

Abstracts Presented at the Twentieth Annual International Neuropsychological Society Mid-Year Conference

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WEDNESDAY AFTERNOON, JUNE 25, 1997

Poster Session 1

Display: Wednesday Afternoon and Thursday

Discussion with authors: Thursday, June 26, 4:20–5:15 p.m.

NEUROLOGICAL DISEASE: PARKINSON'S DISEASE, ALZHEIMER'S DISEASE AND OTHER DEMENTIAS, MS, EPILEPSY, ENCEPHALITIS

J.A. LUCAS, M.F. FINTON, R.J. UITTI, & R.E. WHAREN. The effect of left unilateral pallidotomy on neuropsychological functioning in patients with Parkinson's disease.

Thirteen right-handed patients with Parkinson's disease (PD) were administered a battery of neuropsychological measures prior to stereotactic unilateral (left) pallidotomy and approximately 3–4 months post-operatively. Results revealed significant declines on measures of semantic fluency and controlled oral word association following pallidotomy. Confrontation naming, judgment of line orientation, auditory–verbal attention span, memory, and problem solving did not change significantly over the test–retest interval. Results suggest implications for corticostriatal involvement in language functioning and support the conclusion of Rilling et al. that pallidotomy results in specific cognitive disruption despite improved motor abilities and stable general neuropsychological functioning following surgery.

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K. ERDAL. Motor fluctuations as a predictor of depression in Parkinson's disease and arthritis.

A Parkinson's disease (PD) patient group ($N = 45$) and an arthritis patient group ($N = 46$) were each divided into those with daily motor fluctuations and those without. A full factorial design compared two levels of DISEASE (PD, arthritis) and two levels of MOTOR FLUCTUATION STATUS (fluctuators, non-fluctuators) on two depression measures. A main effect for MOTOR FLUCTUATION STATUS was found indicating that fluctuators were more depressed than non-fluctuators across diseases. Despite similar levels of physical disability, the arthritis fluctuators reported greater levels of motor symptoms of depression (e.g., fatigue, inability to work) than the other groups. Fluctuation status appears to independently contribute to depression over and above physical disability, yet clear differences between the effects of PD and arthritis motor fluctuations remain.

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E. EGERVALL ELGH, M. FAGERLUND, A. LINDQVIST ÅSTOT, B. NÄSMAN, & T. OLSSON. Hippocampal atrophy in Alzheimer's disease is associated with cognitive dysfunction and hypercortisolism. Background: The hippocampal formation, important for cognitive function, is damaged early in Alzheimer's disease (AD). It is a key structure for cortisol axis regulation.

Objectives: The aim of this study was to investigate relations between hippocampal volume, neuropsychological findings and neuroendocrine changes in AD.

Study design: Ten outpatients with mild to moderate AD were included (8 women, 2 men, mean age 77 years). Neuropsychological testing included memory, spatial function and attention. The hippocampus was measured with magnetic resonance imaging (MRI). An overnight dexamethasone suppression test was performed to estimate cortisol axis function.

Results: The volume of hippocampus was significantly correlated to block design, block repetition, logical memory, and Rey 15-item memory test. ($r_s = .66/.85/.60/.65$, $p < .05 / < .01 / < .1 / < .05$) Cortisol levels correlated significantly to hippocampal thickness ($r_s = .70$, $p < .05$).

Conclusion: Neuropsychological tests correlate significantly to hippocampal CA1 atrophy. The association to hypercortisolism may be important for cognitive function and progression of the disease.

Correspondence: Eva Egervall Elgh, Department of Geriatric Care, University Hospital of Northern Sweden, S-901 85 Umeå, Sweden.

L. TROJANO, M. RAGNO, A. MANCA, & G. CARUSO. Neuropsychological follow-up of an Italian kindred with CADASIL.

Cerebral autosomal dominant arteriopathy with subcortical infarcts and leucoencephalopathy (CADASIL) is an inherited disease leading to dementia, linked to chromosome 19q12. Usually dementia develops after recurrent strokes, but asymptomatic subjects with the "affected" haplotype show subcortical leucoencephalopathy at MRI. We present a two-year follow-up study of attention, verbal and nonverbal short-term memory and learning, and abstract thinking in asymptomatic subjects from a recently reported Italian kindred. Data show that asymptomatic patients affected by CADASIL do now show progressive cognitive defects at a pre-clinical stage, and that their performances are not related to leucoencephalopathy. Our results suggest that subcortical lesions are not sufficient to affect neuropsychological performances at this stage. Cognitive defects might become evident later, after some TIAs or strokes.

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N. I. LANDRØ, E. GULOWSEN CELIUS, & H. SLETVOLD. Neuropsychological functioning in multiple sclerosis—A 6-year follow-up study.

Cognitive and emotional changes are commonly associated with MS. The nature and natural history of these changes were investigated by studying a MS sample longitudinally. The patients were evaluated in the early phase of the disease and followed up 6 years later. In the areas of information processing, memory and executive functions, there were only modest group level changes. However, as expected there emerged considerable individual differences. Depression may be a more important precursor of cognitive changes than previous cross-section studies have indicated.

Correspondence: Nils Inge Landrø, Department of Psychology, University of Oslo, Box 1094, Blindern, 0317, Oslo, Norway.

R. SKAVHELLEN, A. GRAMSTAD, & B. ELLERTSEN. MMPI-2 profile characteristics in patients with epilepsy.

MMPI studies of epileptic patients have yielded group profiles of the 2–8 code types. With the introduction of MMPI–2 there is a need for new group studies. Data from 119 epileptic patients were analyzed (mean age 32.8 yrs). The mean group profile was elevated on Scales 8,2,1, and 3, in that order. Patients with well-defined etiology showed lower scale elevations than patients with uncertain etiology. Patients with left hemisphere pathology showed more elevated profiles than patients with right hemisphere etiology. This difference was significant for Scale 2. The MMPI–2 yields a group profile in epileptics similar to the original. Differences in elevation and configuration occur on the basis of etiology and localization of neuropathology.

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LAURA HOKKANEN & JYRKI LAUNES. Cognitive recovery instead of dementia after acute encephalitis.

We evaluated the frequency of persisting dementia and the change in cognitive functioning in a prospective series of 45 consecutive patients with acute encephalitis. Eight of 45 had Herpes simplex encephalitis. Neuropsychological evaluation was first done 26.5 ± 20.8 days after the onset. Follow-up evaluation was performed to patients with reported disability in everyday life at 44.7 ± 16.3 months. Five (12.5%) had persisting dementia. However, improvement in follow-up was observed in several measures. The number of subtests with normal performance had increased in the majority of patients. The meaning of the observed emotional changes and epilepsy will be discussed.

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MEDICAL ILLNESS

J. WELCH, T.P. KELLY, & C. SKILBECK. Neuropsychological impact of coronary artery bypass surgery.

The study reports results from 312 patients undergoing elective coronary artery bypass surgery. Scores from the pre-operative period, 1 week post-operation and 6 months post-operation are compared. The effect of the procedure upon neuropsychological functions is outlined. Particular attention is paid to the recovery process, describing changes in specific functions over time. Most functions decline immediately following the operation and 6 months later the majority have recovered to the premorbid level or just below it. However, this conclusion does not reveal the whole story. Further analysis reveals a pattern of neuropsychological impairment suggesting that certain systems are particularly vulnerable to the effects of CABG surgery. The pattern of impairment is discussed in terms of implications for rehabilitation advice.

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E. POUTIAINEN. Cognitive reserve and neuropsychological functioning in subjects with asymptomatic HIV-1 infection.

The aim of the study was to evaluate the influence of cognitive reserve on neuropsychological performance in early human immunodeficiency virus type-1 (HIV-1) infection. Subjects were 59 asymptomatic HIV-1 seropositive subjects (HIV+) and 37 HIV-seronegative controls (HIV–). Twenty-six HIV+ subjects underwent a one-year follow-up. Neuropsychological examination included measures of cognitive speed/flexibility, non-verbal intelligence, verbal memory, and non-verbal memory. The cognitive reserve score was based on a combination of years of education and an estimate of verbal IQ. The results showed that in HIV+ and HIV– group the subjects with low cognitive reserve had poorer neuropsychological performance than the subjects with high cognitive reserve. However, after a 1-year follow-up an improvement of cognitive performance was found similarly in the HIV+ subjects with low and high cognitive reserve. Thus, in this

study low cognitive reserve did not indicate a progression of cognitive abnormality in asymptomatic HIV+ subjects.

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M.-S. HUA, S.-T. CHEN, L.-M. TANG, & W.-M. LEUNG. Olfactory function in patients with nasopharyngeal carcinoma following radiotherapy.

A suitable battery of tests of olfactory function was administered to 25 adult nasopharyngeal carcinoma patients having received radiotherapy, to 24 adult nasopharyngeal carcinoma patients having not received radiation treatment, and to 36 adult normal control subjects. Members of the three groups were matched for age, educational level, and Full Scale IQ. Comparison of test results indicated that nasopharyngeal carcinoma patients with radiotherapy were impaired in their ability to process olfactory information. The deficits of suprathreshold functioning in these patients did not seem to arise from impaired absolute threshold sensitivity. Provided that the results are reproducible, evaluation of nasopharyngeal carcinoma patients' olfactory functioning with adequate measures may be useful for detecting possible side effects of radiation therapy and guiding radiotherapists to proceed such a treatment with a minimization of its adverse impacts on these patients.

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TRAUMA AND REHABILITATION

E. PECK, S. MITCHELL, & A. PECK. Ecological validity of neuropsychological tests and pre- versus post-head-injury work status.

While neuropsychological testing is accepted as a valid measure of central nervous system functioning, the issue of the ecological validity of such testing has been questioned. This study will present data for 887 adult head injured patients where their pre- versus post-head-injury work levels were statistically associated with selected neuropsychological tests. Four hundred and sixty-three mild, 204 moderate, 220 severe head injured (HI) patients, aged 16 and above, who met admission criteria into an ongoing head injury clinical database, received a comprehensive battery of neuropsychological and emotional measures. Data to be reported include subgroup (HI Severity \times Work Outcome) means and standard deviations, as well as ANOVA results for each selected test. These data indicate that certain neuropsychological tests are statistically associated with differences in pre- versus post-HI work level.

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K. BEECKMANS & K. MICHIELS. Whiplash injury and mild head injury: Differential effects on cognitive functioning?

Twenty-six patients with persistent cognitive deficits (more than 6 months post-injury) following whiplash injury (WI) and 26 patients with persistent cognitive deficits (more than 6 months post-injury) following mild head injury (MHI) were evaluated. All patients underwent an extensive neuropsychological test battery assessing attention, memory, visuospatial abilities and executive functions. The results indicated that WI patients are not much or less impaired in their performance as compared with MHI patients. Both groups differed significantly on only 5 out of 40 test variables. WI patients were more deficient in focused attention, the consistency of performance during sustained attention and visuospatial judgement. In contrast, MHI patients experienced more difficulties in speed of information processing and planning/anticipation. In spite of the differences found, there is no strong evidence to reject the hypothesis that suggests that long-lasting cognitive problems seen in patients with a WI correspond to those noted in patients with a MHI.

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M.F. GREIFFENSTEIN, W.J. BAKER, & C. MORTON. The incidence of malingered test performance in a large postconcussion sample. The incidence of three types of neuropsychological malingering was examined at two levels of clinical confidence in a large series ($N = 278$) of litigating postconcussive patients. The target measures were Rey's Word Recognition List, the MMPI F scale, and Halstead grip strength. Definite malingering was defined as performance below the 10th percentile of a severe TBI group ($N = 100$). Probable malingering was defined as performance below the TBI group mean. Malingered amnesia was found in almost one-half of PCS claimants under the definite criteria. Malingered psychiatric problems were relatively uncommon. Unusually defective motor performances were seen in one-third under definite criteria, more than half under probable criteria.

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T. BODNER, M. DELAZER, & T. BENKE. Improved encoding of arithmetic text problems: A rehabilitation study.

Frontal lobe patients frequently have difficulties to correctly encode complex arithmetic text problems. Previous studies showed that verbal cues (specific questions) provided by the experimenter can improve the patients' encoding abilities and their arithmetic problem solving. Patients, however, were unable to transfer the positive effect of the cueing to a second, non-cued set of problems. In the present study we investigated whether 3 patients with severe head trauma were able to generalize the cueing technique through a specific training over 8 weeks. All patients showed significantly improved problem-solving abilities after the training. The effect of training was specific for arithmetic problem solving and did not extend to other tasks.

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C. ESCANDELL, V. ESCANDELL, D. BARTEL, M. HERREN, & M. GORE. Social interaction as a predictor of rehabilitation outcome.

The social interaction scale of the Functional Independence Measure (FIM) as a predictor of rehabilitation outcome was examined. The 33 participants of this study were age 62 and older and were recently discharged from a rehabilitation hospital. Of the 33 participants, 17 were female and 16 were male. The level of social interaction was measured by the FIM scales upon admission and again at discharge. The groups differed at a greater statistically significant level on t tests for both admission and discharge scores than on other FIM scales such as mobility, cognition or self-care. Results were consistent with the hypotheses that a higher level of social interaction may be indicative of the return home upon discharge from the rehabilitation setting.

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A.K. SCHANKE & E. HOFFT. Cognitive function and prerequisites for driving.

There is an increased referral to psychologists for assessing prerequisites for driving for patients with various cognitive dysfunction such as TBI, CVD and MS. There is, however, no specific driving test battery in wide use. The article describes the Norwegian regulations for holding a driver's licence, and the suspending regulations on medical reasons. The authors argue that cognitive deficits are part of the medical prerequisites, though this is not explicitly described in the regulations, leading to unequal practice. Pointing to the difference between cognitive prerequisites and technical driving abilities, the authors describe a neuropsychological test battery. In cases when laboratory tests yield inconclusive results, referring to a practical driving test is warranted. A study is presented comparing data from neuropsychological assessments and practical driving tests.

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NEUROPSYCHIATRY AND INDIVIDUAL DIFFERENCES

B. PERSSON, S. LEVANDER, & A. WIRSÉN-MEURLING. Conventional and computerized test results in a forensic psychiatric population.

One hundred seventeen consecutive forensic psychiatric patients were tested by 3 WAIS subtests, and the Benton Test. WAIS data correlated in the range .52 to .78 with corresponding data obtained by a subset of tests from the Automated Psychological Test (APT) battery. GAF scores, some selected diagnoses (schizophrenia, antisocial personality disorder), some crimes (murder, fire-setting, rape), but not the forensic psychiatric categorization (*serious mental disturbance*) were significantly but moderately predicted by the neuropsychological tests. It appears that computerized tests can provide salient information that is not covered by conventional tests in a forensic context.

Correspondence: *Ann Wirsén-Meurling, Department of Psychology, Lund University, Box 117, S-221 00 Lund, Sweden.*

B. PERSSON, S. LEVANDER, & A. WIRSÉN-MEURLING. Neuropsychological dysfunction and personality dissociation in a sex crime offender with callosal agenesis.

Agenesis of the corpus callosum is a rare congenital disorder with few symptoms; usually the only signs are epileptic seizures or motor dysfunction. Most patients have IQs within the normal range, and reveal few of the neuropsychological signs of disconnection found in split-brain patients. In the present case study, a 43-year-old sexual offender was submitted to a forensic psychiatric examination that revealed a previously unknown callosal agenesis. The subject had few neuropsychological signs in conventional tests, but severe dysfunction in some computerized tests. He totally denied being sexually interested in children of either sex, but was known to be violent and sexually offensive when drinking alcohol, causing a distinct personality dissociation.

Correspondence: *Ann Wirsén-Meurling, Department of Psychology, Lund University, Box 117, SE-221 00 Lund, Sweden.*

A. ESTÉVEZ-GONZÁLEZ & C. GARCÍA-SÁNCHEZ. Writing speed in adolescents: Sex and handedness variables.

In 195 adolescent subjects, 180 (90F/90M) right-handed and 15 left-handed males, writing speed was measured by recording the number of words written (by hand) during a 60-s period. Right-handed females and males, and left- and right-handed males were matched by age, years of schooling, and handedness quotients. Writing speed was slower in the right-handed male group than in the female. The difference between the groups was statistically significant. In addition, there was a significant difference between left- and right-handed males: Writing speed was slower in the left-handed group.

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CHILD DEVELOPMENT, BRAIN DISEASE, AND INJURY

K. MØLLER-PEDERSEN. Neuropsychological development difficulties in infancy: A model for linking assessment to treatment.

Spontaneous developmental changes and possibilities for influencing the developmental course are essential issues at the age of 0–3. It is important to find alternative models for neuropsychological intervention. In the described intervention model the neuropsychologist has the role of consultant and coworker to the parent–infant psychotherapist. To analyze neuropsychologically natural interaction situations in a standard way—using videos as a working tool—is the basis for a neuropsychological understanding of the infant's functioning. This information can immediately be transformed into daily life experiences for the family and the kindergarten by reviewing the interaction videos together.

