subjects in sentences. These characteristics are indeed the definition of agrammatic speech found in aphasic subjects. However, a native Chinese speaker can readily distinguish a normal speaker who demonstrates these characteristics from the agrammaticism found in an aphasic speaker. Therefore, the aim of this study was to determine in what way the agrammatic speech in Chinese is different from the normal speech. The grammatical production abilities of 30 aphasic subjects were analyzed using a cluster analysis procedure. Three different patterns were revealed. Two of the patterns were characterized by agrammatic production. These patterns were significantly different from that of the normal control group.

A. CASTLES & M. COLTHEART. A Single Case of Developmental Surface Dyslexia.

Attention has recently focused on identifying developmental analogues of the specific word recognition impairments observed in acquired dyslexics. Although some cases of developmental surface dyslexia have been reported, these have shown inconsistencies in their patterns of reading impairments. Also, little is known about what other cognitive deficits might be associated with this type of reading disorder. This paper describes what would appear to be a pure case of developmental surface dyslexia. LH is a 9-yr-old boy with no history of neurological impairment. For his age, he is extremely poor at reading aloud irregular words, but performs normally on nonword and regular word tasks. The details of LH's reading impairment are described, as well as his results on tests of associated cognitive abilities.

R. CUNNINGTON, J.L. BRADSHAW, R. IANSEK, & J.G. PHILLIPS. Movement-Related Cortical Potentials Preceding Imagined Movements.

Movement-related potentials (MRPs) recorded from the scalp overlying premotor and motor cortical areas indicate a slow increase in neural activity beginning 1 to 2 s prior to self-initiated, voluntary movement. In 12 healthy control subjects we found the early component of these MRPs to show identical temporal and spatial characteristics preceding movements which were mentally prepared and imagined but not performed, as those preceding actual movement. This would indicate that the initial rise in neural activity apparent in the early component of the MRP reflects motor preparatory processes which occur even in the absence of actual movement. Further, a possible role of the SMA in such preparatory processes is suggested.

S.F. CROWE. Deterioration in Performance on Verbal Fluency as a Function of Time is Due to the Finite Available Word Store.

The performance of 57 university students were compared on the VFT and the DFT. The results indicated that there was a significant deterioration in performance on the VFT as a function of time. In a second experiment, a second group of 100 subjects were compared for their performance on fluency tests for verbal and nonverbal material, which were meaningful or were nonsense. For both meaning conditions there was a significant deterioration in performance as a function of time while production of the nonsense items remained constant. The results indicate that the requirement for the items on the VFT to be meaningful requires that the subject must draw directly on the available word store, resulting in deterioration of performance as this word store is exhausted.

Paper Session 16

CHILD DEVELOPMENT

M.J. NESTER. Autism as a Secondary Diagnosis: Autistic Children Within Other Syndrome Groups.

Autism usually presents as a primary diagnostic category in children. When a primary diagnosis of another syndrome is present, the autistic symptomatology may be missed or misinterpreted. In the Neuropsychology Service at King Faisal Specialist Hospital in Riyadh, Saudi Arabia, some 15% of our diagnosed autistic cases ($n = 134$) carry another diagnosis. We present three representative cases: a child with Crouzon's Syndrome, a child with classic Phenylketonuria, and a youngster with Down's Syndrome. The discussion emphasizes careful consideration and accountability of all major symptoms when assessing children.

L.W. BRAGA & A. CAMPOS DA PAZ, JR. An Approach to Cerebral Palsy Based on the Family.

The Sarah Hospital for the Locomotor Diseases developed a methodology for handling children with cerebral palsy, based on family training. Aiming to evaluate this approach, two groups of children were studied: group A worked with the family following the method and group B was stimulated only by specialist professionals. Each group was composed of children with cerebral palsy diagnosed from the age of 1 to 6 yr. The motor and cognitive development of the children was followed for 1 yr. The comparison between the two groups was done through chi-square and multiple regression statistic tests. The results showed that the group that worked with the family obtained a better evolution in motor and cognitive development than the group which worked exclusively with professionals ($p < .001$).

A. CAMPOS DA PAZ, JR. & L.W. BRAGA. Walking Prognosis in Spastic Cerebral Palsy: A 22-Year Retrospective Analysis.

A retrospective study was performed with 272 patients with spasticity to determine criteria for the prognosis for ambulation based on the age at which children with cerebral palsy attain important gross motor milestones.

The variables analyzed were age at last clinical assessment, clinical type of cerebral palsy, and age at attainment of gross motor milestones. Achievement of head balance before age 9 mo was an important parameter for good prognosis for walking and, after age 20 mo, an indicator for poor prognosis. Sitting by age 24 mo indicated a favorable outcome, and motor control of crawling at age 30 mo was a predictor for good prognosis. Based on these data, a chart for walking prognosis in children with cerebral palsy is presented ($p < .001$).

D. DEWEY, D. CREIGHTON, & R. SAUVE. Intellectual, Memory, Language, Visual-Motor, and Motor Functioning in Very Low Birth Weight and Normal Birth Weight Children.

This study investigated whether very low birth weight (VLBW) children free of sensorineural impairments had significantly poorer performance on measures of intellectual, memory, language, visual-motor, and motor abilities compared to normal birth weight (NBW) full-term peers. A second purpose of this study was to investigate whether the performance of VLBW children at age 3 yr on intellectual, language, visual-motor, and motor measures predicted later performance on similar measures. Subjects included 25 VLBW children identified at age 3 yr as "suspect" for developmental problems, 22 VLBW children identified at age 3 yr as developing normally and 30 NBW peers. Results indicated that the VLBW children in the "suspect" group performed significantly more poorly on all of the measures compared to NBW peers. The performance of the VLBW children in the "normally developing" group was not found to be significantly different from the NBW children. Results also revealed that the performance of VLBW children on tests of intelligence and motor skills at age 3 yr was predictive of later performance on similar measures. Thus, contrary to the results of previous studies, this study found that not all VLBW children performed more poorly than NBW on measures of cognitive and motor skills.

Paper Session 17

NEUROPSYCHOLOGY OF MEDICAL DISORDERS

D. CAINE, P. ROACH, & D. MCHARG. Cerebral Hypoxia: Neuropsychological Sequelae and Their Neuropathological Correlates.

Despite the diverse circumstances in which cerebral hypoxia occurs and despite the sensitivity of the brain to oxygen deprivation, there has been little elaboration of the cognitive sequelae of episodes of oxygen lack. The aim of this study was to identify patterns of cognitive change in patients following hypoxic brain damage in the context of known neuropathological changes following such events. In the first such controlled study of hypoxic patients, cognitive processes in a consecutive series of 24 patients was compared with the performance of an age- and sex-matched control group. Other methods of investigation included regional cerebral blood flow studies (rCBF). Patterns of cognitive change are identified and discussed in terms of known neuropathological changes.

K. JONES & G. KINSELLA. Subcortical Dysfunction Following Carbon Monoxide Poisoning.

Present understanding of neuropsychological dysfunction following carbon monoxide (CO) poisoning is incomplete, and based on single case studies and uncontrolled research. The study aimed to determine the critical neuropsychological functions affected by CO poisoning and evaluate a model of neuropsychological dysfunction based on a hypothesized subcortical syndrome, with features of attentional impairment, subtle memory deficits, and reduced problem solving efficiency. The first study, based on 13 accidental CO exposure cases, focused on attention and information processing and found that a subgroup of patients experienced a reduction in speed of processing. Preliminary findings of a second study consisting of 70 deliberate CO exposures that aimed to test the possibility of frontostriatal dysfunction accounting for observed attention, memory, and problem solving impairment, are presented and discussed.

J.A. OGDEN, T. UTLEY, & A GIBB. Long-Term Neuropsychological Outcome in 20 People With Herpes Simplex Encephalitis (HSE).

Six mo to 10 yr following confirmed HSE, 20 people who had been treated with Acyclovir were assessed on tests of general verbal and visuospatial functioning, new learning, retrograde memory, frontal-lobe abilities, and psychosocial functioning. The results demonstrate that HSE can result in a wide range and severity of cognitive outcomes, regardless of the initial severity of the disease or the delay in starting Acyclovir. Neurological and neuropsychological outcome measures were significantly correlated.

Surprisingly, many people were left with no or only a mild impairment of new learning or retrograde memory impairment. Frontal-lobe problems, while usually milder than memory problems, were quite common.

A. CASEY & S.F. CROWE. A Case-Controlled Comparison of Chronic Fatigue Syndrome (CFS): Support for Deficits in Memory Functions Independent of Depression.