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C.M. GRANDISON. Toward a model for developmental neuropsychology assessment of children 0–3 years of age.

A model for a neuropsychological assessment of the infant/toddler with developmental challenges is currently being developed at the Infant-Parent Program. We attempt to use developmental psychology, particularly the new view prevailing within the study of the infancy, to inform and to modify the developmental neuropsychology assessment process. The infant/toddler is differently organized than the older child and has as its primary developmental task to form social relationships with caregivers, through which the infant can come to understand the way human relationships work, to learn what he/she provokes in others and how she/he can feel effective in the world. The implications of this understanding on the assessment process, including initial interview, testing, observations, formulation and feedback are discussed.

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C.M. GRANDISON & E. BROWNING. Partnership between developmental neuropsychology and mental health consultation to day care.

We will describe the partnership between a developmental neuropsychologist and a mental health consultant to day care and the creation of a model for working with parents and day care staff by using the case of Mike, a 4-year-old with ADHD. Our presentation explicates the process of integrating the contributions of the two professionals; one who has expertise in working with day care staff in helping them recognize, understand, and deal with children who have behavioral and developmental difficulties, and the other who has expertise in evaluating such challenging children. As a result of the collaborative work, both the parents and the day care staff came to a new understanding of Mike's difficulties and strengths, which served as a framework for designing interventions.

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M. BORTZ. Development and standardization of a language assessment for Zulu speaking preschoolers.

In South Africa no standardized language test exists in Zulu, despite this being the language spoken by the majority of the population. Thus, the aims of this study were to develop, and standardize a linguistically and culturally appropriate receptive and expressive Zulu language assessment for preschool children, according to recognized psychometric procedures. The research was divided into a prestandardization phase and a standardization phase. Subjects were 691 first-language Zulu speakers attending preschool in Soweto. Prevalence of language disorders for this sample was 11%. A method for scoring of responses, utilizing a range of responses was devised, in order to take the sociolinguistic variables into account. The language assessment exhibited good internal consistency and inter-rater reliability (.79). It also demonstrated face validity, content validity and discriminant validity.

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N. COMPTON. The improvement in homeless preschool children's cognitive functioning following parent-child psychotherapy.

Forty-one children from multi-problem families were administered the Early Screening Profiles test both pre and post treatment. The Child Behavior Checklist was also completed pre-treatment. Forty-one percent of the children were classified as being at risk pre-treatment in at least one cognitive domain and 83% scored above the clinical cutoff for a social, emotional, or behavioral disorder. Thirty children were retested 1 year later and only 5 children (17%) were classified as being cognitively at risk. The author concludes that these children's cognitive deficiencies were not a result of

an IQ deficit but rather related to learned helplessness, high anxiety levels and post-traumatic stress disorder.

Correspondence: *Nancy Compton, Department of Psychiatry, University of California San Francisco, Child Trauma Project, San Francisco General Hospital, 1001 Potrero Street, Ward 21, Room 2124, San Francisco, CA 94110, USA.*

N. COMPTON. Psychological profiles of homeless young children who have witnessed violence.

Seventeen African American children were administered the WPPSI-R and asked to draw a person. A parent completed the Child Behavior Checklist form. The mean Full Scale IQ scores fell in the Average range yet there was a great deal of emotional and behavioral disturbance. Children consistently scored highest on the Picture Completion subtest. It is hypothesized that this subtest captures children's hypervigilance in social situations and may be related to the diagnosis of post-traumatic stress disorder.

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E. HEIERVANG, A.I. SMIEVOLL, J. STEVENSON, A LUND, & K. HUGDAHL. Auditory tone discrimination and planum temporale area in dyslexic and control children.

The main purpose of the study was to see if reduced planum temporale area or left/right asymmetry correlated with auditory temporal discrimination in children with dyslexia. The experimental group consisted of 27 children with reading disability, or dyslexia, and an even sized control group. The auditory temporal discrimination test involved three subtests: a same-different discrimination subtest, a tone repetition subtest, and a memory span subtest. The MR scans of the planum temporale were obtained with a 1.0 T Siemens magnet. The results showed significant differences between the dyslexic and control children for the tone repetition and the memory span subtests, with inferior performance in the dyslexic group. For the same-different subtest there was a trend towards significance in the same direction. The differences were larger with shorter duration of the tones, shorter ISIs, and with more tones in a sequence. The behavioral differences showed correlations with area and asymmetry measures of the planum temporale.

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T. HELLAND & A. ASBJØRNSEN. Executive impairments in dyslexia.

The present study focuses on a possible frontal dysfunction in dyslexia. Fifteen dyslexic adolescents were tested with the Wisconsin Card Sorting Test (WCST), Stroop Color-Word Test (SCWT) and dichotic listening to CV-syllables with the additional tasks of forced attention (DLFA) as a part of a clinical assessment. Both DLFA and SCWT performance were impaired, but not the WCST-performance. The data support a hypothesis suggesting impaired attentional functions in dyslexia, but do not confirm a specific frontal lobe deficit hypothesis. Based on factor analysis of the data, a general attention deficit model is discussed as a possible interpretation of the data.

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B. GJAERUM, H. BJØRNEREM, H. KLØVE, K. TROLAND, & A.-L. ØRBECK. Stability and change in neuropsychological profiles of function in young children with developmental disorders and children with mental retardation.

Thirty-four children with specific developmental disabilities and 15 children with mental retardation were assessed with a battery of 10 tests with an interval of 4–5 years. The purpose was to study the stability and change in children's functional profiles and the relative position of each function within the profile. The results will be presented and discussed with respect

to CA, MA and diagnosis at the time of the first assessment because these factors were expected to affect the stability and change of the functional profiles. A new test battery (NPM-X) and the Halstead battery and supplementary tests were used for the first and the second assessment respectively. NPM-X has showed good reliability, concurrent criterion validity and construct validity. The current study indicates its predictive validity. Correspondence: *Bente Gjaerum, National Centre for Child and Adolescent Psychiatry, University of Oslo, P.O. Box 39 Vinderen, 0319 Oslo, Norway.*

G.A. STEFANOTOS, H. RABINOVICH, P. KOLLROS, & K. CONWAY. Neuromotor dysfunction in autism associated with an epileptiform abnormality.

We describe an unusual case of an autistic child who regressed in speech development and behavior between 18 and 24 months of age. At 10 years, he exhibited very superior range verbal intelligence, a profound disorder of speech production and behavioral disturbance marked by obsessive-compulsive behaviors. Neuropsychological evaluation revealed a gross impairment of the ability to produce self-initiated and imitative sequences of movements of both brachial and oro-motor musculature. An EEG revealed right fronto-temporal spiking and a SPECT scan showed decreased perfusion to fronto-temporal areas bilaterally. Overall, the findings were suggestive of disturbances of function of dorsolateral pre-frontal and frontostriatal areas that resulted in a remarkable apraxic disturbance. The implications for understanding regressive communication disorders and executive dysfunction in autism will be discussed.

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L.W. BRAGA. Cognition in a choreoathetoid child.

This study focuses on the development of children with severe choreoathetoid cerebral palsy and analyzes the process through which such a child is able to present normal cognitive development. A case study presented three types of data on: (1) the 11-year-old subject's history based on his medical chart from SARAH/Brasilia hospital; (2) the literacy work conducted over a 16-month span; (3) the thinking and interacting processes (from 4 years of interview data). Conclusions: severe choreoathetosis creates speech and motor difficulties that can lead the child to a unique development process in which roundabout paths are created, starting with the establishment of nonconventional mechanisms in the intra- and interpsychological levels. Despite the limitations, the child constructs and molds his/her own development process where external activity and visible action are predominantly accomplished with special mediation, usually from the mother, in an affective, highly intersubjective relationship.

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J. TA'IR & A. BREZNER. Neuropsychological correlates of MRI imaging in child survivors of traumatic brain injury.

Two protocols of MRI imaging techniques; the standard T1 and T2, versus T1, T2, and T2* were used to demonstrate their differential sensitivity in defining the presence and extent of diffuse axonal injury following closed head injury. We examined the long term effects of CHI in children, correlating the neuropsychological results of this population with MRI findings. We hypothesized that our consistent findings of significant neuropsychological deficits in the absence of corresponding standard MRI abnormalities were related to the limitations in this brain imaging technique. The addition of the T2* technique improved the visualization of diffuse axonal injury, providing neuroanatomical correlates for neuropsychological deficits evident in our population. The preliminary results of this study are presented in this paper.

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A. BREZNER, J. TA'IR, J.M. GOMORI, N. PELED, & P. GOLDSTEIN. MRI imaging of child and adolescent survivors of traumatic brain injury: The tip of the iceberg.

An attempt to understand the biological basis of cognitive and behavioral deficits seen after traumatic brain injury needs to be based upon a valid morphological description of the damage caused to the brain as a result of the injury. This study attempts to examine the claim that different MRI protocols will result in different visualization of brain damage. We compared two types of MRI imaging protocols (T1 & T2 vs. T1, T2 and T2*) in a population of 38 child survivors of CHI. Our results indicated that the addition of the T2* technique to the standard MRI protocol allowed better visualization of diffuse axonal injury than standard methods. Thus, this technique provides one more step in understanding the extent of damage caused by TBI.

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S. DAY, T.P. KELLY, & C. WALTON. Long-term attention and executive problems in children with severe traumatic brain injury.

Twenty-one children who had experienced severe traumatic brain injury were tested 3 years post-injury on a battery of intellectual, attention and executive function tasks. This clinical sample was then compared with a normative sample matched for age, sex, and intellectual ability. Results suggest that the children with traumatic brain injury continue to experience long term specific deficits in attention and executive function, which cannot be accounted for by impairments in intellectual ability.

Correspondence: *T.P. Kelly, Department of Clinical Psychology, Room 432, Ridley Building, University of Newcastle upon Tyne, Newcastle upon Tyne, England.*

J. DICKERSON, T.P. KELLY, D. STILGOE, & C.P. WONG. Cognitive and behavioral sequelae of non-traumatic coma in infants.

Twenty-eight children age 0–2 years who had experienced acute non-traumatic coma, were compared with a control group of children who had been hospitalized with conditions not affecting the central nervous system, at between 4 and 8 weeks after discharge. The non-traumatic coma performed more poorly than the control group on measures of cognitive and behavioral outcome. Measures of frontal lobe function did not show group differences, nor did parent completed temperament scales. As expected outcome could be predicted by severity of illness as measured by time in hospital.

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AGING

P. LAURSEN. Chronological aging and cognitive performance: An 11-year follow-up study of four age cohorts.

The impact of aging on cognitive performance of the general adult population is analyzed with special emphasis on the generation (age), sex, and schooling factors. The analysis was made using a longitudinal design with four age cohorts born in 1952, 1942, 1932, and 1922. One thousand twenty-six subjects were examined in 1982–83 and 711 were re-examined in 1993–94. All testing was done by means of the Cognitive Function Scanner method. The preliminary results of the follow-up showed that performance becomes more scattered with increasing age, and that generation, sex, and schooling are the most important subject-related factors to take into consideration in the evaluation of test results. The significant impact of the generation factor indicates that cognitive performance depends not only on aging but is also modulated to a large extent by generation-specific factors.

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K.M. ADAMS, S. GILMAN, D. JOHNSON-GREENE, R.A. KOEPPE, L. JUNCK, K.J. KLUIJN, S. MARTORELLO, M. HEUMANN, & E. HILL. The significance of family history status in relation to neuropsychological test performance and cerebral glucose metabolism studied with positron emission tomography in older alcoholic patients.

Patients with severe chronic alcoholism have decreased rates of glucose metabolism in the medial frontal lobe and correlated abnormalities of neuropsychological functioning. The potential influence of family history of alcoholism has not been examined in these patients. In a retrospective study, we used neuropsychological tests and neuroimaging employing [¹⁸F] fluorodeoxyglucose with positron emission tomography to study 48 older subjects who had histories of severe, chronic alcohol dependence. These patients were divided into two groups; 27 with a first degree relative with chronic alcoholism, and 21 patients without first degree relation with chronic alcoholism. No differences were found between groups on either neuropsychological or neuroimaging tests. These results demonstrate that a family history does not influence the effects of severe chronic alcoholism on the function of the medial frontal lobe.

Correspondence: *K.M. Adams, Psychology (116B), VA Medical Center, Ann Arbor, MI 48105-2300, USA.*

A.B. SHUTTLEWORTH-JORDAN, P. SATZ, & S. RADLOFF. Inter-individual variability on cognitive test performance in older adults: Can a lawful pattern be identified?

The aim of this study was to investigate the inter-individual variability on cognitive task performance in normal older adults. The alterations in inter-individual variability as they ensue across adult age groups over a broad

range of neuropsychological tests were examined. The statistically significant variability trends which emerge for the domains of attention, memory, language, visual and hand motor skills are described and integrated into a model of variability that appears to occur lawfully in association with the aging process. The work has implications for conceptualizations of the aging process from the neglected differential perspective as distinct from the more regularly employed central tendencies position taken in aging research and diagnostic practices.

Correspondence: *Ann B. Jordan, Psychology Clinic, Rhodes University, Grahamstown 6140, South Africa.*

M. SILVER, T. PERLS, & K. NEWELL. Correlation of neuropsychological testing and neuropathology of two cognitively intact centenarian women.

For neuropsychologists, neurologists, and others involved in the assessment of cognitive functioning, a major question is how accurately does neuropsychological testing correlate with post-mortem brain pathology. This paper will compare the neuropsychological testing conclusions concerning areas of cognitive impairment, etiology, and diagnosis with the results of the post-mortem neuropathology studies in two 100-year-old women. Besides shedding light on diagnostic questions, these centenarian comparisons can help us define the neuropathological changes we can expect from normal aging as well as help us understand the relationships between actual functional abilities and brain pathology.

Correspondence: *Margery Silver, Harvard Medical School Division on Aging, 643 Huntington Avenue, Boston, MA 02115, USA.*

THURSDAY MORNING, JUNE 26, 1997

Symposium 1/9:00–10:40 a.m.

UNDERSTANDING THE DEVELOPMENT OF EXECUTIVE FUNCTIONS IN CHILDREN: INSIGHTS FROM NORMATIVE AND CLINICAL POPULATIONS

Organizers and Chairs:

V.A. Anderson and T.P. Kelly

V.A. ANDERSON & T.P. KELLY. Understanding the development of executive functions in children: Insights from normative and clinical populations.

The concept of executive function incorporates a range of subskills, including attention, planning, problem solving, reasoning, and mental flexibility. Until recently the evaluation of these skills has been neglected in pediatric populations, possibly due to the widely held view that such abilities are inaccessible during childhood. Current research has refuted this position, documenting evidence that, while developing throughout childhood, executive functions are evident even in young children. The aim of this symposium is to investigate the development of executive functions, employing both healthy and clinical samples. Presentations will (1) discuss data from clinical samples, illustrating the impact of early cerebral insult on the maturation of executive functions; (2) describe new approaches to the assessment of these skills in children; and (3) evaluate the validity of traditional tests.

Correspondence: *Vicki Anderson, Department of Psychology, University of Melbourne, Parkville, Victoria 3052, Australia.*

R. JACOBS, V.A. ANDERSON, & A.S. HARVEY. Concept generation and temporal judgment as measures of executive functions in children: Examination of developmental trends.

Executive functions in the pediatric population are difficult to quantify due to the lack of adequately normed measures available for use with children. Further, existing tests only utilize summary scores, making it difficult to fractionate the processes underlying performance on executive tasks. Two re-

cently developed tests were adapted for use with the pediatric population and administered to a group of 50 children ($N = 25$, 7–9 year olds and $N = 25$, 10–14 year olds), with no previous history of emotional or psychiatric disturbance. It was hypothesised that the younger children would perform more poorly than older children on all aspects of task performance. Results revealed significant differences between groups on global scores, time taken to complete tasks, temporal estimations, and strategies used.

Correspondence: *Rani Jacobs, Department of Psychology, Royal Children's Hospital, Parkville, Victoria 3052, Australia.*

P. ANDERSON, L. MATTHEWS, & V.A. ANDERSON. Validity of the Rey-Osterrieth Complex Figure Test (CFT) as a diagnostic tool: Analysis of the accuracy and process scores.

The Rey-Osterrieth Complex Figure Test is used extensively by clinicians and researchers to measure neuropsychological function. Recently a 'Process Score' has been devised that examines the dynamic "process" employed to copy the CFT. The aim of the study was to investigate the validity of the CFT as a diagnostic tool using measures of accuracy and process. Four groups of children were obtained from patient records at the Royal Children's Hospital in Melbourne: frontal lesions ($N = 15$); generalized lesions ($N = 16$); extrafrontal lesions ($N = 30$); and controls ($N = 37$). The results indicated that the generalized and frontal groups performed more poorly than the extrafrontal and control groups on accuracy, and the frontal group utilized poor organizational strategies in comparison to the other groups. It is concluded that the CFT is a valid diagnostic tool, and all scores examined provided some unique differential information.

Correspondence: *Peter Anderson, Department of Psychology, Royal Children's Hospital, Flemington Road, Parkville, Victoria 3052, Australia.*

D. ANDERSON, V.A. ANDERSON, L. PENTLAND, S. SAWYER, P. JOHNSON, M. STARR, C. POWELL, T. NOLAN, J. CARLIN, & P. PHELAN. Attentional function in adolescents receiving isoniazid prophylaxis for mycobacterium tuberculosis infection.

Reports have suggested that isoniazid treatment may be associated with poor concentration and subtle reduction in memory. Adolescence carries

an increased risk of development of TB in those with positive tuberculin tests. As adolescents are often students facing major assessment milestones, such cognitive side effects may have major implications. This study examines attentional function in a group of 27 adolescents who received isoniazid prophylaxis for at least 6 months. Participants were assessed before treatment, 1 month into treatment, and at least 1 week after treatment cessation. Measures included the Paced Auditory Serial Addition Test and subtests of the appropriate Wechsler scale sensitive to attention/concentration and speed of information processing. Results are discussed with respect to implications for prescription of isoniazid and compliance with medication. Correspondence: *Dianne Anderson, Department of Psychology, Royal Children's Hospital, Parkville, Victoria 3052, Australia.*

L. PENTLAND, V.A. ANDERSON, & J. WRENNALL. Bacterial meningitis: Implications of age at illness for language development.

Childhood bacterial meningitis provides an ideal context in which to investigate the impact of early illness on language development, given the high incidence in infancy when language skills are rapidly emerging. This study aims to investigate the differential effect of age at illness on language development. The participants were 30 children, currently ages 9 to 10 years, who had previously suffered bacterial meningitis. A range of language skills were assessed using standardized measures. Results revealed that the group as a whole had acquired fundamental expressive and receptive language skills, but their performance on measures of higher-level language fell significantly below the age-expected level. Multiple regression revealed that all measures of basic language were predicted by illness severity. A summary score of basic language ability was, in turn, a significant predictor of all measures of higher-level discourse. Age at illness was not a significant predictor of performance. The implications for the development of higher-level abilities following early CNS insult are discussed. Correspondence: *Vicki Anderson, Department of Psychology, University of Melbourne, Parkville, Victoria 3052, Australia.*

T.P. KELLY & C. WALTON. Validity and factor structure of tests of executive function in children.

One hundred children ages 7 to 13 years completed a battery of executive and intellectual function tests. The executive function tests used were selected from clinical neuropsychology and developmental psychology literature. The tests of executive function were found to correlate with verbal and performance intellectual ability, with strength of correlation being apparently dependent on verbal or nonverbal content of the executive tests. Factor analysis of executive function tests provided some limited support for separable executive functions. The need for more detailed research using multitrait-multimethod techniques is discussed.

Correspondence: *Tom Kelly, Room 432, Department of Clinical Psychology, Ridley Building, University of Newcastle upon Tyne, Newcastle upon Tyne, England.*

Paper Session 1/9:00–10:40 a.m.

HEMISPHERIC ASYMMETRIES AND GENDER DIFFERENCES—COGNITION

S. POLLMANN & E. ZAIDEL. Hemispheric processing differences for bilateral redundant targets: A commissurotomy study.

Redundant target effects within visual search were investigated in a commissurotomy subject (L.B.). The main findings were (1) a strong redundancy gain when targets were presented simultaneously in each visual hemifield; (2) no redundancy gain was found within either visual hemifield. Analyzed separately for hand of response, the observed gain for the left hand, indicative of right-hemispheric processing, was compatible with a race model. Right hand responses, however, violated the race inequality, suggesting coactivation in the left hemisphere. This pattern of results was independent of target salience. Normal controls' responses were compatible with race-like processing; they showed comparable redundancy gains

within and between the visual hemifields. Results suggest greater independence of hemispheric processing modes after commissurotomy.

Correspondence: *Stefan Pollmann, Max-Planck-Institute of Cognitive Neuroscience, Inselstrasse 22–26, D-04103 Leipzig, Germany.*

K. HUGDAHL, G. CARLSSON, P. UVEBRANT, & A.J. LUNDER-VOLD. Dichotic listening performance and intracarotid amobarbital injections in adolescents tested before and after surgery.

Dichotic listening performance to consonant–vowel (CV) syllables were compared pre- and postoperatively in 13 adolescents who underwent surgical treatment for epilepsy. All subjects were evaluated preoperatively for language hemisphere dominance with injections of amobarbital (Wada test). The Wada results revealed that 9 subjects had left hemisphere language, with 3 subjects having right hemisphere language. A multiple regression analysis was performed for the prediction of Wada-dominance from the dichotic listening scores. The regression analysis showed significant correlations between both pre- and postsurgery laterality indexes and Wada dominance ($r = .81$ and $.76$, respectively). The correlation between the pre- and postsurgery dichotic listening scores was $r = .84$, $p < .001$. It is concluded that the dichotic listening CV-syllables paradigm has predictive value for hemisphere dominance.

Correspondence: *Kenneth Hugdahl, Department of Biological and Medical Psychology, University of Bergen, Årstadveien 21, N-5009 Bergen, Norway.*

K. FLEKKØY, R. BJØRKLUND, I. BAKKE, & E. WIGAARD. Prolonged visual response latencies in chronic whiplash: Implications for brain involvement.

Whiplash patients are still an enigma as to the possible brain mechanisms underlying characteristic symptoms such as increased fatigue and variability of performance. In the present study, choice reaction time (CRT) and simple reaction time (SRT) to lateralized visual stimuli were used in investigating visuomotor processes in chronic whiplash patients and normal controls. In two independent groups, 30 and 20 patients respectively, we found significantly prolonged CRT as compared to normal controls (20 and 19 subjects). Of direct relevance for symptom-related brain mechanisms, was the finding in patients of significantly prolonged latencies or increased latency variability when the left hemisphere responded (right hand) or received the stimulus (right visual field). This might reflect a reduced level of cortical activation in the patients, related to lateralized activation mechanisms.

Correspondence: *K. Flekkøy, Department of Neuropsychology and Rehabilitation, Ullevaal University Hospital, 0407 Oslo, Norway.*

A. REIS & A. CASTRO-CALDAS. Learning to read and write increases the efficacy of reaching a target in two dimensional space.

The processing of written language is a lateralized function that interacts constantly with processes of both sides of the brain. Therefore the acquisition of reading and writing habits may promote an increase in transfer of information, between right and left hemispheres, related to visuomotor activities. The purpose of the present study was to design a functional task simulating the visuomotor components of writing, and compare literate and illiterate non-brain-damaged subjects. Results showed that the overall execution time was slower for the illiterate subjects, the performance of the right hand being particularly difficult in the lower left visual field. It is possible that these differences indicate that the absence of learning to read and write at the proper moment may interfere with the development of visuomotor bihemispheric integration later in life.

Correspondence: *Alexandra Reis, Centro de Estudos Egas Moniz, Hospital de Santa Maria, 1600 Lisbon, Portugal.*

A. HERLITZ. Gender differences in episodic memory. The role of visuospatial and verbal abilities.

Results from two studies will be reported in which potential gender differences in memory have been examined. Results from a population based study, with 1000 subjects ranging in age between 35 and 80, demonstrated

that women performed at a higher level than men on episodic memory tasks, although there were no differences between men and women on tasks assessing semantic memory, primary memory, or priming. In a second study, the impact of verbal and visuospatial ability on gender differences in episodic memory performance was assessed. One hundred men and 100 women, ranging in age between 20 and 40 years participated. Preliminary data indicate that women's higher performance on the episodic memory tasks could not be fully explained by their higher verbal ability.

Correspondence: *Agneta Herlitz, Department of Psychology, University of Stockholm, S-106 91 Stockholm, Sweden.*

Symposium 2/11:00 a.m.–12:30 p.m.

PSYCHOLOGICAL ASSESSMENT OF COMA AND POST-TRAUMATIC AMNESIA

Organizer and Chair: **Barbara A. Wilson**

B.A. WILSON. Psychological assessment of coma and post-traumatic amnesia.

The severity of head injury is usually judged by the depth/duration of coma and the length of post-traumatic amnesia (PTA). However, small changes in behavior may be missed by conventional coma and PTA scales. This symposium is concerned with more detailed assessment of behavior during and shortly after coma. The four papers consider (a) the correlation between a biological (EEG) and a behavioral measure of coma; (b) the usefulness of the Wessex Head Injury Matrix (WHIM) with children; (c) the best tests for (i) differentiating people in PTA from other head injured people and (ii) monitoring recovery from PTA; and (d) the relationship between early cognitive behaviors as measured on the WHIM and outcome 4 years later. The discussant will address the implications of these results for the rehabilitation of head injured people.

Correspondence: *B.A. Wilson, MRC Applied Psychology Unit, Rehabilitation Research Group, Box 58, Addenbrooke's Hospital, Hills Road, Cambridge CB2 2EF, England.*

J.J. EVANS, B.A. WILSON, M. VAN DELFT, D.K. MENON, & B.J. WATSON. The use of bispectral index as a measure of recovery from traumatic coma.

The Bispectral Index (BIS; Aspect Medical Systems), a processed EEG measure, has been developed as a monitor of depth of anaesthesia and has been shown to correlate with the responsiveness in patients receiving a variety of anaesthetic agents. We examined correlations between measures of bispectral index and behavioral recovery point on an 11-point shortened version of the Wessex Head Injury Matrix, in 7 patients who were emerging from coma following either severe head injury or severe subarachnoid hemorrhage. Results demonstrated a highly significant correlation ($r = .75$) between the biological and behavioral measures, suggesting that the bispectral index measure may prove a useful adjunct to behavioral measures of recovery from coma.

Correspondence: *Jonathan Evans, Oliver Zangwill Centre, Princess of Wales Hospital, Lynn Road, Ely, Cambs CB6 1DN, England.*

D.L. MCLELLAN, S. PESTRIDGE, A. SHIEL, & B.A. WILSON. Use of the Wessex Head Injury Matrix with children with head injury.

The patterns of deficit seen after head injury in children are more similar to the patterns seen after head injury in adults than to those from other forms of childhood disability. Yet, specific assessments for children with head injury have not been developed. The aim of this study was to establish whether the Wessex Head Injury Matrix (WHIM) which was developed to assess adults with head injury was an appropriate tool to assess children with head injury. Two groups of children—an acute group ($N = 10$) and a group undergoing rehabilitation ($N = 7$) were recruited to the study. The results showed that the WHIM needs only minor modifications

for use with children of 7 and over but is unsuitable, at present, for younger children.

Correspondence: *A. Shiel, University Rehabilitation Research Unit, Level C West Wing, Southampton General Hospital, Tremona Road, Southampton SO16 6YD, England.*

B.A. WILSON, J.J. EVANS, A.D. BADDELEY, H. EMSLIE, & P. WATSON. Monitoring recovery from post-traumatic amnesia.

We assessed people in post-traumatic amnesia ($N = 11$), later stage head injured control subjects ($N = 12$) and non-brain-injured control subjects ($N = 13$) on 20 occasions to determine which tests were good at (a) distinguishing people in PTA from other groups and (b) monitoring recovery. Word list learning (4th trial), speed of semantic processing and simple reaction time were all good at distinguishing people in PTA from other groups. The best tests for monitoring recovery from PTA, i.e., where PTA subjects changed over time to a significantly greater degree than other subjects, were, in order, speed of semantic processing, digits backwards, simple reaction time, visual recognition memory, and word list learning (4th trial). These findings have implications for the assessment of people in PTA and for the understanding of practice effects with repeated testing.

Correspondence: *B.A. Wilson, MRC Applied Psychology Unit, Rehabilitation Research Group, Box 58, Addenbrooke's Hospital, Hills Road, Cambridge CB2 2QQ, England.*

A. SHIEL, B.A. WILSON, D.L. MCLELLAN, S. HORN, M. WATSON, J.J. EVANS, & J. PICKARD. The relationship between early cognitive and attentional behaviors and outcome 4 years after head injury.

While it is accepted that severity of head injury (e.g., Glasgow Coma score) or duration of post-traumatic amnesia are related to long-term outcome, less attention has been given to identification of behavioral predictors. The aim of this study was to establish if early behaviors observed in a previous prospective study were related to outcome. Forty-one subjects were recruited and assessed on tests of cognition, memory, executive function, visual perception, and language. Social function and level of dependency were also assessed. The results suggest that some combinations of early behaviors are predictive of cognitive and psychosocial outcome. It is not clear however, whether early emergence of the behavior reflect less serious injury or if subjects who recover these behaviors are better able to benefit from rehabilitation.

Correspondence: *A. Shiel, University Rehabilitation Research Unit, Level C West Wing, Southampton General Hospital, Tremona Road, Southampton SO16 6YD, England.*

Paper Session 2/11:00 a.m.–12:30 p.m.

DEMENTIA AND AGING

E.D. BIGLER, C.M. LOWRY, C.V. ANDERSON, S.C. JOHNSON, B.L. PLASSMAN, T. TSCHANTZ, K.A. WELSH-BOHMER, A.M. SAUNDERS, & J.C.S. BREITNER. A population-based study of APOE, Alzheimer's disease and quantitative magnetic resonance imaging.

The relationship between dementia classification [Alzheimer's disease (AD); dementia, non-AD; no dementia] and cognitive status [based on Modified Mini-Mental State (3MS) examination], quantitative magnetic resonance (MR) imaging analysis, and apolipoprotein (APOE) genotype was examined in a population of elderly subjects. Quantitative MR analysis included total brain, CSF, ventricular and hippocampal volumes. Presence of the APOE $\epsilon 4$ allele, a known risk factor for AD, was related to greater degree of atrophic brain change. However, the interaction of APOE and diagnostic classification was not significant. Analysis of cognitive status indicated significance for AD classification with hippocampus, temporal horn volume, and education adjusted 3MS findings as dependent variables. These results have implications for the APOE $\epsilon 4$ role as a risk factor in dementia and atrophic brain changes.

Correspondence: *Erin D. Bigler, Psychology Department, 1082 SWKT, Brigham Young University, Provo, UT 84602, USA.*

B. SMALL, A. HERLITZ, L. FRATIGLIONI, O. ALMKVIST, & L. BÄCKMAN. Cognitive predictors of Alzheimer's disease: Incidence data from the Kungsholmen Project, Stockholm.

The present study examined whether a group of cognitive variables measured at baseline could predict incident cases of Alzheimer's disease (AD) after a 3-year follow-up period. Subjects consisted of 26 incident AD and 179 non-demented very old ($M = 83.5 \pm 4.7$ years) adults participating in a population-based study of aging and dementia. The results of a logistic regression analysis, controlling for age, gender and years of education, indicated that MMSE scores were reliable indicators of who would develop AD. In addition, three individual cognitive measures, recall of organizable words, recognition of faces, and letter fluency, were statistically reliable predictors of subsequent dementia status. We concluded that although the MMSE is useful in predicting dementia, there is an additional advantage of assessing more specific indices of cognitive functioning.

Correspondence: Brent J. Small, Stockholm Gerontology Research Center, Box 6401, Stockholm, S-113 82, Sweden.

S. AURIACOMBE, C. FABRIGOULE, S. LAFONT, & J.-F. DARTIGUES. Letter and category fluency in normal aging and Alzheimer's disease: A population-based study.

Letter (P, L) and category (color, animals) fluency tests were administered to a representative sample of subjects over 65 years old, participating in PAQUID, an epidemiological study of normal and pathological aging. Two groups were considered: a normal (defined by exclusion of dementia) group of 1133 subjects, and a group of 20 subjects meeting NINCDS-ADRDA criteria for Alzheimer's disease. In the normal group, category fluency performance was better than letter fluency performance, and both tests declined with age, lower educational level and less intellectual former occupation. Alzheimer's disease patients had impaired performances at both tests. After adjusting for all confounding factors, category fluency was even more impaired than letter fluency, thus supporting the hypothesis of a specific semantic deficit superimposed on an executive deficit to explain poor fluency performance in Alzheimer patients.

Correspondence: Sophie Auriacombe, Département de Neurologie, Hôpital Pellegrin, Tripode 4ème étage, Place Amélie Raba Léon-33076 Bordeaux cedex France.

K. SUNDET, S. BLOMHOFF, U. MALT, G. BRAATHEN, J. PEDERSEN, & K. BERG. Neuropsychological and psychiatric markers of subjects at risk for Huntington's disease.

Fifty-eight subjects at risk for Huntington's disease (HD) were diagnosed as positive or negative gene carriers and were double-blind assessed with a comprehensive battery of neuropsychological tests (all subjects) and psychiatric questionnaires and rating scales (most subjects). Persons showing manifest signs of HD were excluded from the program but preliminary analyses indicate that 20% show evidence of encephalopathy by standard neuropsychological criteria. The influence of genetic status on test profiles and symptom clusters will be presented addressing the hypothesis of a prodromal phase of subtle signs before manifest HD.