Well-controlled studies of the cognitive status of CFS subjects are rare. In this study of 26 individually matched subjects, it was possible to ascertain that memory efficiency in terms of learning the items of the RAVLT was consistently impaired in this group after the effects of depression had been controlled for. This finding indicates a pattern of impairment characteristic of this group and supports the notion of CNS compromise in these subjects as a consequence of the condition.

S.J. ANDERSON. Neuropsychological Correlates of Chronic Fatigue Syndrome.

Subtle neuropsychological deficits have been implicated in chronic fatigue syndrome and there is some indication that overall cerebral efficiency is compromised in these patients. To further investigate the nature of this impairment, the current study compared 20 CFS patients with 20 matched depressed controls and 20 matched normal controls on a battery of 7 neuropsychological tests (Trials, SDMT, PASAT, Grooved Pegboard, FAS Test, Rey Auditory Verbal Learning Test and the Rey Visual Design Learning Test). Additional measures included the SCL-90-R and Cognitive Failures Questionnaire. Results indicated a significant group difference between CFS patients and normals on only one measure, the FAS Test ($p < .05$), although there were significant group differences in psychological status and subjectively rated cognitive dysfunction.

Paper Session 18

MEMORY

B.A. WILSON. Semantic Memory Deficits Following Nonprogressive Brain Injury.

Tests for assessing semantic memory were administered to 6 patients (3 with sustained encephalitis and 3 with traumatic brain injury). The purposes of the study were to determine whether (a) the deficits seen were similar to those reported for patients with progressive conditions, (b) the anatomical lesion sites were similar in progressive and nonprogressive subjects, and (c) aetiology related to the access versus storage debate. Results found the semantic deficits shown by the 6 subjects were similar to those reported for patients with Alzheimer's disease and with pro-

gressive semantic dementia, the lesion sites were in accordance with those reported for progressive subjects, and the encephalitic patients appeared to have a degraded central semantic system whereas those with TBI appeared to have impaired access to that system.

B. DE GELDER & J. VROOMEN. Modality Effects in Immediate Recall of Verbal and Nonverbal Information in Adult Developmental Dyslexics. Immediate serial recall performance of adult developmental dyslexics was examined for sound-producing objects represented by their spoken name, their typical sound, their written name, or their picture. Experiment 1 compared serial recall of adult developmental dyslexics with that of normal controls. The recency effect (that is, better recall at the final serial position) was largest for spoken lists, intermediate for sounds, and nonexistent for print and pictures. Dyslexics showed the same pattern of modality effects as normals, but their overall performance was lower in the four conditions. At the same time, the auditory advantage observed in normals was less clearly present in dyslexics. To examine the difference in overall recall as well as to investigate the basis of the auditory advantage, experiment 2 presented the two auditory lists to normal subjects under articulatory suppression. Articulatory suppression had the same effect on spoken lists as on sound lists and it reduced the performance of normal subjects to that of dyslexics. Discussion of the results focuses on the role of rehearsal processes in phonological memory.

II. PALMER & S. McDONALD. The Differences Between Retrospective and Prospective Memory in Brain Impairment.

The role of prospective memory (PM) in cognitive ability is not well understood. However, many researchers would agree that PM is distinctive from retrospective memory (RM), despite the fact that the relationship between these two aspects of memory is not clear. The purpose of the present study was to design a comprehensive PM test that was then used to address the relationship between RM and PM, assess population differences (older vs. younger groups) in PM, and neuroanatomically understand the PM process. Analyses of results indicate that PM and RM are two distinguishable aspects of memory and information about one does not necessarily provide information about the other. While performance differences were not found between the two groups tested, explanations regarding these results are discussed. The role of PM and PM testing in the study and understanding of brain impairment is also discussed.

K. SUNDET, A.-K. SOLBAKK, & I. REINVANG. Differences in Memory Profiles: Variations in Degree or Type?

The study reports the combined effects of tests assessing memory span, verbal list learning, paired associate verbal learning, visuospatial recognition, and visual learning in a group of 80 subjects (mean age 43 yr), referred for neuropsychological assessment with suspected nonfocal brain damage. Factor analysis produced 5 memory components: verbal list learning, incidental learning, verbal associate learning, visuospatial recognition, and learning strategy. Cluster analysis found 6 distinct clusters whereas 12 subjects were not easily grouped. The results showed that a wide range of memory tests are informative in describing memory impairments among suspected nonfocal brain damaged subjects and that discrepancies between verbal learning measures may indicate clinically significant subgroups.