Correspondence: Kjetil Sundet, Department of Psychosomatic and Behavioral Medicine, The National Hospital, 0027 Oslo, Norway.

F.K. WITHAAR, W.H. BROUWER, & A.H. VAN ZOMEREN. Predicting performance of instrumental activities of daily life (IADL) in neuropsychologically impaired older adults: Preliminary results from the older driver project.

The relationship between neuropsychological test performance for both basic, and higher order cognitive functions, and self-reported IADL performance in elderly subjects is evaluated. Twenty-five subjects with signs of early cognitive decline and 25 healthy elderly received a neuropsychological evaluation. All were actively involved in social life and were active drivers. Scores on a test for basic cognitive functions did best in predicting self-reported competence. However, neuropsychological test results only predicted (self-reported) IADL *competence* but not IADL *performance*. It will be argued that this is the consequence of the insensitivity of self-report performance measures, which only specify what activities one is involved in, but not their complexity, difficulty, and efficiency. Available methods for the quantitative assessment of actual IADL competence and performance will be discussed, focusing on our methods for assessing driving competence and performance.

Correspondence: Frederic K. Withaar, Department of Neuropsychology and Gerontology, University Hospital Groningen, CMCI-3, P.O. Box 30.001, 9700 Groningen, The Netherlands.

THURSDAY AFTERNOON, JUNE 26, 1997

Symposium 3/1:30–3:00 p.m.

THE NEUROPSYCHOLOGY OF EPILEPSY: METHODOLOGICAL ASPECTS

Organizer and Chair: A. Gramstad

A. GRAMSTAD & B. ENGELSEN. The neuropsychology of epilepsy: Methodological aspects.

Epilepsy has been subject both to traditional neuropsychological assessment and more specialized methods. In this symposium, neuropsychological methodology is related to main areas of application, including epilepsy surgery and Wada testing, the general problem of assessing memory dysfunction in epilepsy patients, assessment of emotional and psychosocial problems in epilepsy patients, assessment and monitoring of cognitive function in relation to antiepileptic drugs, detecting cognitive consequences of subclinical epileptogenic activity, and expanding traditional assessment methods in clinical evaluation of epilepsy patients. The symposium is mainly based on expert reviews, and focuses a discussion on methodological problems and prospects within the various areas of application.

Correspondence: Arne Gramstad, Haukeland University Hospital, Department of Neurology, N-5021 Bergen, Norway.

C.B. DODRILL. Emotional and psychosocial problems in epilepsy.

Epilepsy is usually associated with compromises in brain functions, and these compromises make a person less able to cope with the stresses and strains of everyday life. As a consequence, such persons tend to develop emotional and psychosocial problems. This presentation is devoted to a description of these difficulties, a review of circumstances that lead to their appearance, and coverage of emotional and psychosocial changes with efforts to relieve seizures by means of medications and surgery. Relation of emotional and psychosocial functioning to neuropsychological status will be emphasized. Finally, non-epileptic (psychogenic) seizures will be used as a case in point where the interplay of emotional and neuropsychological factors is especially difficult to untangle.

Correspondence: Carl Dodrill, Epilepsy Center (Box 359745), Harborview Hospital, 325 Ninth Avenue, Seattle, WA 98104-2499, USA.

A.P. ALDENKAMP. Cognitive effects and side effects of antiepileptic drugs.

The claim that antiepileptic drugs may have cognitive side-effects is still under debate. For the same AEDs opposite findings have been reported. Such controversies may be due to a multitude of factors, such as the type of cognitive targets (do AEDs cause mental slowing?), type of tests (are results of computerized tests valid?), design (is it possible to study cogni-

tive side-effects in normal volunteers?) and a multitude of methodological and statistical factors (such as the required sample size). A separate issue is the effect size relative to other factors (such as seizure activity) that may affect cognitive function. It is suggested that the cognitive effects of AEDs are minor effects and the clinical relevance is in question. A meta-analysis of the cognitive side-effects of all AEDs was carried out, with a special focus on the potential validity threats. Using the DIMDI computer-database, 1034 studies were evaluated, yielding 94 studies reporting empirical findings in peer-reviewed journals during the last 25 years. The studies that passed basic criteria with respect to design and methodology were interpreted for cognitive effects per AED. The evaluation is separately performed for the established AEDs: phenobarbitone, phenytoin, carbamazepine, valproate; for newer drugs such as vigabatrin, lamotrigine and oxcarbazepine; for the drugs in development such as tiagabine, gabapentin and topiramate; and for future drugs such as CGP 33.101, remacemide and UCB L059.

Correspondence: *Albert P. Aldenkamp, Epilepsy Centre, Kempen Haeghe, P.O. Box 61, 5590 AB Heeze, The Netherlands.*

P. THOMPSON. Memory assessment in epilepsy.

Many individuals with epilepsy report memory difficulties and complaints of memory decline represent a frequent reason for neuropsychological referral. Complaints do not always tally with memory test performance. Furthermore, at risk groups such as individuals with dominant temporal lobe lesions may perform adequately on standardized tests. A major methodological problem is the heterogeneous nature of the population. A second factor is the methods employed to assess memory. Most tools focus upon the ability to remember new information with the emphasis on what is remembered over short time periods. Much less work has focused on the process of remembering, retention over longer time intervals and the assessment of remote and prospective memory. Such investigations, as will be demonstrated, are themselves fraught with methodological problems.

Correspondence: *Pam Thompson, Department of Psychology, Chalfont Centre for Epilepsy, Gerrards Cross, Bucks SL9 0RJ, England.*

C. HELMSTAEDTER. Neuropsychological issues related to epilepsy surgery.

The neuropsychological issues related to epilepsy surgery will be delineated in large samples of patients with temporal lobe epilepsy (TLE) who underwent left/right temporal lobe surgery. With consideration of cerebral dominance (plasticity/gender), the data clearly demonstrates relations between lateralized epilepsies and material-specific memory impairment. In preoperative patients pathology, antiepileptic drugs, and epileptic dysfunctions turn out to be the major determinants of cognitive impairment in TLE. Memory outcome after selective and standard resections and intracranially recorded event related potentials suggest a differentiation between mesial and lateral memory functions which must be differentially considered when predicting the cognitive outcome after temporal lobe surgery. Finally, the relevance of neuropsychological measures of memory for subjective and daily memory will be demonstrated.

Correspondence: *Christoph Helmstaedter, Department of Neuropsychology, University Clinic of Epileptology, 53105 Bonn, Sigmund Freud Strasse 25, Germany.*

Note: Symposium 3 stops for a break at 3:00 p.m. and continues at 3:20 p.m.

Paper Session 3/1:30–3:00 p.m.

VISUAL PROCESSING

J. RÖNNBERG, B. SÖDERFELDT, J. RISBERG, & M. INGVAR. Visual aspects of language perception studied by means of rCBF and PET.

This paper reviews three recent rCBF and PET studies on sign language, lipreading, and audiovisual speech perception using story materials in

healthy bilinguals. The subjects activate similar posterior temporal cortical regions bilaterally when sign language perception is compared to perception of audiovisual language (i.e., when the speaker is visible). It was also found that lipreading activates left parieto-temporal regions more so than sign language. In the PET study it was shown that sign language specifically activated Brodmann areas 19 and 37 bilaterally. The visual speech component seems to activate similar yet distinct subsets in a neural network of V5-related visual association areas.

Correspondence: *Jerker Rönnerberg, Department of Education and Psychology, Linköping University, S-581 83 Linköping, Sweden.*

F. UHL, M. BREITENSEHER, & L. DEECKE. Altered pathways, but normal occipital cortex: MRI of the congenital peripheral blind's visual system provides further evidence for neural plasticity.

Magnetic resonance imaging (MRI) was used to evaluate possible morphological changes of the visual system in 12 patients suffering from congenital blindness of peripheral origin. While their optical pathways showed degeneration, hypoplasia or atrophy in 7 out of 12 persons, the occipital cortex appeared normal in all cases. This dissociation is in contrast to the assumption that visually-deprived cortex may undergo degeneration. It corroborates findings of our research group that their occipital cortex is involved in nonvisual functions, e.g., their inferior-occipital SPECT blood flow is increased. DC potentials in the EEG were enhanced occipitally during active touch/Braille reading, and even in tactile imagery.

Correspondence: *Frank Uhl, EKN-Munich-Bogenhausen, Department of Neuropsychology, Dachauerstrasse 164, D-80992 Munich, Germany.*

T. BENKE, E. WEISS, G. STEINWENDER, & T. BODNER. Lateral orienting behavior (LOB) in patients with thalamic lesions.

This study investigates the role of the thalamus in lateralized attention for visual stimuli. Nineteen patients with CT-documented lesions in the thalamus performed a searchboard task requiring visual exploration and a pro- and antisaccade paradigm testing the generation of saccades to laterally presented stimuli. Thalamus patients were compared with subjects suffering from parietal and frontal brain lesions. Visual exploration was impaired in the majority thalamus patients contralateral to the lesion, irrespective of the side of the lesion. Furthermore, subjects with thalamic lesions showed a severe deficit to generate antisaccades with normal prosaccade function. EOG recordings showed that they generated insufficient saccades due to poor fixation, premature eye movements and problems to disengage from previously appearing stimulus cues. This profile was similar to patients with lesions in the frontal eye field or in the parietal lobe. These data suggest that the thalamus is part of a network which accomplishes lateralized orienting behavior.

Correspondence: *Thomas Benke, Klinik für Neurologie, Anichstrasse 35, A-6020 Innsbruck, Austria.*

S. WOOD, M.F. GREEN, M. HISCOCK, B. BREITMEYER, & P. SATZ. A comparison of visual and auditory masking at similar stimulus onset asynchronies (SOAs): Evidence for a common mechanism?

Two experiments were performed examining rapid auditory processing using a dichotic listening task. In the first experiment, delays were introduced between the cv syllables, effectively creating a target (leading cv) and a mask (lagging cv). Suppression of the first target was reported at 75 ms and 90 ms SOA. In the second experiment, the task required localization of the signal and the time course of the suppression was compressed to 40 ms SOA. These findings are similar to those reported in the visual system (Green et al., 1994) and support a two-channel model of auditory processing based on that proposed by Breitmeyer and Ganz: (1) a transient system (needed to localize a signal) and (2) a sustained system (needed to identify the stimulus).

Correspondence: *Stacey Wood, UCLA/NPI, 760 Westwood Plaza, Room C8-747, Los Angeles, CA, 90024, USA.*

Symposium 3 continued/3:20–4:20 p.m.**THE NEUROPSYCHOLOGY OF EPILEPSY:
METHODOLOGICAL ASPECTS****Organizer and Chair: A. Gramstad****H. BJØRNÆS. The Wada test: Some methodological considerations.**

The Wada test was developed to determine language lateralization in patients considered for epilepsy surgery, but the technique also offered opportunities to assess lateralized memory functions, thus diminishing the risk for postoperative amnesia. Different designs for memory testing and the use of superselective procedures are discussed. Recently, the technique has been shown to give valuable information concerning the lateralization of the epileptogenic area and to have predictive value for postoperative outcome. The relative contributions of alternative methods, especially dichotic listening, MRI and fMRI are discussed. The question whether the invasive Wada test should be replaced by these alternative methods in combination with traditional neuropsychological assessment is addressed. Correspondence: *Helge Bjørnæs, The National Centre for Epilepsy, Postbox 900, N.1301, Sandvika, Norway.*

A.-L. RUGLAND. Monitoring cognitive problems in subclinical epileptic activity.

The therapeutic implication of subclinical epileptogenic activity has been a matter of concern and controversy. It has been argued that antiepileptic drugs should not be used since this is not a clinical manifestation. Many studies have emerged over the years confirming the occurrence of cognitive impairment during subclinical spike wave discharges. Previous investigations will be discussed with focus on the methodological aspects. A computerized neuropsychological test battery that has been developed at our hospital especially for this use will be presented. The computer is connected to the EEG-machine and gives on-line information about the patient's performance in periods with and without EEG-discharges. The test battery consists of six different tests. The methods and the results from more than 10 years investigation will be presented.

Correspondence: *Anne-Lise Rugland, The National Center for Epilepsy, Postbox 900, 1301 Sandvika, Norway.*

A. GRAMSTAD. Some supplements to standard neuropsychological assessment in epilepsy patients.

The neuropsychological evaluation of epilepsy patients at the Department of Neurology, Haukeland Sykehus, is based on the Halstead-Reitan battery. Several supplementary methods are in use. Data concerning dichotic listening indicates less frequent right ear advantage for cv-syllables in epilepsy patients than in controls, and implications of dichotic listening data are discussed. The evaluation of psychosocial problems is based on the WPSI and MMPI-2, and supplementary scales. A brief scale measuring self-efficacy in relation to epilepsy is presented. The concurrent validity in relation to relevant WPSI-scales is promising. Data concerning locus of control and dimensions of affectivity in about 100 epilepsy patients are presented. Locus of control shows modest correlations with psychosocial problems, while affectivity correlates with important psychosocial factors and also with measures of inventory validity and test-taking attitudes.

Correspondence: *Arne Gramstad, Haukeland University Hospital, Department of Neurology, N-5021 Bergen, Norway.*

Paper Session 4/3:20–4:20 p.m.**CASE STUDIES: APHASIA, DYSGRAPHIA,
AND ACALCULIA****L. MANNING. Visual generation deficit in a case of optic aphasia.**

The patient reported here presented with a mild visual deficit. However, his results showed the core symptoms of optic aphasia on most of the nam-

ing tests he performed. The purpose of this study was to determine the type and extent of the patient's visual impairment and its effects on his optic aphasia. To address this issue the following structures and processes were studied: naming in different sensory modalities; semantic access from vision; the long-term visual memory; the visual buffer and the visual generation process. The results suggested that R.G's difficulties concerning the visual processes were strongly related to loss of visual imagery. The co-occurrence of these two different syndromes are discussed in terms of neural structures and cognitive issues.

Correspondence: *Lilianne Manning, Neuropsychology, Hôpital LADAPT, 12 rue Notre Dame, 91450 Soisy sur Seine, France.*

N. GRAHAM, K. PATTERSON, & J.R. HODGES. Two cases of progressive dysgraphia.

We studied 2 patients with a novel and virtually identical progressive dysgraphic syndrome, which has three components. At presentation the patients exhibited surface dysgraphia on both oral and written spelling. Over time, non-phonologically plausible spelling errors increased, and eventually became the dominant response type for both patients in both response modes. The more slowly developing peripheral dysgraphia consisted of difficulty with producing letters, particularly in lower case, without a model to copy. These findings cannot easily be accounted for using conventional information-processing models since one is forced to hypothesize multiple loci for impairments that emerged in an identical sequence for both patients. We suggest that connectionist models can account better for the observed interactions between central and peripheral processing.

Correspondence: *John Hodges, Department of Neurology, Level 5, A Block, Addenbrooke's Hospital, Hills Road, Cambridge CB2 2QQ, England.*

C. SEMENZA, L. GIRELLI, & L. MICELI. The role of monitoring in calculation: A single case study.

We report the case of a patient who shows a specific deficit for arithmetical procedures. A qualitative analysis of the patient's performance, however, reveals that the nature of the deficit is different with respect to previously described cases. His difficulty seems to stem from an inability to monitor the sequence of operations that calculation procedures specify rather than to the systematic application of disturbed algorithms. On the basis of the available data we propose a distinction between impairment in written calculation due to the application of defective knowledge of the procedures from those determined by lack of monitoring.

Correspondence: *Carlo Semenza, Dipartimento di Psicologia, Università di Trieste, Via dell'Università, 34123 Trieste, Italy.*

Poster Session 1/4:20–5:15 p.m.**NEUROLOGICAL, NEUROPSYCHIATRIC AND
MEDICAL DISEASE, BRAIN INJURY, CHILD
NEUROPSYCHOLOGY AND AGING****Discussion with authors****Invited Lecture/5:15–6:15****THE REPAIR AND RESTITUTION POTENTIALITIES OF
THE CENTRAL NERVOUS SYSTEM****Professor Per Andersen**

FRIDAY MORNING, JUNE 27, 1997

Poster Session 2/11:00 a.m.–12:00 p.m.

MEMORY

I. HARDY, P. AZOUVI, N. AGAR, C. JOKIC, F. ENOT, & M. VAN DER LINDEN. Updating working memory after severe closed head injury (CHI).

The existence of a specific deficit of the central executive of working memory after severe CHI is debated. We addressed this question by means of a running span paradigm: Subjects were given consonants strings of unknown length, and had to recall serially a specific number of recent items. According to Morris & Jones (1990), this task relies on two independent mechanisms: the phonological loop, involved in serial recall, and the central executive, necessary for the updating process. Performance in this task was compared to the Brown-Peterson paradigm, which has also been suggested to rely on the central executive. Surprisingly, the performance of 14 severe subacute CHI patients in the running memory task did not statistically differ from controls'. This could not be attributed to a lack of statistical power, nor to a floor or ceiling effect. However, patients performed poorly in the interference condition of the Brown-Peterson paradigm. This dissociation suggested that some aspects of the central executive were preserved (updating memory), whereas other (task coordination) might be selectively impaired after severe CHI.

Correspondence: *Philippe Azouvi, Department of Neurological Rehabilitation, Raymond Poincaré Hospital, 92380 Garches, France.*

J. GRIGSBY, D. BUSENBARK, N. KRAVCISIN, S.D. AYARBE, & P.M. KENNEDY. Working memory impairment in relapsing-remitting multiple sclerosis.

Using Baddeley's model of working memory, this study evaluated whether: (1) persons with relapsing-remitting multiple sclerosis (R/R MS) demonstrate impaired working memory; and (2) this impairment is associated with deficits in speed and capacity of information processing, or with a defective phonological buffer. Forty-seven persons with R/R MS were compared with 35 neurologically intact persons. All were administered a battery of short-term memory and information processing tests, including an adaptation of the Brown-Peterson test of working memory. MS patients performed more poorly than controls on the Brown-Peterson, Digit Span, PASAT, and Logical Memory measures. No differences were found on measures assessing the passive phonological buffer or the articulatory loop. Tests of the speed and capacity of information processing showed significant differences. The results provided strong support for the hypothesis that working memory is impaired among persons with R/R MS, and that this impairment is strongly associated with deficits in the capacity and speed of information processing (Baddeley's "central executive").

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A. DE SOMER, P. BOON, G. VINGERHOETS, E. THIERY, & L. DEFREYNE. Memory performance in temporal lobe epilepsy patients during presurgical evaluation.

As part of a presurgical evaluation program, patients with refractory partial epilepsy receive a neuropsychological examination and a bilateral intracarotid amobarbital procedure (IAP) to determine the lateralization of language and memory. We set out to evaluate whether memory performance on the IAP correlated with memory performance of the pre-operative neuropsychological examination. In the right temporal epileptogenic group ($N = 22$), there is a significant correlation between IAP memory performance of the right hemisphere and complex figure recall. Mean results of both measures correctly predict the lesion side. The left temporal epileptogenic group ($N = 11$) however, showed many strong correlations between

memory performance during IAP and the neuropsychological examination. The performances on both measures will be discussed as well as their relevance in the presurgical evaluation.

Correspondence: *Anne De Somer, Department of Psychiatry and Neuropsychology, University Hospital 4K3, De Pintelaan 185, B-9000 Ghent, Belgium.*

J.C. ALVAREZ-CARRILES & J. MENOR-PINILLA. Persistent post-traumatic retrograde amnesia: A neuropsychological study.

We report the case of a 33-year-old man who, after a closed head injury, showed a clear retrograde amnesia (RA), basically referred to autobiographical memories. However, he showed a practically normal capacity to acquire new information (anterograde memory). The little autobiographical information that the patient has after the trauma is not accompanied by a feeling of personal implication. This case casts some doubts on the common view that a fundamental feature of the amnesic syndrome is an anterograde deficit.

Correspondence: *Juan C. Alvarez-Carriles, Unidad de Neuropsicología, Hospital Central de Asturias, c/Julian Clavería s/n, Oviedo 33006, Asturias, Spain.*

C. BOAKE. Édouard Claparède and the origin of the Auditory Verbal Learning Test.

This paper describes the role of Édouard Claparède (1873–1941), the famous Swiss psychologist, in developing a one-trial word-list learning test, the Test de mémoire des mots, that is the antecedent of the auditory verbal learning tests (AVLT) of Rey and others. The word lists in the Rey AVLT are taken from Claparède's test. The fact that Claparède's AVLT has survived in modified form for almost 80 years makes it one of the oldest psychological tests in continuous use. In addition to developing the AVLT, Claparède pioneered neuropsychological research in amnesia due to Korsakoff syndrome. He also pioneered clinical testing of head-injured patients for personal-injury litigation.

Correspondence: *Corwin Boake, Department of Physical Medicine and Rehabilitation, University of Texas-Houston Medical School, TIRR, 1333 Moursund, Houston, TX 77030-3405, USA.*

K. JODZIO, D. WIECZOREK, & W. RADZIWIŁLOWICZ. Subjective and objective memory measurements in depression and diffuse brain damage.

This study investigated the factors affecting the severity and character of memory complaints and examined differences in memory functions between depressed and brain damage patients. First group consisted of 21 inpatients with moderate major depression. Second group consisted of 21 persons with mild diffuse brain damage (most with degenerative etiology). Patients with brain damage and depressed subjects described themselves being cognitively impaired in comparable degree. Subjects with brain damage showed greater recency effect in nonverbal learning test and made more false-positive errors in auditory-verbal recognition testing than the depressed subjects did. Results confirmed that effortful learning, copying of designs from memory and free recall are particularly difficult for depressed inpatients. The best task in discriminating brain damaged from depressed patients were delayed recall.

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N. NAKANISHI, S. YOSHIDA, H. NAKAMURA, T. HAMANAKA, & K. HADANO. Unawareness of memory impairment in brain-damaged patients.

This paper evaluated the degree of unawareness (UA) of memory impairment (MI) in brain-damaged patients (22 patients with mild/moderate dementia of Alzheimer type [DAT] and 20 with cerebrovascular disease [CVD] with MI, but without other severe cognitive deficits) by means of a self-

report "Memory Questionnaire" (MQ) as well as a battery of neuropsychological tests. MQ was composed of two forms, one (132 items) in which each patient assessed the degree of his/her own MI, and the other (104 items) in which one of his/her family members assessed the degree of MI of the patient. The statistical analysis revealed that, although there were no significant difference in overall cognitive performance between DAT and CVD, UA scores in DAT were significantly higher than those in CVD with regard to recall deficits concerning events of recent daily life, hypothetical events as well as 10 words with 10 min delay, and also non-mnesic disabilities. The results may contribute to differential diagnosis of both the diseases.

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M. GÓMEZ BELDARRAIN, J.C. GARCÍA-MONCÓ, A. PASCUAL-LEONE, & B. RUBIO. Effect of focal cerebellar lesions on procedural learning in the serial reaction time task (SRTT).

We investigated the effects of chronic focal lesions of the cerebellum with minimal residual motor impairments on the SRTT. Fourteen patients with unilateral lesions in the territory of the posterior-inferior or superior cerebellar artery were compared with age-matched controls. We found that regardless of the side, size, or vascular territory, patients showed normal learning with the hand contralateral to the lesion but did not acquire procedural knowledge when performing with the ipsilateral hand. This study further defines the role of the cerebellum in procedural learning of the SRTT and suggests a critical role of crossed cerebellar-prefrontal connections in this function.

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D. MATAIX-COLS, C. JUNQUÉ, K. VERGER, M. BARRIOS, M. SÁNCHEZ-TURET, & J. VALLEJO. Procedural learning dysfunction in sub-clinical obsessive-compulsive subjects.

Some studies have reported the usefulness of non-clinical samples as a valid model for understanding the underlying mechanisms to obsessive-compulsive disorder (OCD). The aim of the current research was to further investigate the fronto-subcortical involvement in o-c behavior using a sub-clinical sample. Seventy-one students of psychology were recruited from an original pool of 450 people in basis of their scores on the Padua Inventory (PI). Thirty-five "high" o-c (who scored greater than 1 SD above the mean) and 35 controls agreed to participate in the study and were administered a battery of tests sensitive to fronto-striatal dysfunctions. The high o-c group needed significantly more trials and number of moves to reach solution criteria in the Tower of Hanoi puzzle than controls. Female and male subjects showed different impairment patterns. Multiple regression analysis showed an involvement of the "Checking" factor of the PI in these results. Deficits in procedural learning are congruent with the striatal hypothesis of OCD.

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N.I. LANDRØ, T.C. STILES, & H. SLETVOLD. Memory functioning in chronic pain (fibromyalgia), major depression and healthy controls.

A confounding factor when interpreting potential memory impairment associated with chronic pain is that a considerable proportion of pain patients also exhibit a depressive disorder. Chronic pain patients (fibromyalgia), with or without a life time history of major depressive disorder, were compared with major depressives and healthy controls on a comprehensive battery of short- and long-term memory tasks, classified along the automatic-effortful dimension. The results confirm earlier studies indicating that depressed patients are impaired on long-term memory tasks requiring sustained effort. The pain patients show a similar pattern of deficient memory. However, when the depression status of the pain subjects were accounted for, only those who had a lifetime history of depres-

sive disorder showed memory impairment in comparison with healthy controls.

Correspondence: *Nils Inge Landrø, Department of Psychology, University of Oslo, Box 1094, Blindern, 0317, Oslo, Norway.*

ATTENTION

R. YOASH-GANTZ & D. DIPERSIO. Persian Gulf War veterans: Impairment in divided attention, not memory retrieval.

Memory problems are a frequent complaint of Persian Gulf War (PGW) veterans. Recent data have found an increased number of accidental deaths in PGW veterans compared to other veterans. To date, no published data demonstrate cognitive impairment in PGW veterans. Eleven male PGW veterans meeting rigorous inclusion criteria were administered a battery of attention, learning and memory tests. Mean education was 13.09 (range 12–14), and mean age was 36.45 (range 26–46). Data were scored using age and education norms and z score transformations were performed. A 95% confidence interval was computed for various indices. Subjects had significantly impaired performances on the two tests of divided attention, yet they performed normally on all other tests in the battery. Depression did not correlate with performance. These data are impressive given the small sample size.

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J. COUILLET, N. MARLIER, P. AZOUVI, M. LECLERCQ, M. ROUSSEAUX, & Y. MARTIN. Random generation and divided attention after severe diffuse closed head injury (CHI) and focal prefrontal lesions.

The aim of this study was to assess the Supervisory Attentional System (SAS) after diffuse traumatic brain injury and focal prefrontal lesion. The experimental procedure used random number generation and a simple reaction time task, both under single- and dual-task conditions in 16 severe diffuse CHI patients and 7 patients suffering from sequelae of a ruptured aneurysm of the anterior communicating artery (RAACA). Both groups of patients performed each single task slower than controls, but only RAACA patients obtained a poorer quality of randomization. A significant dual-task effect was found in both groups. CHI patients seemed to sacrifice the RT task in order to maintain their performance in the primary task. This suggested that CHI patients still had some residual ability to divide their attentional resources. In opposition, RAACA patients obtained a poorer performance were highly sensitive to the dual-task condition, which produced a global deterioration of performance.

Correspondence: *Josette Couillet, Department of neurological rehabilitation, Raymond Poincaré Hospital, 92380 Garches, France.*

E. MATSUMOTO & N. MOTOMURA. The effects of menstrual cycle on visuospatial attention task.

In this study, we investigated the hypothesis that hemispheric lateralization with cognitive function might depend on the phase of the menstrual cycle. The cognitive act of shifting attention from one place in the visual field to another is monitored by the use of a visuospatial attention task. Thirty-three spontaneously cycling high school girls participated. Test sessions took place during the menstrual, preovulation, and midluteal phases. Attention symmetry ratio representing right visual field advantage was significantly reduced in the menstrual phase compared to the preovulation phase of the menstrual cycle. The results suggested that visuospatial attention performance is influenced by the menstrual cycle, and that sex hormones may influence the balance of hemispheric activation.

Correspondence: *Eriko Matsumoto, Graduate School of Human Environmental Studies, Kyoto University, Kyoto 606-01, Japan.*

A. ASBJØRNSSEN. The development of effortful auditory attentional shifts.

This study examines the effects of effortful and automatic shifts of attention in dichotic listening in right-handed adolescents (age 13 years) and

young adults (age 20 years). A binaural trial-by-trial instruction (verbal cue, VC) or a monaural tone cue (tonal cue, TC) was presented to direct attention to either left or right ear immediately before the presentation of CV-syllables pairs in a dichotic listening task. In addition, subjects were also presented an anti-cue task (AC), where they were instructed to report from the ear opposite to where they heard the tonal cue. Adolescents showed attentional shifts in the instructed direction for both the tonal cue task and the verbal instruction task, but were not able to override an automatic right ear advantage on the more effort-demanding AC task. However, the young adults were able to eliminate the right ear advantage even on the AC task. This implies that the effortful, voluntary attentional skills develop during puberty. This has to be considered when evaluating attentional abilities in adolescents and young adults.

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C. GARCÍA, M. MATARÓ, C. JUNQUÉ, A. ESTÉVEZ, & J. PUJOL. MRI measurement of caudate nucleus in adolescents with attention-deficit hyperactivity disorder.

Quantitative morphological studies with magnetic resonance imaging have been able to detect brain structural abnormalities in children with attention-deficit hyperactivity disorder (ADHD). To further investigate structural basal ganglia abnormalities in ADHD, single-slice transversal and coronal measurements of the head of the caudate nucleus were performed in a group of 11 ADHD adolescents and 19 control subjects. Caudate measures were adjusted for total brain area, since the total brain area was smaller in the ADHD group. The ADHD group had a larger right caudate nucleus compared to control subjects. The larger caudate nucleus found in the ADHD group could be related to a failure of the maturational processes that normally result in volume reduction.

Correspondence: *Carne Junqué, Departament de Psiquiatria i Psicobiologia Clínica, Facultat de Psicologia, Universitat de Barcelona, Passeig de la Vall d'Hebron, 171. 08035 Barcelona, Spain.*

I. LINTERMAN & L. WEYANDT. Divided attention skills in adults with ADHD.

Attention-deficit hyperactivity disorder is estimated to affect 1% of the adult population, however information concerning the attentional patterns of this disorder in adults is sorely lacking. The purpose of the present study was to investigate the divided attention skills of adults with ADHD relative to a control group, using the Colorado Neuropsychological Repeat Test (CNRT). Thirty-six participants (18 with ADHD, 18 controls) were included in the study. ANOVA results indicated that the performance of adults with ADHD was similar to controls on the CNRT tasks. The reaction time (RT) of adults with ADHD was, however, significantly "faster" than the RT of control subjects.

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L. WEYANDT, J.A. RICE, I. LINTERMAN, L. MITZLAFF, S. GREENE, R. WESTWOOD, & E. HERMAN. Time orientation in adults with ADHD.

Attention-deficit hyperactivity disorder, characterized by an inability to sustain attention, impulsivity, and hyperactivity, was previously believed to be outgrown with the onset of puberty. Recent studies suggest that the majority of individuals with ADHD, however, continue to display symptoms into adulthood. The purpose of the present study was to investigate whether adults with ADHD differed from controls, and a second clinical group in terms of time orientation. It was hypothesized that adults with ADHD would be more present-oriented than the remaining two groups. The dependent variable was the Stanford Time Perspective Inventory (Zimbardo, 1992). ANOVA results revealed no significant differences in time orientation between the three groups.

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M. ØIE, B.R. RUND, & K. SUNDET. Attention deficits in adolescents with schizophrenia or ADHD.

Attention deficits are described as main cognitive/neuropsychological impairment in patients with schizophrenia or ADHD. Comparison of these two groups in order to chart in which parameters they are alike and in which they are different, has only to a very limited degree been carried out, however. In the present study 19 adolescents with early onset schizophrenia have been compared to 20 adolescents with ADHD. A normal comparison group of 30 healthy adolescents were also included in the study. A broad test battery consisting of sustained, focused and divided attention tasks, as well as more standard neuropsychological tests and focused and divided attention tasks, as well as more standard neuropsychological tests and clinical assessments were used. Preliminary results for the three groups of subjects will be presented.

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C. GARCÍA-SÁNCHEZ & A. ESTÉVEZ-GONZÁLEZ. Continuous Performance Test (CPT): A PC-compatible version

The Continuous Performance Test (CPT) is an objective measure of sustained concentrated attention. Adaptations for microcomputer are frequently used in neuropsychological research and clinical neuropsychology. We present a technical note on a computerized version of the CPT. The computerized version is developed in the MS-DOS environment and Pascal language. Routines in Assembly language are used in order to control the reaction times in milliseconds. Technical features and program structure are explained.

Correspondence: *C. García-Sánchez, Servicio de Neurología, Hospital de la Sta. Cruz y San Pablo, Sant Antoni M. Claret 167, 08025-Barcelona, Spain.*

"FRONTAL LOBE" FUNCTIONS

S. TORNAAS, J.M. KROGSTAD, S. ANDERSSON, & A. FINSET. Quantitative measurement of executive functions in patients with acquired brain damage.

Disturbances of executive functions in terms of poor planning, lack of volition, purposive action and performance efficiency are frequently observed in brain damaged patients, especially in cases of frontal lobe dysfunction. In spite of growing interest in understanding and treating executive disorders, few methods exist for quantifying such disorders. We present a method based on a revised version of the "Tinkertoy Test" in which patients are instructed to construct an object from standardized material. The process is videotaped, transcribed and scored in 10-s intervals according to specific criteria for working process and complexity. We present preliminary results from 30 patients and 100 normal controls. The possible value of the test as a valid method in measuring disorders of executive functions is discussed.

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R. KOOKEN & J. GRIGSBY. Regulation of motor behavior and independent functioning among brain injured persons.

This study evaluated whether: (1) brain-injured individuals perform more poorly on a test of the ability to regulate motor behavior than neurologically intact persons; (2) persons with impaired capacity for motor control show behavior associated with dysexecutive syndrome; (3) persons with impaired capacity for motor control deficient ability to initiate and carry out goal-directed, purposeful behavior. Fifty persons aged 23 to 61 who had sustained moderate to severe brain injuries (living in a residential brain injury treatment program), and 50 neurologically intact adults aged 22 to 50, were given a test of executive functioning (Behavioral Dyscontrol Scale, or BDS), and the Similarities subtest of the WAIS-R (as a measure of verbal reasoning); 48 brain injured subjects also were rated by program staff on a measure assessing the frequency of behaviors associated with dysexecutive syndrome, and on a measure of independence in 15 activities of daily living (ADL) and instrumental ADLs. Analysis of covariance (AN-

COVA), controlling for age, education, and Similarities score, yielded a significant main effect for group membership [$F(4,99) = 16.3, p < .001$]. Among brain injured persons, ANCOVA, with independent functioning as a dependent variable, found impairment among those with low BDS scores. The BDS was not associated with any of the behavioral disorders.

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M.A. JURADO, K. VERGER, P. VENDRELL, J.L. MARTI-VILALTA, & C. JUNQUÉ. Incidental learning for spatial location in frontal lobe patients.

The frontal cortex has been related to spatiotemporal learning. We studied an incidental spatial location learning in a sample of 44 patients with frontal lobe damage. A picture with nine elements was presented. The subjects were not informed they would have to remember the location of the elements. The frontal group showed an impairment of location learning in relation to a matched-control group. On the contrary, intentional element recall was normal. These results suggest that incidental spatial learning may involve frontal cortex.

Correspondence: Carme Junqué, Department of Psychiatry and Clinical Psychobiology, University of Barcelona, Passeig de la Vall d'Hebron 171, Barcelona 08035, Spain.

F.F. LEFEVER & E.I. KUMKOVA. Standard Judgment of Line Orientation (JLO) versus Line Orientation in Working Memory (LOWM): Proposed paired-test strategy to evaluate frontal lobe function.

"Frontal" tests may be vulnerable to lesions in other loci because of frontal-posterior interactions. Denckla urged development of paired tests, identical except for "frontal" demands. JLO is not a "frontal" test, but performance may be related to spatial working memory. Frontal involvement was seen when speed of perception was confounded with working memory demands. LOWM uses JLO's truncated lines, moderates the speed demands (5-s inspection vs. 300 ms) and increases working memory demands (target items and template never presented together vs. JLO conjoined presentation). LOWM is feasible for normal subjects: When JLO preceded LOWM, 48% of 29 female and 19 male normal volunteers did better, 10% the same, 42% worse in LOWM, but differences were small. For women, not men, both predicted Trails; JLO-LOWM difference did not, but 2 much worse in LOWM had large Trails B:A ratios, as do "frontal" patients. It remains to be seen whether frontal patients with intact posterior function do well on JLO but poorly on LOWM.

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Å. HAMMAR, A. LUND, A. ASBJØRNSSEN, K. HUGDAHL, & A. RONESS. "Hypofrontality" in major depression: Impairments on cognitive functions may indicate frontal lobe dysfunction.

This study investigated attention and language function in 47 patients with major depression. Three groups were investigated: first episode patients ($N = 14$), recurrent/chronic patients ($N = 18$) and ECT-treated patients ($N = 15$). Patients who did not receive ECT treatment were on antidepressive medication. The Wisconsin Card Sorting Test (WCST), Stroop Test and Dichotic Listening were performed a total of 4 times, 3 times during their illness and once at follow-up after recovering. The Hamilton Depression Rating Scale (HDRS) was used to evaluate the intensity of the depression. First episode patients performed normally on all test occasions, both when they were depressed, and when they were recovered. However patients with recurrences/chronicity showed impairments on all tests, both when depressed, and when they had recovered.

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LANGUAGE AND AUDITORY PROCESSING

A. GADE, I. LAW, K. RUNE, C. BONDE, & O.B. PAULSON. Lexical categories: A positron emission tomography (PET) study contrasting silent noun and verb generation.

Verb generation activates prefrontal cortex in PET studies. This may represent semantic association or more general processes in attention or re-

sponse generation. In aphasia difficulties with verbs are associated with anterior lesions, and difficulties with nouns with temporal lobe lesions. We therefore reasoned that a contrast between verbs and nouns in a PET experiment would be relevant evidence. We prepared matched lists of nouns and verbs, and asked 10 normal subjects to generate nouns to verbs, and verbs to nouns, during studies of the regional cerebral blood flow. Behavioral data indicated equal difficulty in the two tasks. The tasks also activated the same brain regions. Our data strengthen the interpretation of the prefrontal activation as a more general task activation.

Correspondence: Anders Gade, Department of Psychology, Copenhagen University, Njalsgade 88, DK-2300 Copenhagen S, Denmark.

K. HADANO, H. NAKAMURA, T. HAMANAKA, & Y. IKEMURA. Effortful echolalia observed in patients with cerebral infarction.

Effortful echolalia is described with a report of 3 patients with cerebral infarction. The patients always spoke nonfluently with loss of the speech initiative, dysarthria, dysprosody, agrammatism, and increased effort, and were unable to repeat a sentence longer than two or three phrases. Addressed by the partner in conversation, they first repeated a few words spoken to them, and then produced their intended speech. They were always aware of their own echolalia and tried to control it with no effect. These cases indicate that each of repetition ability and fluent speech is not always a necessary condition for echolalia. The possibility that a lesion in the left medial frontal lobe including the supplementary motor area (SMA) would play an important role on the occurrence of effortful echolalia is discussed.

Correspondence: Kazuo Hadano, National Institute of Mental Health (NCNP), 1-7-3 Kohnodai, Ichikawa, Chiba, 272 Japan.

M. MORAL-RATO, F. CUETOS-VEGA, J. SALAS-PUIG, M. FERNÁNDEZ-GONZÁLEZ, R. BLANCO-MENÉNDEZ, C. CASAR-TORNERO, J.C. ALVAREZ-CARRILES, & E. VERA-DE-LA-PUENTE. Landau-Kleffner syndrome: Aphasia or auditory agnosia?

Landau-Kleffner syndrome (LKS) has been defined in 1989 by the International League Against Epilepsy as an acquired aphasia with either generalized or partial seizures. Research carried out in a patient with a LKS, diagnosed by a neurologist with recognized experience in epileptology, is presented. Results show that LKS can be associated with auditory agnosia and not only with sensory aphasia. A Spanish version of PALPA, a cognitive neuropsychological instrument, has been used in the assessment of a patient previously diagnosed with partial deafness and sensory aphasia. The version applied, Evaluación del Procesamiento Lingüístico en Afásicos (EPLA), is an adaptation of PALPA specifically designed for the Spanish population. Data suggest that this patient has a remarkable auditory agnosia, with features of amusia and phonological agnosia.

Correspondence: Myriam Moral-Rato, Unidad de Neuropsicología, Hospital Central de Asturias, C/Julián Clavería, s/n E-33006, Oviedo (Asturias), Spain.

NUMBER PROCESSING

L. GIRELLI, M. DELAZER, C. SEMENZA, S. SCIAMA, & G. DENES. Calculation and number processing in aphasic patients.

The aim of this study was to investigate numerical difficulties in patients with left hemisphere brain damage. Fifty-one patients were grouped according to the type of their aphasia, diagnosed with the AAT test. Number processing and calculation skills were assessed by a battery of various numerical tasks. The statistical analysis of the data revealed multiple differences between the aphasic groups. Interestingly, qualitative analysis of the errors indicated that each group presented with specific difficulties, partially reflecting the nature of their language problems. The implications for the relationship between language and numerical systems will be discussed.

Correspondence: Luisa Girelli, Department of Psychology, University College London, Gower Street, W1CH 6BT, London, England.

M. NEGLIA, C. PELIZON, R. RUMIATI, C. GUERRINI, & C. SEMENZA. Script-dependent errors in reading verbal numerals.

Two patients (M.G. and R.M.) who have different and previously unreported patterns of errors in reading Arabic and verbal numerals are described. M.G. makes significantly more syntactic than lexical errors in reading Arabic numerals, while he shows the reverse pattern in reading verbal numerals. R.M. makes only syntactic errors in reading Arabic numerals and he is not impaired with verbal numerals. These findings are discussed, with respect to theories of numerical transcoding, contrasting models entailing a single-modality neutral representation working in all transcoding tasks with so called “multiple routes” models.

Correspondence: *Carlo Semenza, Department of Psychology, University of Trieste, Trieste 34100, Italy.*

L.W. BRAGA. Number processing in Brazilian illiterate adults.

This study examines number processing in a group of 63 illiterate Brazilian adults, ages 18–54. The battery EC301R-PB-A analyzes backwards counting, number comparison in verbal code, digit span, mental calculation, from verbal code to bank notes (exact and approximate amounts), reading Arabic numbers aloud, from digital code to bank notes and telephone numbers. Findings are that the illiterate person can (a) count backward, starting from 10, but struggles from 16; (b) compare 2 units or 2 tens in verbal code; (c) memorize sequences of 4 units; (d) add and subtract units with a result of less than 7; (e) read numbers 1–20; (f) struggles with bank note values as seen in supermarkets; (g) 50% could write two 7-digit phone numbers. Conclusions: Illiterate adults acquire survival-ensuring knowledge and cognitive techniques. Nevertheless, some daily activities become impaired with larger numerical values.

Correspondence: *Lucia Willadino Braga, The SARAH Network of Hospitals for the Locomotor System, SMHS Q. 501, Conj. A, Brasilia/DF 70330.150 Brazil.*

M. GUERREIRO, A. CASTRO-CALDAS, A. REIS, & C. GARCIA. The magnitude component of digits (semantics); Evidence from Alzheimer’s dementia in illiterate subjects.

Illiteracy and low cultural level have been considered in the literature as risk factors for Alzheimer’s disease. In Portugal the prevalence of illiteracy is very high in particular in the age brackets proper for developing dementia. This study addresses the question of the relationship between illiteracy and Alzheimer’s disease based on the following hypothesis: If cognition in low educated subjects stems mainly on semantic associations (as compared to educated subjects who use higher level symbolic ones) and if Alzheimer’s disease disturbs mainly memory and semantic mechanisms, the pattern of cognitive dysfunction would be different if we compare populations of different educational levels reflecting the differences found in normal subjects. Results obtained by 64 literate (46 demented and 18 non-demented) and 59 illiterate (26 demented and 33 non-demented) subjects in a test battery for dementia confirm the hypothesis. The results obtained in digit span are particularly relevant. Normal illiterate subjects store and retrieve information related to digits on the basis of a magnitude marker (semantics) and illiterate Alzheimer’s subjects are particularly bad in digit span tasks. It can be concluded that culture contributes to the generation of mechanisms that are based on different structures from those that can be considered more “primitive.” The disease process affects mainly the areas responsible for the “primitive” mechanisms and spares the more sophisticated ones, at least at the beginning of the evolution of the disease. Correspondence: *Manuela Guerreiro, Centro de Estudos Egas Moniz, Hospital de Santa Maria, 1600 Lisbon, Portugal.*

VISUOSPATIAL FUNCTIONS AND NEGLECT

A. J. LUNDERVOLD, A. LUNDERVOLD, A.I. SMIEVOLL, & O.-B. TYSNES. Assessment of structure–function relationship after a penetrating trauma in the right parietal lobe.

A right-handed, 50-year-old man underwent neurological, neuropsychological, and multispectral three-dimensional magnetic resonance (3D MRI)

examination after a penetrating trauma to his right parietal region. He showed left sided, distal paresis with reduced sensibility. Volume visualization of the 3D MRI data showed damage to major parts of the right parietal lobe, with substance loss and compensatory enlargement of the ipsilateral ventricle, and no macroscopic damage of the precentral gyrus. The neuropsychological examination showed visuoconstructive difficulties and impaired global visual processing. Signs of visual neglect might reflect involvement of cortico-subcortical tracts. Perseveration and ineffectiveness in dealing with complex spatial patterns can be related to structural loss of superior occipitofrontal tracts. Thus, the multidisciplinary approach allows a detailed investigation of structure–function relationships in cases of localized brain damage.

Correspondence: *A.J. Lundervold, Department of Neurology, Haukeland University Hospital, N-5021 Bergen, Norway.*

C. HUBLET, G. DEMEURISSE, J.L. SLACHMUYLDER, & V. VANDERASPOILDEN. Contribution of quantified EEG to the study of the pathophysiology of subcortical neglect.

The pathophysiology of subcortical neglect is still a debated point. Actually, the neural mechanism most frequently evoked suggests a causal relationship between a remote cortical decrease in neuronal activity (akin to diaschisis) and the occurrence of the cognitive disorder. The purpose of the present study was to analyze quantified EEG and neuropsychological data in stroke patients with right-sided deep-seated lesions. Thirty-three patients were studied. A 20-channel EEG cartography system was used. Possible visuospatial neglect was assessed with a battery of seven tests. Discriminant analysis was used to predict category membership (presence vs. absence of neglect). Neglect was observed in 16 patients. Regarding delta activity, regions of interest that discriminated clearly between patients with or without neglect were situated in right-sided temporal, parietal, and central regions. Moreover, right-to-left ratios between homologous parietal and posterior temporal regions also discriminated clearly.

Correspondence: *C. Hublet, Revalidation Neurologique, CHU Brugmann B-1020, Brussels, Belgium.*

A. LOUIS-DREYFUS, C. SAMUEL, A. CHAILLEY, A.S. GONIDOU, P. AZOUVI, & B. BUSSEL. Effect of transcutaneous left hand electrical stimulation on unilateral neglect.

Various sensory inputs such as vestibular or optokinetic stimulation, trunk orientation, have been shown to modulate egocentric frame of reference and may positively affect left hemineglect. More recently, Vallar et al. suggested that transcutaneous electrical stimulation of the left upper limb could also reduce unilateral neglect. The aims of this study were: (a) to try and reproduce the findings made by Vallar et al. on 6 neglect patients; (b) to assess the effectiveness of this technique in a single case rehabilitation trial. Our results did not reproduce Vallar et al.’s findings: No reduction of neglect was observed in our group during electrical stimulation. The same results were obtained with the rehabilitation procedure after 7 weeks of training. Nevertheless we found an improvement of nonlateralized attention (phasic alertness). In conclusion, transcutaneous electrical stimulation of the left upper limb does not seem to improve unilateral neglect but may positively affect non-lateralized attention.

Correspondence: *Anne Louis-Dreyfus, Department of Neurological Rehabilitation, Raymond Poincaré Hospital, 92380 Garches, France.*

OLFACTION

A.W. BACON, R. QUINONEZ, V. HARTWELL, J. RAZANI, & C. MURPHY. Toward a better understanding of olfactory tasks: Contribution of sensory and cognitive components.

Olfactory functioning is compromised in Alzheimer’s disease (AD). However, it is unknown to what extent performance on olfactory tests relies on cognitive abilities, and to what extent sensory abilities. Addressing this question provides insight to the olfactory system in general, as well as the compromise of olfactory functioning in AD. This study examines tests of odor fluency and odor identification in relation to category fluency and

naming tests. Results show odor fluency performance is not only influenced by a sensory component, but to an even greater degree by a cognitive component. These findings, coupled with known cognitive compromise in AD, suggest that this odor fluency test, because it relies on both cognitive and sensory abilities, may be a uniquely sensitive and clinically useful tool.

Correspondence: *Clair Murphy, San Diego State University, Department of Psychology, 6363 Alvarado Court, Suite 101, San Diego, CA 92129-4913, USA.*

J. RAZANI, A. CHAN, D. ROBIDEAU, R. RAMERO, J.S. PAULSEN, & C. MURPHY. A comparison of semantic networks for odors and colors in Alzheimer's patients, Huntington's patients and normal elderly.

Patients with Alzheimer's disease (AD), but not Huntington's disease (HD), demonstrate a breakdown in semantic knowledge, and both groups show deficits on some olfactory tasks. Association networks for odors and colors have not yet been studied in either group. We hypothesize that semantic networks for the odors will differ in AD and normal elderly subjects. Due to intact semantic memory in HD, we hypothesized that this group would perform similar to controls. Multidimensional (MDS) analysis of similarity judgments revealed a difference in the spatial map of the AD patients for odors, but not for colors, compared to normal elderly and HD. Results suggest a breakdown in semantic network for odors in AD patients, perhaps due to the CNS neuropathology found in areas associated with olfaction.

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R. NIJJAR, C. TALESFORE, M. SLIGER, S. WETTER, & C. MURPHY. Differences in olfactory functioning in young and middle-aged individuals with Down's syndrome.

Similar neuropathological changes to those found in patients with Alzheimer's disease (AD) have been observed in 30-year-old persons with Down's syndrome (DS), including pathology in olfactory areas. However, less neuropathology is present in younger DS individuals. The present study assessed olfactory functioning in groups of adolescent and middle-aged subjects with DS. Results revealed that older individuals with DS identified fewer items on a non-lexical odor identification test and showed poorer odor sensitivity than the younger group. This study suggests that olfactory function reflects increasing neuropathology and dementia status of individuals with increasing age.

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Symposium 4/9:00–10:40 a.m.

EPISODIC AND SEMANTIC MEMORY: INDEPENDENT OR INTERACTIVE MEMORY SYSTEMS?

Organizer: M. Verfaellie

M. VERFAELLIE. Episodic and semantic memory: Independent or interactive memory systems?

Neuropsychological studies demonstrating double dissociations of memory function have established the existence of two distinct forms of memory: memory for events (episodic memory) and memory for facts and concepts (semantic memory). It remains controversial, however, whether these two forms of memory are organized in parallel or whether they can mutually influence each other. This symposium addresses this question from two perspectives: (1) the role of episodic memory in the acquisition and maintenance of semantic information; and (2) the role of semantic memory in the acquisition of episodic information. Evidence from patients with

amnesia, aphasia, Alzheimer's disease and semantic dementia will be discussed.

Correspondence: *Mieke Verfaellie, Memory Disorders Research Center (151A), Boston VAMC, 150 South Huntington Avenue, Boston, MA 02130 USA.*

M. VAN DER LINDEN & T. MEULEMANS. Semantic learning and amnesia.

The integrity of semantic memory in amnesia is a controversial point. This presentation will review some studies in which we explored new semantic learning in amnesics. The findings suggest that under appropriate learning conditions, amnesics may acquire new flexible semantic knowledge. They also suggest that an important factor in semantic learning in amnesia is the consistency of the to-be-learned material with preexisting concepts. The importance of minimizing occurrence of errors during acquisition will also be examined. Finally, we will report data obtained on a young woman with Williams' syndrome showing that acquiring the phonological form of new words may occur in the presence of defective episodic memory and that phonological working memory plays an important role in this acquisition process.

Correspondence: *M. Van der Linden, Neuropsychology Unit, University of Liège, Boulevard du Rectorat, B33, Liège, B-4000, Liège, Belgium.*

M. VERFAELLIE. Interactions between episodic and semantic memory: Evidence from amnesia and aphasia.

In a first study, we examined the effects of episodic memory deficits on the acquisition of novel semantic information. Despite the use of successively more sensitive probes, a patient with a 25-year history of dense amnesia showed very little evidence that he had acquired any vocabulary words that entered the language after the onset of his amnesia. In a second study, we examined episodic memory in mildly aphasic patients with or without semantic deficits. Patients with semantic deficits performed worse than those without semantic deficits, especially on tasks of verbal recall. These findings suggest that episodic and semantic memory are mutually interactive memory systems.

Correspondence: *Mieke Verfaellie, MDRC (151A), Boston VAMC, 150 South Huntington Avenue, Boston, MA 02130, USA.*

G. DALLA BARBA. Semantic and episodic memory in Alzheimer's disease.

Tulving's hierarchical hypothesis assumes that episodic memory is a specific subsystem of semantic memory and therefore implies that episodic memory cannot exist without semantic memory. In the present study, four experiments investigated the influence of different types of encoding on recognition memory performance in a population of 12 patients with Alzheimer's disease (AD) and 12 normal controls (NC). The results show that the ability to make a semantic association between two items was significantly and positively correlated to the subjects' performance on the recognition tasks. These findings are interpreted as giving support to the view that episodic memory for an item is affected by the level of semantic awareness of that same item.

Correspondence: *Gianfranco Dalla Barba, U.324 I.N.S.E.R.M., Centre Paul Broca, 2ter,rue d'Alésia, 75014 Paris, France.*

K.L. GRAHAM, R.M. LAMBON, & J.R. HODGES. Does autobiographical experience help maintain semantic knowledge in semantic dementia?

Snowden et al. proposed that autobiographical experience plays a role in maintaining meaning in patients with progressive loss of semantic knowledge. In two patients with semantic dementia, however, we were unable to demonstrate a noticeable impact of autobiographical experience on semantic memory. Both patients play sports regularly, and although they were able to perform a first name-surname matching task, neither patient was able to provide detailed definitions to sporting terms or to select bowls or

golf words from foils. The patients also failed to produce any relevant information about the friends with whom they played sport. These results are discussed with respect to Snowden et al.'s theory and current views of long-term memory storage.

Correspondence: *Kim Graham, MRCAPU, Research Rehabilitation Group, Box 58, Addenbrooke's Hospital, Cambridge CB2 2QQ, England.*

Paper Session 5/9:00–10:40 a.m.

CHILD DEVELOPMENT

S.W. D'SOUZA, E. RIVLIN, J. CADMAN, B. RICHARDS, P. BUCK, & B.L. LIEBERMAN. Children conceived by *in-vitro* fertilization after fresh embryo transfer.

Two-hundred seventy-eight children (150 singletons, 110 twins, 24 triplets & 4 quadruplets) conceived by IVF after 3 fresh embryos were transferred, seen in a 4-year period, were matched with 278 normally conceived singleton controls. They were assessed for neonatal conditions, minor congenital anomalies, major congenital malformations, cerebral palsy and other disabilities. The ratio of male to female births was 1.03:1. Forty-six percent of IVF children were from multiple births; 32.7% were from preterm deliveries; and 43.2% weighed less than 2500 g at birth. Multiple births contributed to preterm deliveries and neonatal conditions in 45.0% of all IVF children. Congenital abnormalities varied: 3.6% of IVF children and 2.5% of controls had minor congenital anomalies, and 2.5% of IVF children and no controls had major congenital malformations. Specific types of congenital abnormality were small and unrelated to multiple births. Two point one percent of IVF children but no controls had mild/moderate disabilities including cerebral palsy. The serious disadvantages of multiple births are discussed.

Correspondence: *Elise Rivlin, Department of Clinical & Health Psychology, Child/Adolescent Specialty, Central Manchester Healthcare NHS Trust, The Winnicott Centre, 195–197 Hathersage Road, Manchester M13 0JE, England.*

M. NESTER & J. WATBAN. Frontotemporal hypoplasia: Clinical sequelae.

Frontotemporal hypoplasia (FTH) is characterized by widening of the anterior CSF spaces and relatively normal ventricular size. It has been described in conjunction with a number of conditions and associated with varying levels of morbidity. More recently, a condition of "benign" FTH has been reported. As part of a preliminary study to determine whether a more involved investigation was warranted, we examined a series of 16 children seen with FTH. Ten of the 16 had poor outcomes on follow-up, with 4 performing within normal limits and 2 in the mild to moderately impaired range. When compared with other children diagnosed with "cerebral dysgenesis" involving various CNS structures but not having FTH, the FTH group did somewhat less well. We found no contributing factors that would suggest ways of discriminating "benign" from other forms of FTH. The findings confirmed the need for a larger prospective study involving specialized imaging protocols and neuropsychological serial evaluations.

Correspondence: *M.J. Nester, Neurosciences Department KFSH, Box 3354, Riyadh 11211, Saudi Arabia.*

P. KLAAS, H.J. HANNAY, J.M. FLETCHER, & J. CAROSELLI. Interhemispheric transfer of sensory information in children with partial agenesis of the corpus callosum.

Hydrocephalic children often have callosal abnormalities and other cerebral anomalies. However, the role of various areas of the corpus callosum in interhemispheric transfer of visual, auditory, and tactile information has not been studied at the same time in hydrocephalic children. Hydrocephalic children with partial agenesis of the corpus callosum (namely the

splenium and aspects of the posterior body) were compared with normal controls on tachistosopic, ITT, dichotic, and tactile naming and matching tasks. Hydrocephalic children with partial agenesis of the corpus callosum resemble individuals who have a congenital absence of the corpus callosum in their performance of all tasks except the ITT task.

Correspondence: *Patricia Klaas, 5217 Maple Street, Bellaire, TX 77401, USA.*

G. BRYHN, P. HAGEMO, M. RASMUSSEN, & I.H. VANDVIK. Neurodevelopmental outcome after palliative surgery in children with hypoplastic left heart syndrome.

The hypoplastic left heart syndrome (HLHS) is a serious congenital heart defect that leads to certain death in the neonatal period unless a program of palliative surgery is performed. The neurodevelopmental outcome and psychosocial adjustment of children with HLHS have been the subject of few studies so far. The present study of a cohort of young children who had undergone the Norwood surgical procedure for HLHS, were conducted in order to describe the cardiac, neurological, psychiatric and cognitive outcome after surgery. Data from the cardiac examination, the neurological assessment, the psychiatric interview including CBCL and HSCL-25, and the psychological testing with the Stanford-Binet IV, the Bayley II or the Griffith Developmental Scale will be presented, and areas for further followup studies will be discussed.

Correspondence: *Grete Bryhn, Rikshospitalet, Berg Gård, Bergsallèen 21, 0854 Oslo, Norway.*

Symposium 5/11:00 a.m.–12:30 p.m.

FACIAL AFFECT PROCESSING

Organizer: **A. Calder**

A. J. CALDER, A.W. YOUNG, D. ROWLAND, & D.I. PERRETT. Perception of facial expressions: Differentially severe impairment of fear.

We describe studies of two cases of impaired expression perception in the context of bilateral amygdala damage: DR and SE. When tested with 10 examples of each of the 6 emotions from the Ekman and Friesen (1976) series, both DR and SE showed deficits in the recognition of fear. Problems in recognizing fear were confirmed using photographic quality images interpolated ('morphed') between prototypes of the 6 emotions in the Ekman and Friesen (1976) series to create a hexagonal continuum (running from happiness to surprise to fear to sadness to disgust to anger to happiness). Control subjects identified these morphed images as belonging to distinct regions of the continuum, corresponding to the nearest prototype expression. However, DR and SE were impaired on this task, with problems being most clearly apparent in the regions of the fear and the anger prototypes. Hence the perception of fear can be differentially severely affected by brain injury. A role for the amygdala in the perception of fear is supported by recent PET data which will also be discussed.

Correspondence: *Andrew J. Calder, MRC Applied Psychology Unit, 15, Chaucer Rd, Cambridge CB2 2EF, England.*

S. SCOTT, A. J. CALDER, & A.E. YOUNG. Impaired perception of auditory emotions after bilateral amygdala lesions; loss of fear and anger.

The amygdala is a temporal lobe structure which has been implicated in aspects of emotional and social processing. Investigations of facial expressions of emotion have shown deficits in recognition after amygdala damage, with the processing of fear and anger being disproportionately affected. A crucial issue is whether the role of the amygdala is limited to the visual domain of facial expressions, or if it is involved in the processing of emotional information across modalities. We report an investigation of a case

of bilateral amygdala damage, DR who has normal hearing and speech perception but impaired perception of the prosodic ones to emotion in vocal affect. As in the recognition of facial expressions, the recognition of fear and anger is most affected in the auditory domain. These data demonstrate that role of the amygdala in appraising emotions is not constrained to the visual domain.

Correspondence: *S. Scott, MRC Applied Psychology Unit, 15, Chaucer Rd, Cambridge CB2 2EF, England.*

R. SPRENGEIMEYER. Emotion recognition in Huntington's disease.

Emotion recognition was investigated in a group of people with Huntington's disease (HD) and controls. In a test of perception of facial expressions of basic emotions from the Ekman and Friesen (1976) series, interpolated images were created for six continua that lay around the circumference of an emotion hexagon (happiness-surprise, surprise-fear, fear-sadness, sadness-disgust, disgust-anger, anger-happiness). In deciding which emotion these morphed images were most like, people with HD showed deficits in the perception of anger and fear, and an especially severe problem with disgust, which was recognized only at chance level. A follow-up study with tests of facial and vocal expression confirmed that the perception of disgust was markedly poor for the HD group, still being no better than chance level. These data reveal severe impairment of emotion recognition in HD and show that the recognition of some emotions is more impaired than others. The loss of ability to recognize disgust in HD contrasts with previous reports of differentially severely impaired recognition of fear after amygdala damage. The possibility that certain basic emotions may have dedicated neural substrates need to be seriously considered; among these disgust is a prime candidate.

Correspondence: *Reiner Sprengelmeyer, Neurologische Klinik (St Josef) Ruhr-Universität Bochum, Gudrunstrasse 56, 44791 Bochum, Germany.*

J.M. GRAY, A.W. YOUNG, W.A. BARKER, & A. CURTIS. Impaired recognition of disgust in Huntington's disease gene carriers.

Facial processing was examined in 38 persons at prior 50% risk for Huntington's disease presenting for genetic testing, 15 of whom turned out to carry the abnormal allele (AR + group) and 23 of whom did not (AR - group). Both groups were equivalent and unimpaired on a number of standard tests of cognitive function, including picture naming, verbal fluency, recognition memory for words, and figure copying. Both groups were equivalent and unimpaired on a number of tests of facial processing for identity, including tests of identification of famous faces, unfamiliar face matching and recognition memory for faces. The AR+ group showed a tendency to be worse overall in the recognition of facial expression of emotion ($0.05 > 0.10$). When recognition of each of the 6 basic emotions was examined separately, only disgust was found to be significantly impaired.

Correspondence: *J.M. Gray, Neurobehavioural Service, Newcastle City Health N.H.S. Trust, St. Nicholas Hospital, Newcastle upon Tyne, England.*

Paper Session 6/11:00 a.m.–12:30 p.m.

HEAD TRAUMA AND REHABILITATION

J. PONSFORD, C. WILLMOTT, A. ROTHWELL, P. CAMERON, A. KELLY, G. AYTON, C. CURRAN, & R. NELMS. Cognitive and behavioral outcome following mild traumatic brain injury in children.

The present study aimed to establish factors associated with persisting problems following mild traumatic brain injury (TBI) in children, and the impact of early assessment and information provision. Of 79 mild TBI children aged 6–15 years, 45 were seen at 1 week and 3 months post-injury, and 34 at 3 months only. Performances on measures of behavior, attention, speed, and memory, and reported symptomatology, were compared with matched control groups seen at similar time intervals. Children with mild TBI reported more symptoms than controls at one week, particularly headaches, but these had resolved at 3 months. No neuropsychological or behavioral

differences were apparent at 1 week or 3 months. Ten percent of children did have ongoing problems. They tended to have a history of learning difficulty, behavioral, or emotional problems.

Correspondence: *Jennie Ponsford, Department of Psychology, Bethesda Hospital, 30 Erin Street, Richmond, Victoria 3121 Australia.*

T. NYBO, I. ASIKAINEN, S. SARNA, & M. KASTE. Gender differences in cognitive performance after traumatic brain injury (TBI).

Recent basic research has suggested that gender influences outcome of brain injury. We studied 114 patients (37 females and 77 males) who had been exposed to severe or moderate TBI with a comprehensive neurological, neuropsychological and social follow-up evaluation at least 5 years post-injury. Factor analysis was used to collapse the neuropsychological test variables into five factors; memory, speed (both motor and processing), executive, fluency and learning. One-way ANOVA was performed and the gender groups differed significantly in speed ($p < .001$) and fluency ($p < .01$) tasks, males being slower and less fluent in their performance than females. The impact of these cognitive differences on outcome (e.g., capability to work) will be analyzed further and the role of gender influencing outcome of brain damage will be discussed.

Correspondence: *Taina Nybo, Kauniala Hospital for Disabled War Veterans, Kylpyläntie 19, 02700 Kauniainen, Finland.*

S. MILLIS & S. PUTNAM. The California Verbal Learning Test in the assessment of financially compensable mild head injury: Further developments.

A logistic regression model with CVLT variables (hits, primacy, slope, and bias) was derived to differentiate individuals with financially compensable mild head injury ($N = 60$) showing suboptimal effort on a forced-choice test from patients with moderate to severe brain injury ($N = 60$). The logistic regression model fit the data well ($G = 105.9$, $p < .001$, $R^2 = .64$, $\text{tau-p} = .80$, 90% correct classification, ROC AUC = .96). Suboptimal effort on the CVLT may be marked by a performance pattern that is different from that generated by patients with genuine head trauma. This pattern is marked by sluggish recall overall, a tendency to not recall items from the first half of the list, and a propensity to deny recognition of target items.

Correspondence: *Scott R. Millis, Rehabilitation Institute of Michigan, 261 Mack Boulevard, Detroit, MI 48201, USA.*

B.A. WILSON. Cognitive rehabilitation: How it is and how it might be.

This paper suggests there are four main kinds of cognitive rehabilitation programs for brain injured people. The first attempts to rehabilitate cognitive deficits through drills and exercises. The second uses theoretical models from cognitive psychology to identify deficits in order to remediate them. The third is a patient driven approach using a combination of learning theory, cognitive psychology, and neuropsychology to identify and remediate cognitive difficulties. The fourth is the "holistic" approach that believes cognitive functions cannot be divorced from emotion, motivation, or other non-cognitive functions, and all aspects should be addressed in rehabilitation. Despite some overlap between these approaches, there are major differences. The main arguments in this paper are (a) the first two approaches do not lead to good clinical practice; and (b) a synthesis of the second two approaches would result in the best cognitive rehabilitation model.

Correspondence: *B.A. Wilson, MRC Applied Psychology Unit, Rehabilitation Research Group, Box 58, Addenbrooke's Hospital, Hills Road, Cambridge CB2 2QQ, England.*

Invited Lecture/12:30–1:30 p.m.

THE BRAIN AND THE IMMUNE SYSTEM—WHO IS IN CONTROL?

Professor Johan Aarli

FRIDAY AFTERNOON, JUNE 27, 1997

Symposium 6/2:30–4:00 p.m.

NEUROTOXICOLOGY

Organizers: Hallgrim Kløve and Kari Troland

R.F. WHITE, F. DEBES, P. GRANDJEAN, & P. WEIHE. Cognitive deficit in 7-year-old children with prenatal exposure to methylmercury.

A cohort of 1022 consecutive singleton births was generated during 1986–1987 in the Faroe islands, where frequent consumption of seafood causes increased exposure to methylmercury. Mercury concentrations in cord blood and maternal hair were measured as indicators of prenatal methylmercury exposure levels. At approximately 7 years of age, 917 of these children underwent clinical examination and detailed neuropsychological assessment. The neuropsychological test battery included three computer assisted tests from the Neurobehavioural Evaluation System - 2 (Finger Tapping, Hand-Eye Coordination, Continuous Performance Test), three WISC-R subtests (Digit Span, Block Design, Similarities), Bender Visual Motor Gestalt Test, Boston Naming Test and California Verbal Learning Test for Children. These tests were all translated into Faroese and administered by a Faroese neuropsychologist. Decreased performance on many of the neuropsychological tests was related to increased mercury exposure, even when adjusted for covariates such as age, gender, parental education, maternal Ravens score, paternal employment, presence of older siblings at home, and experience with computers. Results suggest that prenatal methylmercury exposure may have subtle but widespread effects on brain function.

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H. KLØVE & K. DALEN. Adverse reaction to amalgam in dental patients.

Problem: Is it possible to demonstrate neuropsychological and personality differences between patient groups with and without adverse reaction to amalgam? **Groups:** Control groups (23-20F, 3M), Adverse reaction group (28, 19F, 9M). The groups were comparable regarding age, education and amalgam points. **Methods:** Wechsler Memory Scale-revised, Skin Conductance variables, and MMPI-2 were obtained for all subjects. **Results:** The results demonstrated that patients with adverse side effects function on the same level as the control group regarding memory variables, attention, concentration and delayed recall. There were no differences on the SCL-variables between the groups. On the MMPI-2, the patients with adverse reactions to amalgam reported an increased prevalence of psychological and somatic complaints at a statistically significant level. **Conclusion:** Since the study did not employ a reference group without amalgam fillings, it cannot be excluded that the absence of differences between the groups may be due to the fact that both groups have been exposed to amalgam. However, it was not possible to generate groups in this age and education range without amalgam fillings. These problems will be discussed.

Correspondence: *Hallgrim Kløve, Department of Neuropsychology, University of Bergen, Arstadveien 21, N-5009, Bergen, Norway.*

A.H. SKORVE. Retrospective assessment of neurotoxic exposure.

In a clinical context one has to decide whether or not an individual patient's exposure to neurotoxic agents is sufficient to cause damage to the nervous system. The decision is hampered by the fact that our knowledge about these substances stem largely from epidemiological research, demonstrating a relationship between exposure and effects on the nervous system, but without a satisfactory quantification of exposure. In early studies,

job title was very often the only index of exposure. There is general agreement that this is unsatisfactory, and several attempts have been made to create exposure indexes as tools for quantifying exposure in epidemiological investigations. Still there is no clear-cut solution as to how to estimate sufficient exposure in a clinical context. The patient must have been exposed to a known neurotoxic substance in sufficient amounts for a sufficient period of time. For organic solvents the rule of thumb has been exposure in concentration above TLV for at least 10 years. Interviewing the patients gives information about individual work history, i.e. work titles, tasks in hours per day, ventilation, protective devices, type of solvent etc. In addition, the occupational hygienist gathers information from industrial hygiene data from the actual workplace or similar. Retrospective assessment very often has to rely on the accumulated knowledge about high risk and low risk workplaces and trades, and historical data on usage of certain chemicals and protective devices. We will present "standardised solvent year" as a feasible exposure index.

Correspondence: *Anne-Helene Skorve, Department of Occupational Medicine, Haukeland University Hospital, N-5021, Bergen, Norway.*

M. GRONNING & U. FLODIN. The neurological assessment in neurotoxic syndromes. A study of a hospital-based population and case-control study.

One of the main clinical problems in occupational neurotoxic syndromes is that the symptoms and findings are often subtle and non-specific. The neurological examination is important to the diagnosis of toxic encephalopathy, and for the differential diagnosis like inflammatory and vascular diseases. The diagnosis in a population of patients referred for solvent induced chronic toxic encephalopathy to the Dept. of Neurology, Haukeland University Hospital, Bergen, Norway during a three year period will be discussed, as will the findings from examination of peripheral nerves in a case-control study based on solvent exposed industrial workers.

Correspondence: *Marit Gronning, Department of Neurology, Haukeland University Hospital, N-5021, Bergen, Norway.*

K. TROLAND, M. THOMPSON, T. BENTSEN & A.H. SKORVE. Solvent induced chronic toxic encephalopathy: A retrospective clinical study.

A retrospective analysis of medical records for all patients referred for solvent induced chronic toxic encephalopathy (SICTE) to the Dept. of Occupational Medicine, Haukeland University Hospital, Bergen, Norway over a five-year period was carried out. Patient-reported symptoms were in accordance with the mainstream literature based largely on cross sectional epidemiological studies. When controlling for age, reported listlessness, sexual dysfunction, fatigue, concentration problems, irritability, hypersomnia, reduced alcohol tolerance, cacosmia and frequent headaches were significantly related to degree of exposure, whereas reported memory problems seemed to be a function of age rather than exposure. The amount of exposure needed to receive a positive diagnosis of SICTE was higher than expected. Differences between cases and non-cases of SICTE were in accordance with diagnostic criteria. Neuropsychological findings were crucial to the diagnostic judgment. Two neuropsychological approaches were compared. There were significant differences in conclusions drawn upon an Extended Halstead Reitan Battery as compared to a battery of selected tests, not attributable to differences in patient characteristics. The latter seemed more sensitive, suggesting SICTE far more often than HRB. The HRB seemed more specific, providing a broader array of diagnostic categories, including other neuropathology. Our findings suggest that selected tests may be used for risk assessment and screening, whereas a comprehensive neuropsychological battery is recommended for diagnostic purposes.

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Paper Session 7/2:30–4:00 p.m.**DEMENTIA–NEUROPSYCHOLOGICAL
CHARACTERISTICS****H.L. GRIFFITHS & D. NEARY. Conversational discourse in Alzheimer's disease and frontotemporal dementia.**

The aim of this study was the analysis of conversational discourse in two major forms of primary degenerative dementia, that of Alzheimer's disease and frontotemporal dementia. Analysis of both linguistic and non-linguistic skills permitted the identification of the patterns of cognitive impairment within the subjects studied. Prior to conversation analysis, formal assessments of language and memory failed to differentiate the two syndromes. The manifestation of these impairments on conversation was analyzed within a framework motivated by the principles of conversation analysis (CA). Conversation analysis indicated different patterns of breakdown that could be explained by the loss of executive function in frontotemporal dementia and its preservation in Alzheimer's disease.

Correspondence: *H.L. Griffiths, Department of Neurology, Manchester Royal Infirmary, Oxford Road, Manchester, M13 9WL England.*

C. SEMENZA, N. GAMBOZ, & F. NICHELLI. Memory for lists of common and proper names in normals and Alzheimer's patients.

The primary effect in free recall lists of common and proper names has been studied in young, elderly, and Alzheimer's patients. Frequency, length, and phonological complexity were matched across all categories of stimuli. An attenuated primacy effect was found for lists of proper names in all groups. The Alzheimer patients had a less evident first position effect for proper names than other groups. These effects are attributed to the different semantic organization in long-term memory that common and proper names might enjoy.

Correspondence: *Carlo Semenza, Department of Psychology, University of Trieste, Trieste, Italy.*

M. LAIACONA, R. BARBAROTTO, E. CAPITANI, T. JORI, & S. MOLINARI. Type of naming errors as a marker of Alzheimer's disease (DAT) progression.

Three DAT patients entered a longitudinal study of the qualitative and quantitative evolution of picture naming impairment. The follow-up lasted 6 to 18 months. The absolute number of lexical-semantic errors tended to be constant until the advanced stage of DAT. However, the proportion of er-

rors of the lexical-semantic type in relation to the overall number of errors showed a decline, with visual or unrelated errors and empty responses being increasingly observed. A model able to accommodate these findings has been verified by an item analysis of the transitions between different response types. It appears that the integrity of the lexical-semantic system undergoes a progressive degradation, but there were also considerable oscillations around a given level of degradation, possibly explained by access problems.

Correspondence: *Marcella Laiacona, "Salvatore Maugeri" Foundation, IRCCS, Rehabilitation Institute of Veruno, Division of Neurology-Service of Neuropsychology, 28010 Veruno (NO), Italy.*

T.H. BAK & J.R. HODGES. The neuropsychological profile of progressive supranuclear palsy.

Twenty-five patients with possible or probable diagnosis of PSP have been examined in a prospective study using a comprehensive neuropsychological test battery including assessment of global cognitive ability, psychomotor speed, memory, attention, visuospatial skills, language and executive function, alongside with a clinical neurological examination. Most patients demonstrate a characteristic pattern of neuropsychological deficits, including decreased verbal fluency, memory deficits, and difficulty in performing of dual tasks. Subtle changes in these functions can be noted early in the course of the disease. By contrast, attention, visuospatial skills, naming, and comprehension remain relatively well-preserved until late stages. The observed deficits can be attributed to the mode of processing (initiation of new concepts, dual tasks, information retrieval) rather, than to the specific modalities involved.

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Presidential Address/4:30–5:30 p.m.**THE AGING BRAIN:
NORMAL AND ABNORMAL MEMORY**

Marilyn Albert

Business Meeting/5:30–6:30 p.m.**SATURDAY MORNING, JUNE 28, 1997****Invited Lecture/9:00–10:00 a.m.****EVOLUTION OF THE WHITE MATTER MODEL
OF THE SYNDROME OF NONVERBAL LEARNING
DISABILITIES: 1982–1997**

Byron Rourke

Paper Session 8/10:00–11:00 a.m.**HEMISPHERIC DIFFERENCES–AFFECT****A. BOUMA. Emotional and psychosocial problems after stroke.**

This study was designed to get a better insight into the problems experienced by stroke patients. The judgments of left-hemisphere stroke (LHS)

patients were compared to those of right-hemisphere stroke (RHS) patients. After a stroke, a large number of emotional and psychosocial disturbances is observed in the patients; however, generally LHS patients are less aware of their disturbances than RHS patients are. Besides, RHS patients prove to be more depressed as well as more anxious than LHS patients are. Theoretical and practical implications of the present findings will be discussed.

Correspondence: *Anke Bouma, Department of Clinical Psychology, Vrije Universiteit, De Boelelaan 1109, 1081 HV Amsterdam, The Netherlands.*

J.W. VAN STRIEN & K. VAN HOOFF. The lateralized emotional Stroop task: Effects of state and trait anxiety.

Twelve males and 12 females participated in a unilateral emotional Stroop task. In this task, subjects are asked to name the color of laterally presented emotional and neutral words, while ignoring their semantic content. Vocal onset times were recorded. In low state-anxiety subjects, neutral and positive words resulted in symmetric latencies, while negative words

resulted in a right visual field advantage due to delayed latencies, especially in the left visual field. In high state-anxiety subjects, neutral words resulted in shorter latencies to right than to left visual-field presentations. Both positive and negative words resulted in delayed latencies in the right visual field, reducing the asymmetry. The outcome will be discussed in terms of differential engagement of the cerebral hemispheres in positive and negative emotions.

Correspondence: *Jan W. Van Strien, Department of Clinical Psychology, Vrije Universiteit, De Boelelaan 1109, C141, 1081 HV Amsterdam, The Netherlands.*

S. ANDERSSON, A. FINSET, & J.M. KROGSTAD. Apathy in acquired brain damage.

Apathy in terms of lack of interest, spontaneity, and emotional indifference is a neurobehavioral feature present in a number of neurological diagnoses. Data from patients with traumatic brain injury, cerebrovascular lesions, and hypoxic brain damage are presented, showing that apathy is a phenomenon distinguishable from other neurobehavioral and neuropsychological disorders. Results from our study indicate that apathy frequently occurs in patients with right hemisphere and subcortical lesions and its occurrence is correlated with reduced autonomic reactivity to psychological stress. Results also show that coping strategies in brain damaged patients are related to the degree of apathy demonstrating that apathy should be considered a major aspect in the rehabilitation process of patients with brain damage.

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Paper Session 9/10:00–11:00 a.m.

COGNITIVE OUTCOME AFTER CORONARY ARTERY BYPASS GRAFTING

O.A. SELNES, G.M. MCKHANN, M.A. GOLDSBOROUGH, & L.M. BOROWICZ. Predictors of cognitive change after coronary artery bypass grafting.

Few studies of cognitive outcome following CABG have been able to identify specific preoperative, intraoperative, or postoperative factors associated with cognitive change. We examined change in performance in specific cognitive domains using standardized neuropsychologic tests in a prospectively studied cohort of 127 patients, and correlated these outcomes with pre-, intra-, and post-operative factors. For each patient, change over time in eight cognitive domains was categorized as one of four patterns: no decline, decline and improvement, persistent decline, and late decline. By multiple logistic regression, comparisons were made between the group of patients with no decline versus all other patients. Factors included in the analysis included preoperative and medical history variables, intraoperative variables, and postoperative variables. No postoperative factors were significant. Certain preoperative factors such as increasing age and diabetes are correlated with declines in specific cognitive domains. Cardiopulmonary bypass time was not correlated with cognitive decline but factors

relating to a diseased aorta were significant. No factors were identified correlating with decline in verbal or visual memory.

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G.M. MCKHANN, M.A. GOLDSBOROUGH, O.A. SELNES, L.M. BOROWICZ, & C. ENGER. Domain-specific cognitive decline after coronary artery bypass grafting.

Adverse neurological outcomes after coronary artery bypass grafting (CABG) include cognitive deficits, but the reported incidence and nature of these deficits varies widely. To identify the incidence of cognitive change and determine whether these changes persist over time, we prospectively studied a sample of 172 patients. Cognitive testing was obtained preoperatively, at 1 month and 1 year postoperatively. The incidence of cognitive decline ranged from 6% to 31% at 1 month and from 4% to 33% at 1 year depending on the cognitive domain examined. In addition, we identified four patterns of change for each cognitive domain; no decline; decline and improvement; persistent decline; and late decline. Only 12% of patients showed no decline across any of the domains tested. An unexpected finding was that 25% of patients had a late decline (between 1 month and 1 year) in visuoconstruction. Our study demonstrates that the incidence of cognitive decline varies according to the cognitive domain. For some domains such as visuoconstruction, 25% of patients had persistent and late cognitive changes at 1 year following surgery. The identification of these domain specific changes in cognition may provide clues to the pathophysiology of the cognitive changes following CABG.

Correspondence: *Guy McKhann, Mind Brain Institute, 338 Krieger Hall, Johns Hopkins University, Baltimore, MD 21287, USA.*

G. VINGERHOETS, E. LANNOO, & C. JANNES. Relation between cognitive complaints and neuropsychological performance after cardiopulmonary bypass.

We compared subjective reports of perceived cognitive changes with neuropsychological test performance in 90 cardiac patients 6 months after cardiopulmonary bypass. Based on a subjective complaints checklist, patients most often reported postoperative complaints of memory (46%), concentration (38%), and sustained attention (33%). Patients who reported complaints in specific cognitive areas were not found to be suffering from impaired cognitive abilities as assessed with appropriate neuropsychological tests, nor did they show a significant decline in cognitive test performance compared to their preoperative assessment. The occurrence of cognitive complaints appears related to the emotional status of the patient. Correspondence: *Guy Vingerhoets, Department of Psychiatry and Neuropsychology, University of Ghent, De Pintelaan 185, B-9000 Ghent, Belgium.*

Poster Session 2/11:00–12:00 a.m.

MEMORY, ATTENTION, FRONTAL LOBE FUNCTIONS, LANGUAGE, PERCEPTION, SPATIAL FUNCTIONS

Discussion with authors